Cheap Maids and Nannies: How Low-skilled immigration is changing the labor supply of high-skilled American women*

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Comments Welcome

Abstract

Low-skilled immigrants represent a significant fraction of the labor employed in service sectors that are close substitutes of household work like housekeeping, gardening, and babysitting services. This paper studies whether the increased supply of low skilled immigrants has led high-skilled women, who have the highest opportunity cost of their time, to change their time use decisions.

We find evidence that low-skilled immigration has increased hours worked by women with a professional degree or a PhD. The estimated magnitudes suggest that the low-skilled immigration flow of the 1990s increased between 20 and 30 minutes a week the average time of market work of women with a professional degree or a Ph.D.. Consistently, we find a decrease in the time highly skilled women spend in household work and an increase in their reported expenditures on housekeeping services. We also find that the fraction of women in this group working more than 50 (and 60) hours a week increases with low-skilled immigration, and that the effect is particularly large for those with young children. Except for smaller but significant effects on the probability of women with a college education or masters degree working long hours, there is no evidence of similar effects for any other education group of the female population.

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1 Introduction

Low-skilled immigrants work disproportionately in service sectors that are close substitutes for household production. For example, whereas low-skilled immigrant women represent 1.5 percent of the labor force, they represent more than 22 percent of the workers in private household occupations and 17 percent of the workers in laundry and dry cleaning services. Low-skilled immigrant men account for 23 percent of all gardeners in America although they represent only 2.5 percent of the labor force.[1]

The importance of low-skilled immigrants in certain economic activities has been raised as part of the recent discussion on immigration policies, particularly in the US. For example, in a recent article about immigration reform in the US, The Economist, writing about illegal immigration and the recent regulatory efforts in the US, argues that:

> ... in the smarter neighborhoods of Los Angeles, white toddlers occasionally shout at each other in Spanish. They learn their first words from Mexican nannies who are often working illegally, just like the maids who scrub Angelenos' floors and the gardeners who cut their lawns. ...Californians... depend on immigrants for even such intimate tasks as bringing up their children. (*The Economist*, "Debate meets reality", May 17th, 2007.)

If the recent waves of low-skilled immigration have led to lower prices of services that are substitutes for household production, we should expect natives to substitute their own time invested in the production of household goods with the purchase of the now cheaper services available in the market. Recent evidence suggests that in fact low-skilled immigration has reduced the price of these services; for example, Cortes (2006) finds that recent low-skilled immigration has reduced the prices of non-tradable goods and services, including those we are interested in in this paper. The link between immigration and changes in the prices of household services indicates that even without effects on wages, low-skilled immigration has the potential to generate effects on natives' decisions related to time use.[2] Furthermore, these price changes should affect differently the various skill groups of the population; in particular, given that high skilled women have the highest opportunity cost of working at home production, a decrease in the price of housekeeping services is likely to have the largest impact on the labor supply decisions of this group.

Overview. This paper uses cross-city variation in low-skilled immigrant concentration to study how low-skilled immigration has changed the labor supply of American women, particularly of the most skilled. It also explores related outcomes such as time devoted to household

[1] Authors' calculations using the 2000 Census.

[2] Most, if not all, of the studies that use cross-city variation in immigrant concentration have failed to find economic and statistically significant negative effects of low-skilled immigrants on the wage of the average native high school dropout. Note however, that this is not inconsistent with immigration lowering prices of services that are close substitutes of household production, if as argued by Cortes (2006), lower prices are a consequence of lower wages but mostly for low-skilled immigrants, not natives.

work and reported expenditures on housekeeping services. To identify a causal effect we instrument for low-skilled immigrant concentration using the historical distribution of immigrants of a country to project the location choices of recent immigrant flows.

Our results suggest that very high-skilled women (those with an MBA, a professional degree or Ph.D)[3] have significantly increased their supply of market work as a consequence of low-skilled immigration. The magnitudes of our estimates suggest that as a result of the low-skilled immigration wave of the 1990s, women from this group increased their time working in the market between 20 and 30 minutes a week. We do not find similar effects for any other education group.

Lawyers, physicians and managers are the main categories represented in the group of women with professional degrees.[4] To have a successful career in one of these fields, workers have to work long hours. We find that low-skilled immigration has helped professional women increase their probability of working more than 50 and 60 hours a week. Within this group, we also find differences according to the demographics of the household, the estimated effect is significantly larger for women with children age 5 or younger.

Our findings with respect to highly skilled women have important implications. On one hand, the results suggest that the availability of flexible housekeeping and childcare services at low prices might help female physicians and lawyers, and highly educated women in general, to advance in their careers. Conflicting demands of the profession and of the household have been linked to the relative lack of women in positions of leadership (such as partners in law firms) and in prestigious medical specializations, such as surgery.[5] On the other hand, it provides some evidence against recent theories that highly skilled women are opting out of demanding careers because they value more staying home with their children.[6] Overall, it suggests that not only cultural barriers have stopped highly educated women from a more active involvement in the labor market.

More hours of market work resulting from lower prices of household services should be reflected in less time devoted to household production. Using data from the recently released 2003-04 American Time Use Survey conducted by the Bureau of Labor Statistics and from the 1980 Panel Study of Income Dynamics (PSID), we find that the immigration wave of the 1990s reduced by a city-average of 60 minutes the time very skilled American women spend weekly on household chores.

Finally, as an additional robustness check on our labor supply estimates, we use data from the Consumer Expenditure Survey (CEX) to test if highly educated women have changed their consumption levels of market-provided household services as a consequence of low-skilled im-

[3] We excluded from the group of women with a professional degree primary and secondary school teachers, nurses and social workers. We included them in the group of women with a masters degree.

[4] See Appendix 2.

[5] "While many women with children negotiate a part-time schedule for family care... they are still less likely to be promoted to partner than women who stay in firms but do not use part time options"... "The expectation that an attorney needs to be available practically 24/7 is huge impediment to a balanced work/family life" (Harrington and Hsi, 2007).

[6] The headline for the October 26 2003 edition of the *New York Times Magazine* was "Why don't more women get to the top? They choose not to."

migration. Given that expenditures, not units of consumption, are reported in the CEX, the exact sign and magnitudes of our estimates depend on the price elasticity of these services; in the case of dollar expenditures, a unit price elasticity implies we should observe zero effect on the amount spent on these services. We also study in separate regressions if the immigration waves have made households more likely to report any positive expenditure on these services. We find evidence that the immigration flows of the last two decades have increased the expenditures in housekeeping services among households with high educational attainment.

Related Literature. Our paper provides a new perspective on the literature of the labor market effects of low-skilled immigration. We move away from the past focus on the effects on the groups of natives competing directly with immigrants (Altonji and Card (1991), Borjas et al (1996), Borjas (2003), Card (1990), Card (2001), Ottaviano and Peri (2006)) and explore a potentially important dimension in which low-skilled immigrants affect the average level of native welfare and its distribution: the time-use effects of a decrease in prices of services that are close substitutes for household production.

Ours is not the first paper to study the employment effects of low-skilled immigration; previous papers whose main focus is on wage levels also include regressions of employment levels. There is a great deal of dispersion in the findings reported by the various studies. As expected, studies that find no effect on wages also find no effect on employment or labor force participation. In his Mariel Boatlift paper, Card concludes that the 1980 influx of Cubans to Miami had no effects on the employment and unemployment rates of unskilled workers, even for earlier cohorts of Cubans.[7] A similar result is obtained by Altonji and Card (1991), who find no significant effect of low-skilled immigrants on the labor force participation and hours worked of low-skilled native groups. On the other hand, Card (2001) calculates that "the inflow of new immigrants in the 1985-90 period reduced the relative employment rates of natives and earlier immigrants in laborer and low-skilled service occupations by up to 1 percentage point, and by up to 3 percentage points in very high-immigrant cities like Los Angeles or Miami." It is unclear from his results, however, if the displaced workers in these occupations moved out of the labor force, or simply shifted to another occupation. The estimates in Borjas (2003) suggest that a 10 percent supply shock (i.e. an immigrant flow that raises the number of workers in an education-experience skill group by 10 percent) reduces by approximately 3.5 percent the fraction of time worked by workers of that skill group (measured as weeks worked divided by 52 in the sample of all persons, including nonworkers). The effect is significantly smaller and not statistically significant when the sample is limited to high school dropouts.

