LOW-SKILLED IMMIGRATION AND FEMALE LABOUR SUPPLY

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Abstract. In this paper we examine whether and how the inflows of female immigrants "specialized" in household production has changed the labour supply of Italian women. Our focus is on the intensity of work (i.e., the number of hours worked). To identify the causal effect we exploit the reunifications motives and the network effects – i.e. the tendency of newly arriving female immigrants to settle in places where males of the same country already live – as instrument for the geographical distribution of female foreign workers. We find that a higher concentrations of immigrants who provide (informal) domestic services lead to high-educated women to spend more time at work. A similar effect is not found for other skill groups. The impact is stronger for self-employed women who are presumably more able to adjust at the margin their labour supply. The effect of immigration varies also depending on the presence of children and/or elderly persons at home.

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Aim of the paper. We examine the impact of the inflows of female immigrants "specialized" in household production on the labor supply of Italian women at the intensive margin (that is the number of hours worked).

Motivation. Since the nineties Italy has attracted high immigrants inflows. More recently the female component has gained increasing relevance and part of these workers has specialized in household services.

At the same time, Italy performs relatively bad in an international comparison concerning the extent of labour force participation and time allocation of females. Female employment rate is about 47 percent, far below the Lisbon target of 60 percent. Also among the employed women, the time use is markedly different from their European counterparts: they spend 3 hours and 53 minutes per day in domestic activities that corresponds in a week from a minimum of 1 hour and half to a maximum of nearly 5 hours more than in other European countries.[1] One traditional explanation of these figures, apart from cultural reasons, is the rationing and the lack of flexibility in the childcare service and elderly care.

Background. The labour market effect of migration on the host countries is traditionally viewed in terms of complementarity/substitutability with natives in the production sector. In the case of females another channel is at work: immigrants might substitute natives in the production of household services by removing a pre-existing rationing and/or by reducing the market price of that service. The overall effect on natives is ambiguous and, in principle, could vary with their human capital. These ideas are sketched in a simple model presented in the Appendix.

Literature. The paper is at the crossing of two strands of literature. The former is related to the impact of immigration on host countries.[2] The latter concerns the incentives and the constraints that affect female labor supply. However the connection between immigration and native female labour supply is poorly investigated. In the literature on migration the focus is on the impact on natives' wages and/or labour force participation (extensive margin), ever on the hours worked (intensive margin). In the literature on female labour supply the focus is

[1] The corresponding figures are 3:29 for Spain, 3:11 for Germany, 3:40 for France, 3:32 for Sweden and 3:28 for the United Kingdom. The activities that are more time-consuming are cleaning dwelling, food preparation, dish washing, laundry and ironing, childcare and help to elderly. Information is drawn from the *Harmonised European Time Use Survey*.

[2] See Okkerse (2008) and the works cited therein for a review of the literature. See Brandolini *et al.* (2005) and D'Amuri and Pinotti (2009) for evidence on the impact of immigration in Italy.

on the supply (and prices) of childcare or other family services; again the role of immigrants – who largely supply these services – is surprisingly under-investigated. The two only notable exceptions are Cortes and Tessada (2008) – who find that low-skilled immigrates supply significantly decreases the time high-skilled US women spend in household work – and Furtado and Hock (2008) – who find that low-skilled immigration in US has increased the joint likelihood of childbearing and employment, indicating a substantial reduction in role incompatibility between the two. The main novelty of our paper is the focus on Italy that represents an interesting case of study. Italy performs relatively bad in the international comparison concerning both the extent of labour force participation and time allocation of females. The usual explanations are cultural motives – that have shaped a model of family where women are primarily responsible for unpaid work at home and men are the breadwinners – and the inadequate welfare policies that have affected gender relations and constrained women's labour supply. The most common examples are the rationing and the lack of flexibility in the childcare service (Del Boca and Vuri, 2007) and the inadequacy of elderly care service (Bettio, 2005).

Empirical strategy. We exploit the geographical heterogeneity of the immigrant distribution as main source of variability (so-called "area-approach"). Geographical areas coincide with Istat local labor markets (LLMs). We also use time variability although for a short time period. We estimate a reduced form equation of weekly hours worked explained by individual characteristics of women (age, education, number of children, marital status, etc.), local context variables (i.e., features of the local labor market where the woman lives) and by the incidence of female immigrants specialized in household production:

$$HOURS_{i,t} = const + IMMIGR_{l(i),t-1}\beta + X_i\gamma + Z_{l(i)}\delta + FE + \varepsilon_{i,t}$$

where *HOURS* is the number of weekly hours worked, *i* and *t* denote individuals and periods, respectively; $IMMIGR = \frac{(\#\text{"}specialized\text{"}\ female\ immigrants)}{(\#\ female\ total\ population)}$ is the one-year lagged incidence of foreign females "specialized" in housekeeping and childcare services and elderly care in the LLM *l* where woman *i* resides. *X* is a matrix of individual-level controls; *Z* are further control at the LLM level; *FE* are fixed effects for 20 regions and period (year-quarter) to which individual information is referred.

Specialization is defined on the home-country base. We consider "specialized" workers those women coming from Albania, Ecuador, Philippines,

Morocco, Moldavia, Peru, Poland, Romania and Ukraine. These countries have resulted from the following selection process. Using microdata form the Labor Force Survey (LFS) we computed for each citizenship two specialization indicators (relative to Italians) in *domestic services* defined in terms of job contents and sector of activity. Job types are "Unqualified personnel assigned to cleaning services, hygiene, laundry and similar", "Occupations in personal services and assimilated" and "Paramedic Technicians"; sectors of economic activity are "Health and social care" and "Household services". For home country *c* specialization indicators I_c is given by the following ratio:

$$I_c = \frac{\frac{(\#\ females\ \ from\ country\ c\ employed\ in\ domestic\ services)}{(\#\ females\ \ from\ country\ c)}}{\frac{(\#\ Italian\ \ females\ employed\ in\ domestic\ services)}{(\#\ Italian\ \ females)}}$$

Specialized countries are then those with both specialization indicators greater then 1.3 provided that the number of observations in the job (or sector) – citizenship cell is greater than 30 and in the citizenship cell is greater than 200. The identification of the selected countries is robust to perturbations of these thresholds.[3]

Identification. There are two major threats to validity of our empirical strategy. First, immigrants are not randomly distributed across labor markets and this makes difficult to isolate the effect of immigration on natives from other associated phenomena. There may be some local omitted variable that attract immigrants and affects natives' labor supply. Moreover, reverse causality might be at work: for instance native females who work more intensively could attract a higher number of "specialized" immigrants. Second, local labor markets are not closed and natives may move in response to immigrant inflows, thus biasing again OLS estimates.

To deal with the endogeneity issue we adopt an instrumental variable strategy. Our instrument is a slightly modified version of the standard approach in the migration literature. The traditional "shift-share methodology", firstly applied by Card (2001), is based on the idea that immigrants tend to settle in places where immigrants from the same country already reside. Therefore, the predicted end-of-period composition of a region's immigrant population can be computed on the

[3] Female immigrants are largely employed in domestic services (53 percent; the corresponding figure for native females is 19 percent). However, there is a huge variation across nationalities with percentages around 80 for females from Ukraine, Ecuador and Peru, and around 90 for Filipinos.

basis of its beginning-of-period composition by country of origin and subsequent inflows. One potential criticism is that if local economic shocks that attracted immigrants at the beginning-of-period are persistent over time, then the instrument cannot be credibly solve the endogeneity problem. We believe that our approach represent an improvement in this direction. First, we are quite confident on the length of the time lag between the beginning- and end-of-period (about 15 years). Second, and more importantly, we distinguish immigrants also by gender, recognizing that pull (labour market) factors that attract *male* immigrants are significantly different from those that attract *female* immigrants. The former usually work in the industry and construction sectors, the latter are mainly involved in family and social services.