Our paper is also related to the literature on female labor supply and child care provision and prices. Gelbach (2002) estimates the effect of public school enrollment for five-year-old children on measures of maternal labor supply using as an instrument for enrollment the quarter of birth of the child. His main results suggest that public pre-school enrollment of a child has a strong effect on the labor supply of the mother, especially on single women whose youngest child is five years old, and on all married women with a five-year-old child. Strong effects of the availability/price of child care on labor supply are also found by Baker et al (2005), who study the introduction of universal, highly subsidized childcare in Quebec in the

[7] See Card (1990).

late 1990s. The authors estimate difference-in-differences models comparing the outcomes in Quebec and the rest of Canada around the time of this reform. Using additional information on family and child outcomes they also find that the provision of this subsidy has been associated with worse outcomes for the children. Our paper differs from these papers in the experimental set-up: the magnitude of the variation in prices generated by immigrants is of a different order of magnitude than the ones considered in the two studies mentioned above. We also consider the effect of changes in prices in services other than childcare, which might also affect women with no children.

Layout. The rest of the paper is organized as follows. The next section presents a theoretical framework for the time allocation/household work problem. Section 3 describes the data and the descriptive statistics. Section 4 presents the empirical strategy. Then we discuss the main results in section 5, and in section 6 we present the conclusions.

2 Theoretical Framework

2.1 A Simple Time Use Model

The model follows the household production-time use model developed in Gronau (1977).

Consider an agent with preferences given by

$$U(x, z) = u(x) + v(z) \tag{1}$$

where x is the consumption of goods and services and z is leisure time. Assume $u(\cdot)$ and $v(\cdot)$ are strictly concave, strictly increasing in their arguments. Also, $u(\cdot)$ satisfy Inada conditions at 0 and $v(\cdot)$ satisfies Inada conditions at 1 and 0. We introduce household production as in Gronau (1977), i.e. assuming that x can be purchased in the market or produced at home using time, h, according to a *household production function* $f(h)$, and that the agent is indifferent between them. We assume $f(\cdot)$ is strictly increasing and concave, and $\lim_{h\downarrow 0} f'(h) = \infty$. Denoting by x_m market purchases, the following equation gives us total consumption of goods and services as the sum of market and home produced goods:

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

Equation (2) assumes that services purchased in the market and the services produced by the agent in the household are perfect substitutes. Notice, however, that the concavity of the household production function $f(\cdot)$ implies that substitution is less than perfect between *household time* and *market services*. Moreover, the assumption of Inada conditions for the production function $f(\cdot)$ is sufficient to guarantee that the agent will always spend a strictly positive amount of time in household work. In other words, the agent will never, at any price, buy all of her childcare or housekeeping on the market.

The (endogenous) budget constraint is

$$I + wl = px_m, \tag{3}$$

where I is non labor income (measured in "dollars"), l is hours of market work, and p is the price of market goods. The agent also faces the time constraint:

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

with total time normalized to be 1.[8]

The agent maximizes (1) subject to (2), (3) and (4), plus nonnegativity constraints on h, and l.[9] We use (4) to eliminate leisure from the optimization problem. Note that the properties of $f(\cdot)$ guarantee that h cannot be 0, thus the agent's problem is

$$\begin{array}{ll} \max\limits_{x_m,h,l} & u\left(x_m + f\left(h\right)\right) + v\left(1 - l - h\right). \\ [\lambda] & I + wl = px_m \\ [\eta] & l \geq 0 \end{array} \tag{P}$$

We can see that the change in the price of the market services, p, will have an effect on the *real* value of labor and non-labor income, in order to separate these effects we will first look at the problem with no non-labor income ($I = 0$), and then will see how results change when we lift this assumption.

2.1.1 Household Production and Labor Supply with $I = 0$

In this case we can write the optimization problem as

$$\begin{array}{ll} \max\limits_{h,l} & \widetilde{U} = u\left(\dfrac{w}{p}l + f\left(h\right)\right) + v\left(1 - l - h\right). \\ [\eta] & l \geq 0 \end{array} \tag{P1}$$

Lemma 1 *In the agent's optimization problem P1, there exists ω such that if*

- *$\frac{w}{p} > \omega$, the agent participates in the labor market ($l > 0$), and household work, h, is such that $f'(h) = \frac{w}{p}$;*
- *$\frac{w}{p} \leq \omega$, the agent does not participate in the labor market ($l = 0$), and household work, h, is given by the solution to*

$$\max_{h} \; u\left(f\left(h\right)\right) + v\left(1 - h\right), \tag{P1'}$$

[8] Using (4) to eliminate j from (3) we obtain

$$\underbrace{R + w}_{\text{full income}} = px_m + w\left(h + l\right),$$

where the left hand side corresponds to *full income* in this set-up, see Becker (1965).

[9] The restriction that $x_m \geq R/p$ is redundant after we impose strict equality of the budget constraint and nonegativity of the labor supply.

or equivalently

$$f'(h) = \frac{v'(1-h)}{u'(f(h))}. \tag{5}$$

The results in the previous lemma indicate that agents with a higher wage should be more likely to participate in the labor force, all else equal. Notice also that the solution when not participating in the labor force is independent of w and p. The effects of a fall in the price of market services are stated in the next lemma.

Effect of a Reduction in p Our main motivation is that low-skilled immigration drives down the price of the services that are close substitutes of the time spent at home in productive activities. We look at two sets of results, first, the comparative statics of labor supply, market purchases of services and time spent at home on household production. Second, the effects on labor force participation.

Lemma 2 *In the case when $I = 0$ and $w/p > \omega$, the effects of a fall in p are*

- *household work, h, decreases, i.e.*

$$\frac{\partial h}{\partial p} = -\frac{w}{p^2 f''(\cdot)} > 0, \tag{6}$$

- *consumption of market services, x_m, goes up,*

$$\frac{\partial x_m}{\partial p} = -\frac{\frac{w}{p^2}\left(lv''(\cdot) - \frac{f'(\cdot)}{f''(\cdot)}\Omega\right)}{\Pi} < 0, \tag{7}$$

- *and, labor supply, l, may increase or decrease,*

$$\frac{\partial l}{\partial p} = -\frac{\partial h}{\partial p}\frac{\Omega}{\Pi} + \frac{1}{\Pi}\left[\frac{w}{p^2} l f'(\cdot) u''(\cdot)\right] \tag{8}$$

where

$$\Omega = f''(\cdot) u'(\cdot) + f'(\cdot)^2 u''(\cdot) + v''(\cdot) = \frac{\partial \widetilde{U}}{\partial h} < 0,$$

and

$$\Pi = v''(\cdot) + \left(\frac{w}{p}\right)^2 u''(\cdot) = \frac{\partial \widetilde{U}}{\partial l} < 0.$$

- *As the variable that matters is w/p, the comparative statics with respect to w have exactly the reverse signs.*

When $w/p \leq \omega$, $l = x_m = 0$ and h is independent of w and p.

The first two results in these lemma are simple. A fall in p makes market work relatively more attractive as the real wage increases: agent substitutes away from her own time and towards market purchases. In the case of market purchases there are two effects that work in the same way: holding constant x, market provided services are cheaper and hence *production* shifts towards them (a pure substitution effect), but also x is now cheaper and hence total demand for x increases (a scale effect).[10] In the case of labor supply, there is one more effect at play, captured in the terms inside the bracket on the right hand side of equation (8), and it corresponds to a *valuation* effect: total labor income, wl, is now equivalent to more units of market services.

We now want to look at the effects of p on labor force participation. The last result in Lemma 2 states that when the agent does not participate in the market, her household production decision is independent of p. On the other side, if participating in the labor market, the hours work at home are decreasing in p. This implies that at some point, a decrease in p will make these two values of h coincide, and the agent will become a participant in the labor market. These result is then just a simple corollary from Lemma 2, and it is stated next.

Corollary 1 *For a given w, $\exists\ \widehat{p} = w/\omega$ such that iff $p < \widehat{p}$, the agent participates in the labor market.*

2.1.2 The Model with Non-labor Income

We now incorporate I into the budget constraint of the agent. This extra term will bring in another effect, as reductions in p will also generate real income effects through I. We can now write problem (P) as

$$\begin{array}{ll} \max\limits_{h,l} & \widetilde{U} = u\left(\dfrac{w}{p}l + \dfrac{I}{p} + f(h)\right) + v(1-l-h). \\ [\eta] & l \geq 0 \end{array} \tag{P2}$$

The solution to this problem is qualitatively similar to the case with no non-labor income. There are two cases depending on whether the agent participates in the labor market. Unlike the previous case, now it is not just w/p what matters for labor supply, because the real value of non-labor income, I/p, also plays a role (and does it too in the case where the agent does not participate).

Points X_A and H_A in Figure 1 corresponds to the case when the agent does participate in the labor market. In this case, we see her spend h_A units of time in household production, z_A units in leisure, and $(1 - h_A - z_A)$ in market work. Point H_A is the point where the production function $f(\cdot)$ has a slope equal to w/p; the straight black line is the corresponding budget constraint, and at point X_A the indifference curve is tangent to the budget constraint. Notice also that at the point where an indifference curve is tangent to the household production function the slope $f'(\cdot)$ would be lower than w/p.