Specifically, the instrument is built as follows. First we compute the fraction of *male* immigrants living in LLM i in 1991 by country-of-birth c; the countries are those whose people we define as "specialized" in household production. Then we apply the ratios obtained in the first step as weights to "distribute" across LLMs the new waves of *female* immigrants from the same countries. Finally, we collapse the number of immigrants by country to obtain the total predicted immigrants by LLM-year. Formally:

$$\overline{IMM}_{it} = \sum_{c=1}^{N} \delta_{ci} \cdot IMM_{ct}$$

where δ_{ci} measures the fraction of male immigrants from country c that are settled in LLM i in 1991, and IMM_{ct} represents the total number of female immigrants from the same country at time t in Italy.

In doing so, we exploit the family reunification motives (about one half of female immigrants obtains a residence permits thanks to family reasons) and the network effects for immigrant distribution over the territory.

Data. We combine microdata drawn from the 2005-2007 waves of the LFS with aggregate data on the presence of immigrants and other covariates at the local level. Our chosen territorial units of analysis is LLM that is defined as a cluster of municipalities that represent a self-contained labor market on the basis of the degree of work-day commuting by the residents. Therefore it is the best territorial configuration in terms of labor market features and probably the most appropriate units to analyze externalities from immigration. Information on female labour supply is drawn from LFS. The main scope of the survey is to supply accurate and official statistics regarding the employed and unemployed population in Italy. The survey is carried out on a quarterly basis, and the representative sample is approximately 76.800 families per period. We pool data from the quarterly 2005,

2006 and 2007 waves. Our sample is restricted to female in the age bracket 15-64 (working age population), who are employed and who has worked a strictly positive number of hours in the last week.

Results. Main findings are reported in Table 2.[4]

Control variables. Consider the OLS estimates (cols. 1-3). Hours worked has the standard U-shaped relationship with age. Education enters with a negative sign. Several studies have shown that education play a significant role in the decision to participate in the labor force, with the low-educated women working significantly less than high-educated ones. However, as far the number of hours worked is concerned, the effect is less clear. If education captures the (unobserved) wage effect then a positive association between education and hours worked is expected; however, when the wage overcome a certain threshold women might decide to work less (i.e. a "backward bending" labor supply curve). Married women work on average a lower number of hours. The number of children with less than 6 enters, as expected, with a negative sign. The presence of elderly people (over-65) in the family does not significantly affect the number of hours. On the one hand, old people may need special care, keeping women at home; on the other, grandparents tend to take care of small children and thus, on the opposite, they make it easier for young mothers to work. We also include a number of controls for sector of economic activity, job definition and other contractual arrangements that may affect hours worked from the demand side. The hours worked tend to increase with permanent contract and with tenure. Apart from individual characteristics, the individual context can also provide strong incentives or restrictions to individual behaviour. To control for any unobserved local variables we included regional fixed effect. To capture further heterogeneity at the local level, we include the GDP per capita as a proxy of the degree of economic development, density to control for agglomeration effects (that may boost intensity of work) or congestion costs (that push down the number of hours devoted to work), and dummies that identify the productive specialization of the LLM (heavy-industry, made-in-Italy manufacturing, tourism, urban labour market, etc).

Our key variable. OLS estimates (cols. 1-3) show that hours worked is positively associated with incidence of immigrants "specialized" in household production.

[4] In all estimates we show insofar standard error are clustered at LLM-level to meet the Moulton (1990) critique: in a regression performed on micro units and including aggregated (in our case LLM-level) variables, usual standard errors will be underestimated.

The impact is common to low- and high-educated natives. However, as stated before, there are many potential sources of bias for OLS estimates. Turning to the IV estimates, they show that immigrants have a significant positive effect on the female labor supply (col. 4). This effect is driven by the effect on the subsample of the high educated natives (degree-level) while the impact on the less educated (at most compulsory school) remain positive but is no more significantly different from zero (cols 5-6).

The implied economic effect of our estimates is non-negligible: according to our IV estimates an increase by one standard deviation of the incidence of immigrants in a LLM causes on average an increase of 1 hour worked per week that equals the 3 per cent of the total hors worked (33 hours). For comparison, according to our estimates one more child reduces the dependent variable by 2.2 weekly hours worked. In the case of high-educated females the positive economic impact of immigration is far larger (3.3 hours).

Overall, our results highlight the fact that female immigrants change the time use of high-skilled natives. Immigrants replace household work and high-educated natives might supply a higher number of hours, specializing in the production of goods and services that better suit their competencies. As far as low skilled natives are concerned we find that the number of hours worked is substantially unaffected. A possible interpretation is that the decrease of the price of household work is counterbalanced by a decrease of market wages.

Robustness & refinements. Now we provide a set of robustness checks and some refinements. Table 3 reports only the estimate of the *IMMIGR* parameter, but all regressions include all controls reported in Table 2.

Selectivity bias. In order to take into account the fact that our dependent variable is observed only if the woman is employed, we adopt a standard Heckman approach. We use employment status in the previous year as exclusion restriction. Even though we recognize that this choice might be debatable, we didn't find in the literature on this topic an alternative (more convincing) instrument. The coefficients reported in the first row confirm our previous findings: female immigrants push upward Italian women labor supply and this effect is driven by high educated natives.

Left truncation. Following part of the literature we restrict our sample to people working at least one hour. After removing this constraint our dependent variable has a positive and significant density mass in zero where it is left-truncated. The standard way to tackle this departure from the usual setting is to estimate a (IV)

tobit model. Results are shown in the second rows of Table 3 and prove that the left-truncation does not significantly bias our evidence. The main difference with the baseline estimates is the significant (and positive) effects for the low-educated sample, although they remain much slower than what found for high-educated one.

Selection of the sample. Some field papers analyze the determinants of hours worked focusing only on married woman and/or restricting the sample to the full-time employees. The standard argument for the former choice is that restricting to married female is more interesting and allows including a battery of partner's controls. On the other hand, choosing a certain labor supply on the intensive margin might not make fully sense in the case of part-time workers. In both cases our findings are unaffected (rows 3 and 4).

Another interesting sample split shows that the positive effect on high educated females is stronger for self-employed who presumably are more able to adjust at the margin their labor supply (row 5).

In rows 6 and 7 we provide further evidence for different selections of the sample; we refer to women who have at least one child under 6 years in the first case, and those who have at least one elderly person at home in the second. The effect of immigration on the number of hours worked by native women is higher for those who have small children. No appreciable differences emerge, however, depending on the level of education. As far as women with elderly persons at home are concerned, the presence of female immigrants has a strong impact on the intensity of work of high-educated natives whereas the impact is not significantly different from zero from the others.

Measurement issues. We log-transform the dependent variable (row 8). Our results are qualitatively confirmed. Female immigrants push upward Italian women labor supply and this effect is stronger for high educated natives than for low educated ones.

Is the household production the channel at work? In row 9 we measure the local presence of immigrants as their ratio over population considering male and female immigrants from all countries. The instrument is modified accordingly. Again we find a positive and statistically significant effect of migration on female labor supply that is driven by the high-skilled component of Italian females. The effect on low-skilled native is null. Interestingly, the implied economic effect, computed as above as the product of the parameter and one standard deviation of the regressor, equals 0.33 hours and is significantly less than the effect we estimate

considering only specialized female immigrants (1 hour). This evidence seems to support the idea that one transmission channel of the effects of migration on female labor supply is through the outsourcing of household production.

Spatial sorting. We are confident that out IV approach allows us to give a causal interpretation of the positive correlation between *IMMIGR* and labor supply. However we discuss here some more evidence that corroborates that view. One possible drawback of the so called area-approach is that selective outflows (or inflows) of natives might cancel out the impact of immigrant inflows (spatial sorting). For example, if the arrival of one unskilled immigrant leads one unskilled native to leave, then we do not observe a detectable impact on local labour supply; alternatively native females may be attracted from LLMs with a high presence of immigrants so to be able to work more hours. Mocetti and Porello (2009) find that this labour market adjustment is at work in Italy. To address this issue we introduce a dummy that is equal to 1 for those who did not change the place of residence in the last two years and 0 otherwise and introduce it in our baseline regressions either standing alone and interacted with *IMMIGR* (the interaction variable is obviously properly instrumented). We test if stayers systematically differ from movers either in the average hours worked or in the sensitivity to the immigrant incidence. A negative answer to both questions would signal that our results are robust to selective individual assignments in LLMs. The coefficients of the relevant variables reported in Table 4 indicate that this is the case.