[10] Notice that our assumptions about preferences and time allocation lead to the result that the scale effect does not affect the household production decision at the margin.

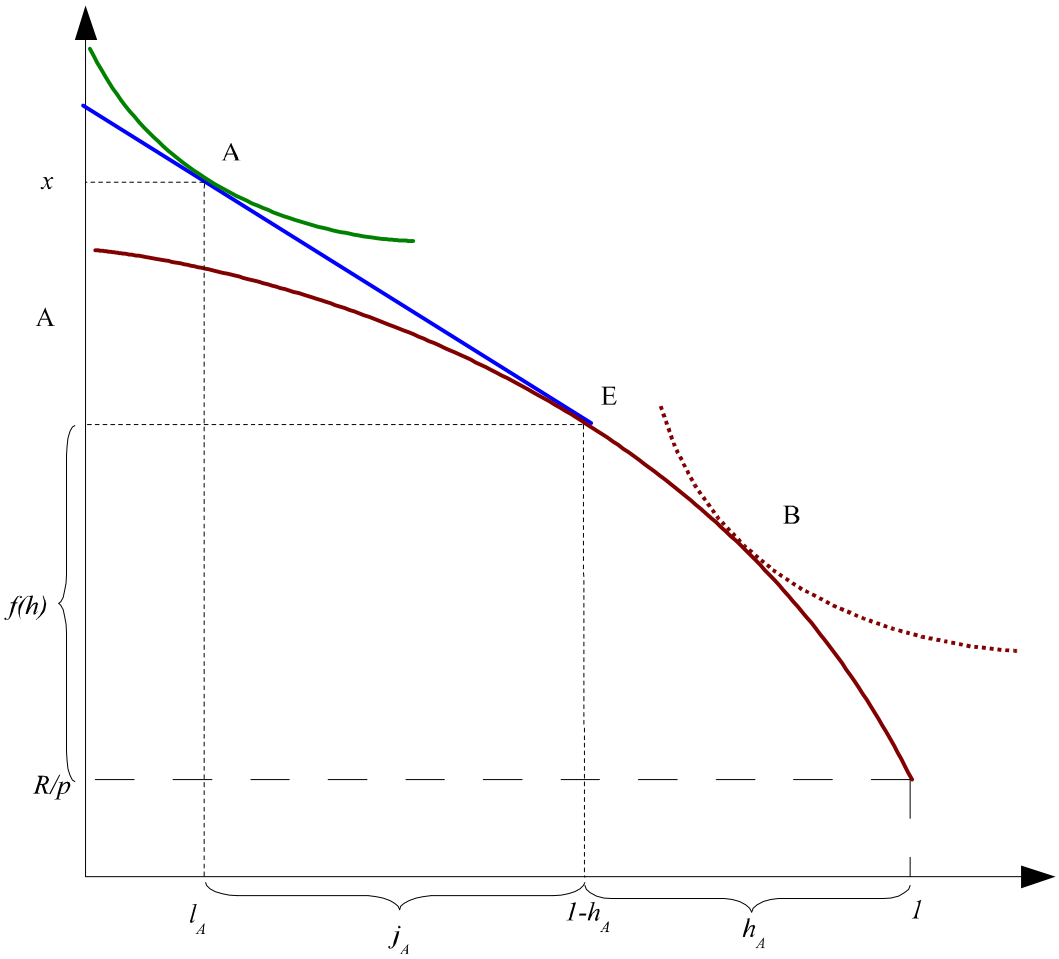

Figure 1: Household Production and Labor Supply with $I > 0$.

Effect of a Reduction in p The positive non-labor income adds another channel to the effects of the reduction in p. However, not all the results stated before for the case of $I = 0$ will change. The optimality condition for h and the comparative statics are the same in the case when the agent participates in the labor market. But, now h is not independent of p when the agent does not participate, it corresponds to the solution to

$$\max_h \; u\left(\frac{I}{p} + f(h)\right) + v(1-h),$$

and the price of the market services affect the decision of the agent through the valuation effect on I.[11]

Finally, unlike the previous case, the effect of a fall in p on labor force participation is ambiguous. The extra effect coming from the increase in the real value of I changes the characteristics of the problem. Consider a fall in p, like the one represented blue lines in figure 1. The curved blue line that is discontinuous at $z = 1$ corresponds to a vertical shift in the production frontier described by $f(\cdot)$; this shift reflects the fact that I is not equivalent to more units of x_m. The dashed blue line corresponds to the budget constraint. Notice that in this case, point B is not feasible, as it would imply a negative labor supply, hence the agent choose to become inactive. Two elements play a role here: first, that immigration generates a significant effect on the *total* price of market services (and goods), as summarized by p, and second, that the income elasticity of leisure is sufficiently high, so that most of the income effect translates into an increased demand for leisure.

2.2 Other Effects

In order to keep the model simple we have abstracted from two other elements that we will exploit later in our empirical strategy. We briefly indicate here how and why we expect them to affect the time-use decisions.

Consider first the case of demographic composition of the household. Until now we looked at the problem as that of a single agent, but there are two relevant details about the household composition. First, the spouse's income/labor supply decision, in particular, we will try to capture part of this effect using a dummy variable for the education level of the husband in some of our regressions. Second, if there are children at home, then the parents will probably face the need to spend time with them or to be able to find a person to care for them while they work. In their case, there is a higher need for market services, and thus, they should be more sensitive to the price and availability of these services in the market. Hence, we expect the effect of low-skilled immigration on female labor supply to be stronger in the case of women with children at home.[12]

[11] We can show that in this case the effect of a fall in p on the time spent working at home when the agent does not participate in the labor market is negative, i.e.

$$\frac{\partial h}{\partial p} = \frac{f'(\cdot)\, u''(\cdot)\, \frac{I}{p^2}}{f''(\cdot)\, u'(\cdot) + f'(\cdot)^2\, u''(\cdot) + v''(\cdot)} > 0.$$

[12] Notice though that public schools play a similar role in this case, as they provide childcare services by

We also consider the effect of professional choices. As we explain in the introduction, some careers require tough time commitments, with a lot of hours of work and flexibility to deal with high workloads. Most of them also come together with higher wages than in more "flexible" or "family friendly" occupations. Taking a job that requires longer hours at a higher wage generates two effects: with less time available for household work and leisure the agent has a higher marginal value of sacrificing leisure for household production, but also gives more resources to pay for market services. Lower p then makes the choice of taking the time consuming job less burdensome, as it is cheaper to acquire the goods and services from the market, and it also increases its real wage. Given this logic, we explore whether women with professional titles or working on activities that demand long hours of work have changed their labor supply as a result of the recent waves of low-skilled immigration.

3 Data and Descriptive Statistics

Immigration Data. This paper uses the 1980, 1990, and 2000 Public Use Microdata Samples (PUMS) of the Decennial Census to measure the concentration of low-skilled immigrants among cities and industries. Low-skilled workers are defined as those who have not completed high school. An immigrant is defined as someone who reports being a naturalized citizen or not being a citizen. We restrict the sample to people age 16-64 who report being in the labor force.

Table 1 shows the evolution of the share of low-skilled immigrants in the labor force for the 25 largest cities in the US. As observed there is large variation in immigrant concentration both across cities and through time. Table 2 presents the 15 industries with the highest share of low-skilled immigrants, low-skilled female immigrants, and low-skilled male immigrants in the year 2000. With the exception of agriculture and textiles, almost all other industries fall into the category of services that are close substitutes to household production: landscaping, housekeeping, laundry and dry cleaning, car wash and shoe repair (the Census does not include babysitting as a separate industry). The low-skilled immigrant concentration in these services is very large. For example, whereas low-skilled immigrant women represented 1.9 percent of the total labor force in the year 2000, they represented more than 25 percent of the workers in private household occupations and 12 percent of the workers in laundry and dry cleaning services. Similarly, the immigrant men's shares in gardening and in shoe repair services were 9 and 6 times larger, respectively, than their share in the total labor force.

Market Work Data. We also use the Census to quantify hours worked and labor force participation. As Table 3 shows, labor force participation and the number of hours worked a week increase systematically with the education level of the woman. Women with a graduate degree, a college degree, and some college present a significant increase in their labor force participation between 1980 and 1990.[13] During the last decade, participation of all education

keeping children at school during (part of) the day, see Gelbach (2002) for a study that exploits this fact to study the labor supply effects of childcare availability.

[13] Note that the characteristics of the educational groups are likely to change significantly over time because of composition issues. For example, whereas in 1980 only 7 percent of wives in the sample had a college degree,

groups has stabilized, and if anything it has gone down. We also observe that the group of women with a graduate degree is the only one that experienced an increase in the probability of being married. The increase in marriage rates is particularly acute for women with professional degrees and Ph.D.'s.

Table 3 also includes the share of women with a professional degree or Ph.D. that reports working at least 50 or 60 hours a week. Close to a third of professional women reported working 50 hours or more a week in 2000, a double-fold increase from 1980, and at least two time as large as the share for women from any other group. Highly educated women are also at least three times as likely, compared to any other educational group, to work 60 hours or more a week.

Household Work Data. We combine information from the 2003-2005 ATUS and the 1980 PSID to measure the effect of low-skilled immigration on time devoted to household work.

Since 2003, the BLS has been running the ATUS, a monthly survey, whose sample is drawn from CPS – two months after households complete their eight CPS interviews. An eligible person from each household is randomly selected to participate, and there are no substitutions. The week of the month and the day of the week on which the survey is conducted is randomly assigned; weekends are oversampled, they represent 50 percent of the sample. The overall response rate is 58 percent and the aggregated sample for 2003 and 2004 consists of approximately 38 000 observations.

Until the ATUS, only scattered time-use surveys were available for the US –all of them with too few observations to provide reliable information about city-averages of time allocation. Though not a time-use survey, the PSID included between 1970 and 1986 a question about average hours a week spent by the wife and head of household on household chores. We construct a similar variable using the ATUS data. Specifically, we aggregate daily time spent on food preparation, food cleanup, cleaning house, clothes care, car repair, plant care, animal care, shopping for food and shopping for clothes/HH items, multiply this aggregate by 7 and divide it by 60. Any difference in the definition of household work we hope to capture using decade dummies.

For both surveys, our sample consists of women ages 21-64 that have completed the survey. Table 4 presents the descriptive statistics of our time use data. In both years, time spent on household chores decreases as the education of the woman increases, and labor force participation increases with education. The data suggests that time devoted to household work has decreased significantly for all groups of women, and hours worked in the market (conditional on working) have been stable. Although the changes across years might be partially due to differences in the surveys, the fact that hours of household work have not changed much for men (and have actually increased for highly educated men) suggests that a reduction in household work for women has taken place, and that a big part of it might be explained by the increased participation of women in the labor force.[14] Note that PSID's and ATUS's statistics on labor

by 2000 this number has increased to 17 percent.

[14]The discussion on composition issues of the market work data also applies for the descriptive statistics presented in Table 4.

force participation of women and usual hours worked are not very different from the Census.

Consumption Data. We use CEX data to construct two measures of consumption of market supplied household services. First, in order to capture the extensive margin, we consider a dummy variable for positive reported expenditures in household services. Second, we also consider the amount spent on each of these services, a measure we identify as capturing mostly the intensive margin and that allows us to have an estimate of the elasticity of demand.[15] As observed in Table 5, both the probability of consuming household services and the amount spent on them increase significantly with the education level of the wife / female head of the household. Expenditures on household services differ by the education of the main adult female in the household (either the head's wife or the head herself). Whereas only 3 percent of households where such a female has at most a high school degree reported positive expenditures on this category, that fraction rises to 3, 8, 15 and 22 percent when considering females with respectively at most a high school degree, some college, a college degree, or a graduate degree. The last group was also the only one to experience a systematic increase in the probability of reporting positive expenditures across the three decades.

4 Empirical Strategy and Estimation

4.1 Identification Strategy

We exploit the intercity variation in the (change of) concentration of low-skilled immigrants to identify their effect on the time use decisions of American women and purchases of household services in American households. There are two concerns with the validity of the strategy. First, immigrants are not randomly distributed across labor markets. If immigrants cluster in cities with thriving economies, there would be a spurious positive correlation between immigration and labor force participation of women, for example. To deal with this potential bias, we instrument for immigrant location using the historical city-distribution of immigrants of a given country. The instrument will be discussed thoroughly in section 4.3.

The second concern is that local labor markets are not closed and therefore natives may respond to the immigrant supply shock by moving their labor or capital to other cities, thereby re-equilibrating the national economy. Most of the papers that have studied this question, however, have found little or no evidence on displacement of low-skilled natives (Card (2001), Cortes (2006)).[16] In any case, if factor mobility dissipates the effects of immigration flows to cities, our estimates should provide a lower bound for the total effect of low-skilled immigration on the time use of natives.

[15] We do not include child-care at home because the variable in the CEX was redefined between 1990 and 2000.

[16] The exception is Borjas et al (1996).

4.2 Econometric Specification

Ideally, and as suggested by our theoretical framework, we would have liked to use price indexes (in particular, the price index of household services in a city) as the explanatory variable in our analysis of time use and consumption. Unfortunately however, the price data used in Cortes (2006) is available only for 30 cities in the US, and given the reduced sample, the variation is not large enough to identify the effects we are interested in. As a result, and in order to expand the sample, we estimate reduced-form specifications using as explanatory variable the log of the share of low-skilled workers in the labor force (henceforth denoted by $\mathcal{L}_{it}$), a simplified version of Cortes (2006)'s price equations' main explanatory variable (See the appendix). For the main specifications, and to test the robustness of our results, we also present results using the share of low-skilled immigrants in the labor force, an immigration concentration measure commonly used in the literature.

Labor Supply. The size of the Census sample allows us to run a separate regression by education group for the study of labor supply. The explanatory variables of interest are usual hours a week worked, a dummy for labor force participation, usual hours a week worked conditional on working, and the probability of working at least 50 or 60 hours a week. We use the following specification:

$$y^e_{nit} = \delta^e * \mathcal{L}_{it} + X'_n\Lambda^e + \phi^e_i + \psi^e_{jt} + \varepsilon^e_{ijt} \tag{9}$$

where e is education group. Vector X_n are individual level characteristics, namely age, age squared, race, marital status and presence of children. Henceforth, ϕ_i and ψ_{jt} represent city and region*decade fixed effects, respectively. Finally, $\mathcal{L}_{it}$ is given by $ln(\frac{LSWorkers}{LaborForce})_{it}$.

Our hypothesis is that $\delta^e > 0$ and $\delta^{\text{graduate}} > \delta^{\text{college}} > \delta^{\text{somecollege}}$ and so on; the coefficients should reflect the fact that the alternative cost of time spent at home is increasing in education.

Time devoted to household work. Because of the reduced number of observations, we cannot run a separate regression for each education group. Therefore, we estimate one regression and restrict the coefficients on individual characteristics and the city and decade*region fixed effects to be equal for all education groups. We do allow for the effect of low-skilled immigration to differ by the education level of the woman. The specification is the following:

$$y_{nit} = \sum_e \pi^e * \mathcal{L}_{it} * dummy\_educ_{nit} + X'_n\Lambda + \theta_e + \phi_i + \psi_{jt} + \varepsilon_{ijt} \tag{10}$$

where y_{nit} now represents the average hours a week woman n spends doing household work in city i and year t and θ_e education level fixed effects.

If the price of a market substitute goes down, women should reduce their time spent doing household work. Therefore, we expect $\pi^e < 0$. We also expect $\left|\pi^{\text{graduate}}\right| > \left|\pi^{\text{college}}\right| > \left|\pi^{\text{somecollege}}\right|$: ceteris paribus, given their high opportunity cost of time, the most skilled women should be the ones to reduce by the most their time devoted to household chores.

Consumption of Housekeeping Services. We use a similar, but more restricted specification than the one above:

$$y_{nit} = \kappa * \mathcal{L}_{it} + \nu * \mathcal{L}_{it} * Grad_{nit} + X_n'\Lambda + \phi_i + \psi_{jt} + \varepsilon_{ijt} \tag{11}$$

where n represents a household, i city, j region, and t year. y is an outcome taken from the expenditure data; it can be either a dummy variable for positive reported expenditures in housekeeping services, or the amount spent, in dollars, on them. $Grad_{nit}$ is a dummy variable for whether the wife or female head of the household has a graduate degree. The vector X_n are household level characteristics, namely age, sex, and education of the wife or female head of the household (includes a dummy for graduate degree), and household size and demographic composition. As we mentioned earlier, ϕ_i and ψ_{jt} represent city and region*decade fixed effects, respectively.

We expect $\kappa, \nu > 0$, i.e. an immigrant induced increase in the share of low-skilled workers in the labor force, by reducing the prices of housekeeping services, increases the probability a household purchases housekeeping services, more so for the highest skilled households. If the elasticity of demand for housekeeping services is greater than one, κ, and/or $(\kappa + \nu)$ should also be positive in the regression where the dependent variable is the level of expenditures in housekeeping services.

We estimate equations (9) to (11) using 2SLS, instrumenting $\mathcal{L}_{it}$ with the variable we describe below in section 4.3. We cluster all of the standard errors at the city-decade level.