Concluding remarks. In this paper we examined the impact of immigration on the female labour supply at the intensive margin. We used cross-LLMs variation in immigrant concentration to investigate its impact on the time allocation of native females. To identify a causal link between the two, we adopted an instrumental variable strategy. Our instrument tries to isolate the "exogenous" component of immigrant distribution across LLMs using the existence of previous enclaves of males who pull female immigrants from the same country-of-birth, mostly for reunifications motives.

This analysis has interesting implications and provides ground for a reflection on the role of welfare policies. We (indirectly) find evidence that rationing of some household services matters for female labour supply decisions. The availability of immigrants specialized in those services impact on time allocation of women, favouring an increase of the time devoted to work and, more presumably, to advance in their careers. This is especially true for high-educated women whereas the impact on low-educated natives is low or null.

From a policy maker point of view, it is debatable whether this form of social organization is a proper one. The choice to use the services of migrant women has ensured the continuity of a model of assistance based on family (familialism). Wives are substituted by cheap nannies and housekeepers. However this (private) welfare model raises complex issues in terms of equity and its sustainability.

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Tables

Table 1: Descriptive statistics

	Mean	Standard deviation	Min	Max
Weekly hours worked	32.987	11.512	1.000	130.000
Immigrants (specialized female)	2.464	1.308	0.044	6.664
Immigrants (total)	4.718	2.575	0.130	11.971
Age	44.203	8.753	16.000	64.000
Schooling	11.487	3.823	0.000	21.000
Married	0.755	0.430	0.000	1.000
# children less than 6	0.231	0.505	0.000	4.000
# persons older than 65	0.087	0.319	0.000	4.000
Log Tenure	4.538	1.285	0.000	6.475
Temporary contract	0.097	0.296	0.000	1.000
Log GDP per capita	9.945	0.369	8.254	10.529

Table 2: Baseline regressions

	OLS			IV		
	All sample	Low-educated	High-educated	All sample	Low-educated	High-educated
Immigrants	0.227***	0.212*	0.261*	0.763**	0.537	2.502***
	(0.079)	*(0.120)*	*(0.150)*	*(0.305)*	*(0.372)*	*(0.761)*
Individual characteristics:						
Age	-0.253***	-0.062	-0.336***	-0.251***	-0.061	-0.342***
	(0.037)	*(0.054)*	*(0.092)*	*(0.037)*	*(0.054)*	*(0.095)*
Age square	0.001***	-0.000	0.001	0.001***	-0.000	0.002
	(0.000)	*(0.001)*	*(0.001)*	*(0.000)*	*(0.001)*	*(0.001)*
Schooling	-0.170***	0.196***	-1.012***	-0.172***	0.195***	-1.023***
	(0.015)	*(0.051)*	*(0.094)*	*(0.015)*	*(0.051)*	*(0.094)*
Married	-2.432***	-2.169***	-2.431***	-2.445***	-2.174***	-2.467***
	(0.092)	*(0.156)*	*(0.168)*	*(0.094)*	*(0.157)*	*(0.172)*
# children less than 6	-2.212***	-1.769***	-2.303***	-2.215***	-1.775***	-2.318***
	(0.098)	*(0.163)*	*(0.145)*	*(0.097)*	*(0.163)*	*(0.145)*
# persons older than 65	0.159	0.118	0.017	0.170	0.125	0.097
	(0.116)	*(0.184)*	*(0.298)*	*(0.116)*	*(0.184)*	*(0.301)*
Temporary contract	-0.269*	1.102***	-3.309***	-0.282*	1.090***	-3.299***
	(0.148)	*(0.222)*	*(0.288)*	*(0.149)*	*(0.224)*	*(0.289)*
Log Tenure	0.815***	0.980***	0.520***	0.815***	0.980***	0.518***
	(0.039)	*(0.056)*	*(0.093)*	*(0.040)*	*(0.056)*	*(0.094)*
Sector of activity FE	YES	YES	YES	YES	YES	YES
Type of job FE	YES	YES	YES	YES	YES	YES
Local controls:						
Log GDP per capita	-0.307	-0.502	0.235	-0.639**	-0.698*	-1.164
	(0.198)	*(0.332)*	*(0.370)*	*(0.280)*	*(0.394)*	*(0.724)*
Density	0.270**	0.352*	0.334**	0.164	0.290	0.006
	(0.127)	*(0.204)*	*(0.148)*	*(0.101)*	*(0.196)*	*(0.414)*
LLM's features	YES	YES	YES	YES	YES	YES
Regional FE	YES	YES	YES	YES	YES	YES
Year/trimester FE	YES	YES	YES	YES	YES	YES
Constant	55.053***	43.695***	70.361***	56.843***	44.792***	78.342***
	(2.285)	*(4.024)*	*(4.675)*	*(2.612)*	*(4.176)*	*(6.746)*
Observations	183,106	66,987	30,449	183,106	66,987	30,449
R-squared	0.17	0.18	0.25	0.17	0.18	0.23