Deriving the Effects of Low-Skilled Immigration. Given that what we are ultimately interested in the magnitude of the effect of immigration flows on consumption and time use, we use the chain rule for its estimation:

$$\begin{aligned} \frac{dy}{d\left(\ln\ LSImmigrants\right)} &= \frac{dy}{d\mathcal{L}} * \frac{d\mathcal{L}}{d(\ln\ LSImmigrants\ )} \\ &= \theta * \left(\frac{LS\ Immigrants}{LS\ Immigrants\ +\ LS\ Natives}\right), \end{aligned} \tag{12}$$

where $\left(\frac{LS\ Immigrants}{LS\ Immigrants\ +\ LS\ Natives}\right)$ is the share of immigrants in the low-skilled labor supply and θ is the coefficient that measures the impact of $\mathcal{L}$ on outcome y (i.e. $\theta \in \{\delta, \pi, \kappa, \nu\}$).

The last equality is based on the assumption that $\frac{d(\ln L)}{d(\ln I)} = 0$, i.e. there are no displacement effects. Note that the share of immigrants in the low-skilled labor supply varies significantly by city. We use its value for each city from the 1990 Census to calculate the city-specific immigration effect on consumption and time use of the low-skilled immigration flow of the 1990s. We report the weighted average across cities of these effects unless explicitly noted.

Our motivating theory and the discussion we have introduced so far has focused on the case where the wages of native workers do not respond to the low-skilled immigrants. It is not unreasonable to assume that for lower education groups, the increased inflow of other

low-skilled workers may generate some wage or employment effects. However, these effects are less likely to be present in the most educated groups, which are the focus of our study. We try to address any potential problem along these lines by running separate regressions for each educational achievement group whenever that is possible. Our assumption of no wage and/or employment effects are more likely to hold for our group of interest: highly-skilled educated women.

4.3 Instrument

The instrument exploits the tendency of immigrants to settle in a city with a large enclave of immigrants from the same country. Immigrant networks are an important consideration in the location choices of prospective immigrants because these networks facilitate the job search process and the assimilation to the new culture (Munshi (2003)). The instrument uses the 1970 distribution of immigrants from a given country across US cities to allocate the new waves of immigrants from that country. For example, if a third of Mexican immigrants in 1970 were living in LA, the instrument allocates 33 percent of all Mexicans in the 1990s to LA.

Formally, the instrument for the number of low-skilled immigrants in city i and decade t can be written as,[17]

$$\sum_j \frac{Immigrants_{ji1970}}{Immigrants_{j1970}} * LSImmigrants_{jt},$$

where j are all countries of origin included in the 1970 Census, $\frac{Immigrants_{ji1970}}{Immigrants_{j1970}}$ represents the percentage of all immigrants from country j included in the 1970 Census who were living in city i, and $LSImmigrants_{jt}$ stands for the *total* number low-skilled immigrants from country j to the U.S. in decade t.

As can be seen in Table 6, the instrument is a good predictor of low-skilled immigrant shares. The magnitudes of the coefficients in columns 1 and 2 suggest that, at current U.S. immigration levels, an increase of 10 percent in the predicted number of low-skilled immigrants increases the share of low-skilled workers in the labor force by between 2 and 2.5 percent. Columns 3 and 4 present the estimates when the dependent variable is the share of low-skilled immigrants in the labor force. The specification includes a quadratic function of the instrument to take into account that when immigrant concentration in a given city reaches a certain level, congestion effects might overcompensate network effects and this might drive new immigrants to locate in other cities.

The size of the coefficients is significantly larger when the sample of cities is that of the CEX, consequence, most likely, from the sample including fewer but larger cities.

[17] I use a logarithmic functional form because the price equation derived from the theoretical model (Section 4.3) is expressed in logs. Appendix C, Table C2 presents alternative specifications for the first stage as a check on the robustness of the instrument.

Identification Assumption. All of the econometric specifications in the paper include city (ϕ_i) and region*decade (ψ_{jt}) fixed effects; therefore, the instrument will help in identifying the causal effect of immigration concentration on time use as long as the unobserved factors that determined that more immigrants decided to locate in city i vs. city i' in 1970, both cities in region j, are not correlated with *changes* in the *relative* economic opportunities offered by the same two cities (or other factors that might have had affected the time use of women) during the 1990s.

An additional concern is the violation of the exclusion restriction, i.e., that low-skilled immigrant concentration might affect the time use of American women through other channels besides changing the prices of household related services, in particular, through lowering the wages of competing natives. However, our focus on very highly educated women reduces the likelihood that our main results are driven by wage effects. It would be difficult to argue that low-skilled immigrants are particularly complementary in production to lawyers and doctors, but not to women with just a college degree.

We should emphasize that even if the exclusion restriction is violated, our estimates still capture the causal effect of low-skilled immigration on the time use of American households. Hence, even in this case our results still show different effects for different groups of the population, reinforcing the idea that not all groups are equally affected by immigration. However, a violation of the exclusion restriction invalidates the use of our framework as a test for time use models, and therefore of our estimates as measures of the services' price elasticities of labor supply. We believe that if this were the case our estimates still document causal relations and stylized facts that have not been previously explored in the literature.

5 Results

Our results explore the three outcomes of the household decision that we have described before: labor supply, home production and household services expenditures. After presenting the results for each of them, we summarize the results for the case of highly-skilled women, to emphasize our view that they reflect a change in the use of time as a response to the lower prices of services.

5.1 Market Work

Tables 7 presents the estimation of equation (9) with labor supply as the dependent variable. Each number in the tables comes from a different regression, where the explanatory variable of interest is the log of the share of low-skilled workers in the labor force (columns 1 and 2) and the share of low-skilled immigrants in the labor force, appropriately instrumented, and the sample is restricted to women with a professional degree or Ph.D..

Our results suggest that low-skilled immigrants have significantly increased the labor supply of highly educated women, particularly at the intensive margin. The magnitudes of the coefficients in column 2 imply that the low-skilled immigration shock of the 1990s increased

between 20 and 30 minutes a week the time women in this group devoted to market work. Similar results are obtained when the explanatory variable of interest is the share of low-skilled immigrants in the labor force and although the effects are larger, they are of the same order of magnitude.

Lawyers, physicians, MBAs and women with Ph.D.'s are the main categories represented in the group of women with professional degrees. In these fields, having a successful career requires the workers to have long hours of work. Doing so is specially challenging for women, who are usually responsible for household work and the care of children. Being able to buy from the market housekeeping services and, specially, child care services at unusual hours allows women with a professional degree or Ph.D. to compete with their male counterparts. Table 7 shows how low-skilled immigration has helped professional women increase their probability of working more than 50 and 60 hours . The magnitude of the effect is economically significant: the low-skilled immigration flow of the 1990s increased by 1.4 percentage points (a 5 percent increase) the probability that a working woman in these groups of the population reported working more than 50 hours a week, and by 0.6 percentage points the probability of working at least 60 hours, a 6 percent increase.

On the other hand, we find no evidence that low-skilled immigrants have increased the labor force participation of highly educated women. The coefficient for the labor force participation is negative under both specifications. However, it is far from statistically significant in column 2 and only marginally significant in column 4.

Professional women with small children and even with children of school age should be particularly sensitive to changes in prices of housekeeping and childcare services. The first two panels in Table 8 present the estimation of equation (9) expanded to include the interaction of the immigration variable with a dummy for having a child 5 or younger or with a dummy for having children 17 and a set of city fixed effects for women with children. The coefficients of the interactions all go in the expected direction and are large in magnitude, but only the ones for the probability of working at least 50 or 60 hours are statistically significant at conventional levels. A plausible interpretation for these results is that what professional mothers value the most of immigrant provided services is their flexibility.

The third panel of Table 8 shows the estimated coefficient of the interaction of the immigration variable with a dummy for the husband also having a professional degree or Ph.D. We interpret the dummy as a proxy for the non-labor income of the woman, and the estimation of the model should give us some sense about the magnitude and importance of income effects. As observed, although the interactions go in the right direction, they are not statistically significant.

In order to check that we are correctly estimating and interpreting the effects of immigration on highly skilled women, in Table 9 we present the estimation of (9) for all other education groups. As discussed in section 4.2, we expect to find smaller (but positive) labor supply effects of changes in the prices of services that are close substitutes of household production for groups of women with lower education level. Given that we are presenting reduced form regressions, the interpretation of the coefficients as price effects is going to be particularly problematic for the groups with the lowest education levels. We expect that for women with at most a high

school degree the main effect of immigration is going to be through competition in the labor market, and not through changes in the prices of services.

Three observations from Table 9 are worth mentioning. First, low-skilled immigration increases the labor supply of women with a college degree or a masters degree but only at the intensive margin. The effects on hours worked conditional on working and on the probability of working at least 50/60 hours are positive and statistically significant, but as predicted by the theory, considerably smaller in magnitude than the effects for women with a professional degree or Ph.D. Second, Table 9 shows that for the labor force participation equation, the relevant coefficients for these two groups are negative and statistically significant. This result goes against our theory, and will be further confirmed by the household work regressions. Third, for the groups with the lowest education levels, there is also a negative effect of labor force participation and no significant effect on the intensive margin. As mentioned above, negative effects are expected for groups that directly compete with immigrants in the labor market.

5.2 Household Work

In Table 10 we present the estimations of equation (10). Confirming our previous results, the estimates show important variation by educational group.[18] For highly educated women we find a negative effect of the log of the share of low-skilled workers in the labor force, a result in accordance with our original conjectures and with our previous finding that low-skilled immigration has increased hours worked by working women with a graduate degree. Its magnitude suggests that the low-skilled immigration flow of the 1990s reduced by 60 minutes a week the time devoted to household work by women with a graduate degree. Note that with the ATUS and PSID we cannot further disaggregate this highly educated group into women with a master's degree and women with a professional degree or Ph.D., so the magnitude could be even larger for the latter group. Given that the magnitude of the decline in household work of women with a graduate degree is larger than that of the increase in hours worked in the market, it is likely that leisure time for this group of women also increased. Unfortunately, we cannot test this hypothesis with our data.

For all other education groups, women experienced a positive but not statistically significant effect of immigration on household work, the sole exception being women with at most a high school degree for which the effect is statistically larger than 0. This result is consistent with the labor supply effects estimated in Table 9. [19]

[18] Surprisingly, the "average" effect of the relative labor supply of low-skilled vs. high-skilled workers is positive and statistically significant when ignoring the heterogeneity we document.

[19] We also study the effects on household work using the 2003 and 2004 ATUS (American Time Use Survey), and the Fall 92-Summer 94 National Human Activity Pattern Survey (NHAPS). The results obtained are consistent with the evidence we find with our prefered database in the household work dimension. However, the small sample size of the NHAPS survey and some compatibility concerns about the labor supply statistics lead us to present the results with the ATUS and PSID sample only.

5.3 Consumption

Using CEX data from 1980, 1990, and 2000, we estimate equation (11) and summarize the results in Table 11. The left panel reports the estimation when the dependent variable is a dummy for positive expenditures in housekeeping services, and the right panel when the variable of interest is the level of expenditures in dollars. Several points are worth mentioning. First, all of the main effects of the share of low-skilled workers in the labor force are negative (contrary to the predictions of the model), though none is statistically significant. On the other hand, the interaction with the dummy for wife or female head with a graduate degree is positive, large in magnitude, and, for the level of expenditures' equation, statistically significant at the 10 percent level. The magnitude of the coefficients suggests that the low-skilled immigration flow of the 1990s increased by a city-average of about 25 dollars per quarter the amount spent on housekeeping services by households whose wife/female head has a graduate degree.[20] Given that women with a graduate degree reduced their time doing household work by 12 hours a quarter, 25 dollars seems a little low. There are two reasons why this number is not necessarily low: first, given that expenditures on housekeeping services do not include expenditures on services such as gardening, laundry, child-care (that are likely to be the first ones acquired from the market or provided by hired service), the estimated effect on expenditures is probably underestimating the real total effect on service acquisition on the market. Second, the estimations come from different datasets and hence are not necessarily comparable in magnitudes with the previous one. Therefore, we consider the number to be in a reasonable range, and see it as a confirmation that highly educated (skilled) women are indeed substituting, partially at least, household production with market services.

Combining the Cortes (2006)'s price estimates with the estimates on expenditures from Table 11, we calculate a price elasticity of demand for housekeeping services between 2 and 3.

5.4 High-Skilled Women and Time Use

The empirical evidence we present in the previous subsections describes an interesting profile of response by highly-skilled women. We observe that while for women with a professional degree or Ph.D. there is, if anything, a small negative effect on labor force participation, they experience a large effect on hours worked conditional on working, a result that implies that the women who work, work longer hours on average. This effect may come in a variety of ways: women at the top may start working more or all working women may work more hours per week than women who worked before the waves of low-skilled immigration. The evidence in Table 7 suggests that part of this effect comes from an increased fraction of women working more than 50 and 60 hours per week. This effect is compatible with the fact that among the women with professional degrees we observe many occupations that require long hours of work (e.g. lawyers, managers) or that have irregular schedules (e.g. physicians), making them more likely to rely on flexible services as replacement for household work.[21]

[20] Given that the average expenditure for this group in 1990 was approximately 70 dollars, the estimated effect represent a 35 percent increase in expenditures.

[21] See Table A.2 for a list of the main occupations of women with a professional degree or a Ph.D.

Further evidence can be observed in the upper and middle panels of Table 8. One main reason why households may need more household work is related to the presence of children, as looking after them and keeping them company are likely to be time consuming. In Table 8 we show that the response to immigration is larger when there is a child present at home, the estimated coefficient is positive and in some specifications significantly different from 0. The magnitude of the coefficient suggests that the increase in the probability of working more than 50 and 60 hours per week is approximately twice as large than the increase for a woman without a child at home. In section 2 we mentioned that the valuation effect of the lower prices on non-labor income could play a role; weak evidence supporting this is presented in Table 8 also, where we see that the effect of low-skilled immigration is attenuated for women whose spouse (husband) holds a professional degree.

Overall, the picture observed in our empirical results suggests that reduced prices for services is a reasonable channel for these responses to low-skilled immigration. The differential effects according to skill level (or educational attainment) are likely to be linked to an increase in the demand for these services; also women with more education are less likely to suffer a direct effect on their wages. The significant effect of household characteristics, in particular the effect of children, also points in the same direction.

6 Concluding Remarks

This paper shows that low-skilled immigration into the US can generate effects on the labor supply of natives that go beyond the standard analysis of the impact that immigrants have on natives of similar skill. Using a simple model of time-use, we argue that by lowering the prices of services that are close substitutes of home production, low-skilled immigrants might increase the labor supply of highly skilled native women, a group that is unlikely to be affected through other channels usually mentioned in the literature: wages and employment (displacement) effects. It is particularly interesting that for the other groups of the population, we find no consistent evidence suggesting a channel through market services and time-use considerations (household production and labor supply).

Using Census data we estimate that the low-skilled immigration wave of the 1990s increased between 20-30 minutes a week, the time women with a professional degree or Ph.D. spend working in the market. The effect is larger for highly educated women that have small children. The average increase hides important changes in the distribution of hours. Many women with professional degrees, especially lawyers, physicians, and women with Ph.D.'s, work in fields where long hours are required to succeed. Motivated by this fact we explore whether women in those groups effectively choose to work longer hours a week when the prices of services go down. We find that low-skilled immigration has helped professional women increase significantly their probability of working more than 50 and 60 hours. We also find that the effects of low-skilled immigration on these outcomes are stronger for women in households were there are children present, with estimates that imply an increase in the impact of close to 100% of that on a woman without children at home.

As supporting evidence for our result on the effects of low-skilled immigration on the labor

supply of highly skilled women, we find that low-skilled immigration has also decreased the amount of time women with a graduate degree devote to household work and has increased the amount of services purchased in the market; a result that is implicit in their reported dollar expenditures in housekeeping services.

Our findings suggest that only women at the very top of the skill distribution are being positively affected by the reduction in the prices of services that are substitutes for household production. Therefore we provide additional support for the hypothesis that the effects of low-skilled immigration on the welfare of the native population can be heterogeneously distributed, benefitting some groups more than others. In our particular case we find that very highly educated women seem to be able to choose labor supply profiles that they could not afford before. The question remains open as to whether this allocation is indeed desirable if the quality of some of the goods, like childcare, is not the same when provided by the market instead of by the parents (Baker et al (2005)).

Additionally, the fact that highly-educated women change their labor supply decisions in response to the immigration-induced price changes also suggests that at least part of the differences between women and men in certain jobs reflect barriers that should not be fully attributed to differences in preferences; according to our results, part of these differences are coming from restrictions on affordable household help. Women might indeed value family life more than men, but the lack of more affordable services seems to be playing a role on the decision.

Finally, while on a broader perspective the estimated effects are not likely to be the main channel through which immigration affects natives, they do provide a newer point of view on the same question about the effects of immigration on native workers. Highlighting a plausible and new channel emphasizes the importance of a thorough understanding of the effects of immigration across all groups and not just for those that seem at first sight to be most affected by it. The high level of heterogeneity in the responses implies that the benefits are extremely concentrated at the top of the educational attainment distribution.