Note: The dependent variable is weekly hours worked at individual level. The sample is a cross section on women aged 15-64 from LFS in years 2005-2007 working a strictly positive number of hours per week. Immigrants is a LLM-level variable given by the (per cent) ratio between immigrant women "specialized" in household services (that is coming from Albania, Ecuador, Philippines, Morocco, Moldavia, Peru, Poland, Romania, Ukraine) and the total number of women (Italian and foreign females). Columns 1-3 present OLS estimates while columns 4-6 present IV estimates. Low educated are those with at most compulsory school; high educated are those who obtained a degree. Standard errors are clustered at the LLM level; *, **, *** denote coefficients significantly different from zero at the 10, 5 and 1 percent level, respectively.

Table 3: Robustness checks & refinements

	All sample	Low-educated	High-educated
Specification:			
(1) Heckman selection	0.763**	0.536	2.515***
	(0.310)	*(0.374)*	*(0.763)*
(2) Tobit with zeros	1.067***	0.991**	3.294***
	(0.351)	*(0.413)*	*(0.955)*
Sample selection:			
(3) Only full-time workers	0.561**	-0.229	2.643***
	(0.240)	*(0.336)*	*(0.827)*
(4) Only married (include controls for the husband)	0.800**	0.706	1.830**
	(0.361)	*(0.480)*	*(0.723)*
(5) Only self-employed	0.096	-0.961	5.702**
	(0.646)	*(0.977)*	*(2.279)*
(6) With children less than 6 years old at home	1,172**	1,238	1,645*
	(0,477)	*(1,007)*	*(0,928)*
(7) With persons more than 65 years old at home	0,241	-0,276	5,138**
	(0,673)	*(1,096)*	*(2,269)*
Measurement:			
(8) Dependent variable: log of hours worked	0.032***	0.028**	0.103***
	(0.011)	*(0.013)*	*(0.031)*
(9) Independent variable: overall immigrants	0.249*	0.069	0.806***
	(0.139)	*(0.247)*	*(0.189)*

Note: The dependent variable is weekly hours worked at individual level. See the text for the definition of the sample. The table reports only the coefficient and the standard error of our key variable (incidence of female immigrants "specialized" in domestic services, except row 9 that refers to all immigrants). Each row corresponds to a different specification. All regressions include all controls reported in Table 2 except for row 4 including also controls for the husband. All rows report IV estimates. Low educated are those with at most compulsory school; high educated are those who obtained a degree. Standard errors are clustered at the LLM level; *, **, *** denote coefficients significantly different from zero at the 10, 5 and 1 percent level, respectively.