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A Derivations and Proofs

Proof of Lemma 1. Write the lagrangean for the agent's problem as

$$\max_{h,l,\eta} \; u\left(\frac{w}{p}l + f\left(h\right)\right) + v\left(1-h-l\right) + \eta l, \tag{13}$$

then the results follow from the Kuhn-Tucker conditions of the problem. ■

Proof of Lemma 2. Write the first order conditions of equation (13) as

$$\begin{aligned} f'(\cdot)\,u'(\cdot) - v'(\cdot) &= 0 \\ \frac{w}{p}u'(\cdot) - v'(\cdot) &= 0, \end{aligned}$$

for the case when η is zero. With little algebra we obtain

$$f'(h) = \frac{w}{p}.$$

The comparative statics for h and l are then obtained differentiating these last equation and one of the first order conditions with respect to p. The result for x_m comes from the fact that with $I = 0$, $x_m = (wl)/p$.

The statement about the solution when labor supply is 0, follows from the characterization of the solution in Lemma 1. ■

B Summary of Cortes (2006) Model

Cortes (2006) constructs a simple, small-open-economy model with two sectors (one traded, one non-traded) and three factors of production (high-skilled native labor $\overline{H}$, low-skilled native labor $\overline{L}$, and low-skilled immigrant labor $\overline{I}$). The production functions in the two sectors are given by:

$$T = H_T. \tag{14}$$

The non-traded good production function is a nested CES:

$$NT = H_{NT}^{\alpha}\left[(\beta L_{NT}^{\rho} + (1-\beta)I_{NT}^{\rho})^{\frac{1}{\rho}}\right]^{1-\alpha}, \tag{15}$$

where $0 < \rho \leqslant 1$ and $0 < \alpha < 1$. This specification implies that the elasticity of substitution between the low-skilled labor aggregate and high-skilled labor is equal to 1, and that the elasticity of substitution between L and I is $\sigma = \frac{1}{1-\rho}$.

The economy admits a representative consumer with a Cobb-Douglas type utility:

$$U = T^{\gamma}(NT)^{1-\gamma} \tag{16}$$

She assumes that all markets are competitive and sets the price of the tradeable good P_T to one.

Based on this setup, she finds that non-traded goods' prices are given by:

$$Ln(P_{NT}) = \vartheta - (1-\alpha)Ln\left(\frac{(\beta\overline{L}^{\rho} + (1-\beta)\overline{I}^{\rho})^{\frac{1}{\rho}}}{\overline{H}}\right)$$

where $\vartheta = Ln(\frac{(1-\gamma)^{1-\alpha}}{\alpha^{\alpha}(\alpha+\gamma(1-\alpha))^{1-\alpha}})$.

Table 1. Share of Low-skilled Immigrants in the Labor Force (%)

City	1980	1990	2000
Atlanta	0.38	0.84	3.23
Baltimore	0.76	0.44	0.67
Boston	3.53	2.71	2.62
Chicago	4.99	5.09	5.86
Cincinnati	0.44	0.23	0.34
Cleveland	1.82	0.89	0.65
Dallas	2.13	5.17	8.63
Denver	1.18	1.42	4.13
Detroit	1.76	0.93	1.35
Houston	3.96	7.03	9.21
Kansas City	0.58	0.47	1.44
Los Angeles	11.64	15.90	15.09
Miami	15.13	14.44	11.36
Milwaukee	1.07	0.84	1.54
Minneapolis	0.49	0.37	1.43
New Orleans	1.20	1.13	1.08
New York City	8.91	7.82	8.15
Philadelphia	1.39	0.91	1.06
Portland	1.03	1.53	3.27
St. Louis	0.49	0.24	0.53
San Diego	4.59	5.92	6.34
San Francisco	4.40	6.73	6.19
Seattle	1.22	1.00	1.94
Tampa	1.50	1.69	2.15
Washington DC	1.61	2.52	3.76

Source: US Census

Note: Low-skilled workers are defined as those without a high school degree

Table 2. Top Industries Intensive in Low-skilled Immigrant Labor (2000)

All Low-skilled Immigrants		Male LS Immigrants		Female LS Immigrants	
	%*		%		%
Labor Force	5.3	Labor Force	3.3	Labor Force	1.9
Textiles	44.8	Gardening	28.5	Textiles	27.9
Gardening	29.2	Shoe repair	19.2	Private households	25.8
Leather Products	28.4	Crop production	19.0	Leather products	16.1
Private households	27.4	Car washes	17.5	Fruit and veg. preserv.	13.1
Animal slaughtering	25.3	Textiles	16.9	Dry cleaning and laundry SS	12.0
Crop production	24.0	Animal slaughtering	16.5	Services to buildings	11.6
Fruit and veg. preserv.	21.9	Furniture manuf.	15.9	Sugar products	11.2
Car washes	20.2	Carpets manuf.	15.2	Animal slaughtering	8.8
Services to buildings	20.0	Recyclable material	12.7	Hotels	8.0
Carpets manuf.	19.8	Wood preservation	12.4	Pottery, ceramics	7.6
Furniture manuf.	19.8	Leather products	12.3	Nail salons	7.5
Sugar products	19.3	Construction	12.3	Home health care SS	6.7
Dry cleaning and laundry SS	19.3	Fishing, hunting	12.0	Plastics products manuf.	6.5
Shoe repair	19.2	Bakeries	11.9	Seafood	6.3
Bakeries	17.9	Aluminum prod.	11.8	Toys manufacturing	6.1

*% of LS Immigrants in Tot. Employment of Industry. Includes only the 25 largest cities.

Source: Census (2000)

Table 3. Descriptive Statistics - Census Data on Women's Labor Supply

	High School Dropout			*High School Graduate*			*Some College*		
	1980	1990	2000	1980	1990	2000	1980	1990	2000
Share of Year sample	0.24	0.15	0.12	0.42	0.34	0.30	0.20	0.31	0.33
Labor Force Partipation	0.46	0.48	0.47	0.63	0.67	0.65	0.67	0.76	0.75
	(0.50)	(0.50)	(0.50)	(0.48)	(0.47)	(0.48)	(0.47)	(0.43)	(0.43)
Usual Hrs. per week working on the Mkt.	34.62	34.85	35.35	35.20	35.86	36.71	34.39	35.71	36.32
(conditional on working)	(11.30)	(11.72)	(12.04)	(10.38)	(10.62)	(10.81)	(11.23)	(11.17)	(11.52)
% work at least 50 hrs.	0.02	0.03	0.03	0.03	0.06	0.07	0.04	0.08	0.09
	(0.13)	(0.17)	(0.18)	(0.18)	(0.23)	(0.26)	(0.20)	(0.26)	(0.29)
% work at least 60 hrs.	0.01	0.01	0.01	0.01	0.02	0.03	0.01	0.03	0.03
	(0.09)	(0.11)	(0.12)	(0.11)	(0.15)	(0.16)	(0.12)	(0.16)	(0.17)
Married	0.59	0.52	0.50	0.65	0.60	0.56	0.55	0.54	0.53
	(0.49)	(0.50)	(0.50)	(0.48)	(0.49)	(0.50)	(0.50)	(0.50)	(0.50)
Child younger than 5	0.15	0.17	0.17	0.17	0.17	0.15	0.16	0.17	0.15
	(0.36)	(0.37)	(0.38)	(0.38)	(0.37)	(0.35)	(0.37)	(0.38)	(0.36)
Child younger than 17	0.40	0.37	0.39	0.44	0.39	0.38	0.38	0.39	0.38
	(0.49)	(0.48)	(0.49)	(0.50)	(0.49)	(0.48)	(0.49)	(0.49)	(0.49)

	College Grad			*Master's Degree (ex. MBA)*			*Professional Degree or Ph.D.*		
	1980	1990	2000	1980	1990	2000	1980	1990	2000
Share	0.07	0.14	0.17	0.05	0.04	0.06	0.01	0.02	0.03
Labor Force Partipation	0.72	0.81	0.79	0.79	0.86	0.84	0.85	0.89	0.88
	(0.45)	(0.39)	(0.41)	(0.41)	(0.34)	(0.37)	(0.36)	(0.31)	(0.33)
Usual Hrs. per week working on the Mkt.	35.61	37.49	38.55	35.39	37.76	38.90	39.06	42.33	43.66
(conditional on working)	(11.18)	(11.27)	(11.74)	(11.22)	(11.17)	(11.74)	(12.40)	(12.41)	(13.07)
% work at least 50 hrs.	0.06	0.12	0.17	0.05	0.12	0.16	0.15	0.27	0.33
	(0.24)	(0.33)	(0.37)	(0.23)	(0.32)	(0.37)	(0.36)	(0.44)	(0.47)
% work at least 60 hrs.	0.02	0.04	0.05	0.02	0.04	0.05	0.06	0.10	0.13
	(0.14)	(0.19)	(0.22)	(0.13)	(0.18)	(0.22)	(0.23)	(0.30)	(0.34)
Married	0.66	0.61	0.62	0.60	0.63	0.64	0.51	0.58	0.61
	(0.47)	(0.49)	(0.49)	(0.49)	(0.48)	(0.48)	(0.50)	(0.49)	(0.49)
Child younger than 5	0.19	0.18	0.18	0.16	0.15	0.14	0.11	0.17	0.15
	(0.39)	(0.39)	(0.38)	(0.37)	(0.36)	(0.34)	(0.31)	(0.38)	(0.36)
Child younger than 17	0.41	0.37	0.39	0.38	0.40	0.37	0.29	0.35	0.37
	(0.49)	(0.48)	(0.49)	(0.49)	(0.49)	(0.48)	(0.45)	(0.48)	(0.48)