Table 4: spatial sorting

	All sample	Low-educated	High-educated
Immigrants	0.825*	0.948	2.463**
	(0.432)	*(1.057)*	*(0.963)*
Immigrants × stayer	-0.062	-0.411	0.027
	(0.345)	*(0.937)*	*(0.690)*
Stayer	-1.442	-0.747	-0.840
	(0.962)	*(2.587)*	*(2.017)*
Controls	YES	YES	YES
Observations	183,106	66,987	30,449
R-squared	0.17	0.18	0.23

Note: The dependent variable is weekly hours worked at individual level. The sample is a cross section on women aged 15-64 from LFS in years 2005-2007 working a strictly positive number of hours per week. Immigrants is a LLM-level variable given by the (per cent) ratio between immigrant women "specialized" in household services (that is coming from Albania, Ecuador, Philippines, Morocco, Moldavia, Peru, Poland, Romania, Ukraine) and the total number of women (Italian and foreign females). Stayer is an individual-level dummy variable that equals 1 for those who did not change the place of residence in the last two years and 0 otherwise. Controls are all those reported in Table 2. All regressions report IV estimates. Low educated are those with at most compulsory school; high educated are those who obtained a degree. Standard errors are clustered at the LLM level; *, **, *** denote coefficients significantly different from zero at the 10, 5 and 1 percent level, respectively.

Appendix: A simple model of female labor supply and migration

It is likely that the inflows of immigrants who supply jobs that are close substitute of household work change time use of native females. To give a formal frame to these ideas, we sketch a simple model adapted from Gronau (1977) and Cortes and Tessada (2008).

Preferences are given by

$$U = u(x) \tag{1}$$

where x is a consumption good. Assume the following well behaviour properties for $u(\cdot)$: $u' > 0$, $u'' < 0$. Consumption good x can be indifferently bought in the market at price p or produced according to the household production function $f(h)$ such that $f' > 0, f'' < 0$ and $\lim_{h \to 0^+} f(h) = +\infty$. Denoting x_m market purchases it holds that

$$x = x_m + f(h) \tag{2}$$

The budget constraint is

$$wl = p\, x_m \tag{3}$$

where w is the salary and l is market work. The model is completed with the time constraint:

$$l + h = 1 \tag{4}$$

Now substitute x_m from (3) in (2), the resulting x from (2) in (1) and h from (4) in (1). The agent's optimization problem is:

$$\max_l u\left(\frac{wl}{p} + f(1-l)\right)$$

The FOC for an interior solution is:

$$u'\left(\frac{wl^*}{p} + f(1-l^*)\right)\left(\frac{w}{p} - f'(1-l^*)\right) = 0$$

that is

$$f'(1-l^*) = \frac{w}{p} \tag{5}$$

Given our assumption on f equation (5) implies $l^* = l^*\left(\underset{+}{w_r}\right)$ where $w_r = w / p$ is the real salary. The simplest way to introduce migration M in this picture is to assume that it affects both w and p with $w'(M) \overset{?}{>=<} 0$ and $p'(M) < 0$. So the effects of, say, an increase of M on l^* has the same sign of

$$\frac{dw_r}{dM} = \frac{w'(M)p(M) - w(M)p'(M)}{(p(M))^2}$$

that is positive as long as:

$$\frac{w'(M)}{w(M)} > \frac{p'(M)}{p(M)} \tag{6}$$

If natives and immigrants are complements (and this is more likely for high-educated natives) then $w'(\cdot) > 0$. Therefore, condition (7) is satisfied and we argue that an increase of M lead to an increase of l^* (hours worked). Alternatively, if natives and immigrants are substitutes (as likely for low-educated natives) then $w'(\cdot) < 0$. Therefore the result of condition (7) is unclear. An increase of M leads to an increase of l^* if the elasticity of the salary to the migrants is less (in absolute value) than the corresponding elasticity of the price of household services. Otherwise, we expect a reduction in the number of hours worked.