Table 4. Descriptive Statistics - Time-use of Women from 1980 PSID and 2003-2005 ATUS

	High School Drop		*High School Grad*		*Some College*	
	1980	2000s	1980	2000s	1980	2000s
Sample Share	0.22	0.12	0.31	0.29	0.32	0.29
Avg. No. of Hours p. week spent on HHld. Chores	25.05	17.96	24.52	15.09	22.19	13.82
	(17.12)	(17.12)	(16.13)	(15.80)	(15.96)	(15.36)
Avg. No. of Hours p. week spent on HHld. Chores	7.97	5.50	7.73	6.54	36.98	36.85
(by men of same education level)	(9.06)	(10.27)	(7.73)	(6.54)	(8.77)	(10.64)
Usual Hours per week working on the Market | H>0	36.87	35.35	36.65	37.14	7.61	6.51
	(10.81)	(10.62)	(8.35)	(9.88)	(6.94)	(10.93)
Labor Force Partipation	0.50	0.49	0.60	0.72	0.71	0.75
	(0.50)	(0.50)	(0.49)	(0.45)	(0.46)	(0.43)
Married	0.53	0.47	0.75	0.55	0.67	0.51
	(0.50)	(0.50)	(0.44)	(0.50)	(0.47)	(0.50)
Child less than 6 years	0.31	0.27	0.40	0.21	0.33	0.20
	(0.46)	(0.45)	(0.49)	(0.41)	(0.47)	(0.40)
Children	0.65	0.52	0.71	0.48	0.59	0.50
	(0.48)	(0.50)	(0.46)	(0.50)	(0.49)	(0.50)

	College Grad		*More than College*	
	1980	2000s	1980	2000s
Sample Share	0.11	0.21	0.04	0.11
Avg. No. of Hours p. week spent on HHld. Chores	20.40	13.38	16.85	11.66
	(14.83)	(13.66)	(13.57)	(12.69)
Avg. No. of Hours p. week spent on HHld. Chores	7.92	6.88	6.67	7.40
(by men of same education level)	(6.53)	(10.76)	(6.23)	(11.16)
Usual Hours per week working on the Market | H>0	36.95	37.50	35.24	40.03
	(8.82)	(12.00)	(10.92)	(11.67)
Labor Force Partipation	0.72	0.78	0.89	0.83
	(0.45)	(0.42)	(0.31)	(0.38)
Married	0.75	0.63	0.79	0.63
	(0.44)	(0.48)	(0.41)	(0.48)
Child less than 6 years	0.32	0.26	0.25	0.25
	(0.47)	(0.44)	(0.44)	(0.43)
Children	0.46	0.52	0.43	0.50
	(0.50)	(0.50)	(0.50)	(0.50)

Table 5. Descriptive Statistics - Consumer Expenditure Survey

	Year		
Education of Woman (spouse or head)	1980	1990	2000
High School Drop			
Sample Share	0.18	0.12	0.07
Dummy for Positive Exp. in Housekeeping	0.03 (0.16)	0.03 (0.17)	0.03 (0.17)
Housekeeping Expenditures (1990 dollars)	2.06 (22.74)	3.83 (24.73)	4.56 (30.63)
High School Grad			
Sample Share	0.39	0.35	0.29
Dummy for Positive Exp. in Housekeeping	0.05 (0.21)	0.03 (0.18)	0.03 (0.17)
Housekeeping Expenditures (1990 dollars)	9.28 (75.02)	8.52 (88.72)	4.79 (50.42)
Some College			
Sample Share	0.25	0.28	0.32
Dummy for Positive Exp. in Housekeeping	0.07 (0.26)	0.09 (0.29)	0.07 (0.25)
Housekeeping Expenditures (1990 dollars)	14.54 (81.40)	18.36 (83.40)	11.01 (57.69)
College Grad			
Sample Share	0.11	0.15	0.21
Dummy for Positive Exp. in Housekeeping	0.16 (0.37)	0.15 (0.35)	0.15 (0.35)
Housekeeping Expenditures (1990 dollars)	80.51 (312.33)	37.69 (135.08)	35.67 (131.26)
More than College			
Sample Share	0.08	0.10	0.10
Dummy for Positive Exp. in Housekeeping	0.18 (0.38)	0.22 (0.41)	0.26 (0.44)
Housekeeping Expenditures (1990 dollars)	77.94 (362.03)	63.75 (192.59)	103.24 (469.74)

Table 6. First Stage

	Dependent Variable			
	L(LS Imm + LS Nat./LF)		LS Imm/LF	
	(1)	(2)	(3)	(4)
Instrument:				
$\text{Log}(\sum_j \text{share}_{i,j,1970} * \text{LS Imm}_{jt})$	0.206	0.252		
	(0.033)	(0.058)		
$[\sum_j \text{share}_{i,j,1970} * \text{LS Imm}_{jt}]/\text{LF}_{i,1970}$			0.050	0.160
			(0.026)	(0.061)
$\{[\sum_j \text{share}_{i,j,1970} * \text{LS Imm}_{jt}]/\text{LF}_{i1970}\}^2$			-0.021	-0.150
			(0.007)	(0.059)
Sample	Census	CEX	Census	CEX
N.obs.	362	117	362	117

Note: OLS estimates. City and region*decade fixed effects are included in all the regressions. Regressions are weighted by city's labor force. Robust Std. Errors are reported in parenthesis.

Table 7. Low-skilled Immigration and the labor supply of women with Professional Degrees or PhDs
(Census Data 1980, 1990, 2000)

	Key Explanatory Variable			
	L(LS Imm + LS Nat./LF)		LS Imm/LF	
Dependent Variable:	OLS	IV	OLS	IV
Usual Hrs. Work	0.809	4.722	9.53	150.12
	(0.718)	(1.180)	(6.40)	(96.58)
Labor Force Participation	-0.006	-0.018	-0.13	-1.72
	(0.014)	(0.027)	(0.13)	(0.98)
Usual Hrs. Work | Working	2.164	7.106	18.31	203.80
	(0.722)	(1.198)	(6.55)	(109.60)
Prob(H>=50)	0.045	0.191	0.42	5.37
	(0.023)	(0.035)	(0.20)	(3.05)
Prob(H>=60)	0.031	0.081	0.26	3.87
	(0.014)	(0.024)	(0.11)	(1.95)

Each number comes from a different regression. All estimations include city, decade*region fixed effects and demographic controls. Errors are clustered at the city*decade level. Number of Obs. is 109597.

Table 8. LS Immigration and the Labor Supply of Highly Educated Women - Effects of Children and Highly Educated Husbands
(Census Data, Sample: Women with a professional degree or Ph.D.)

	Usual Hrs. Work	Lab Force Part.	Hrs. Work | H>0	Prob(H>=50)	Prob(H>=60)
I. Effects of having a child age 5 or younger					
L(LS Imm + LS Nat./LF)	4.450	-0.017	6.781	0.166	0.073
	(1.236)	(0.027)	(1.203)	(0.034)	(0.024)
Interacted with :					
Dummy for Child age <6	2.543	0.007	1.948	0.178	0.075
	(2.223)	(0.032)	(1.866)	(0.044)	(0.028)
II. Effects of having a child age 17 or younger					
L(LS Imm + LS Nat./LF)	4.216	-0.010	6.433	0.149	0.057
	(1.321)	(0.029)	(1.252)	(0.035)	(0.024)
Interacted with :					
Dummy for Child age <18	1.657	-0.004	1.367	0.114	0.065
	(1.440)	(0.031)	(1.130)	(0.033)	(0.023)
III. Effect of a highly educated husband					
L(LS Imm + LS Nat./LF)	5.771	-0.020	7.710	0.237	0.122
	(1.953)	(0.037)	(1.548)	(0.048)	(0.034)
Interacted with :					
Dummy for Husband with Professional	-1.730	0.004	-1.005	-0.034	-0.051
Degree or PhD	(2.491)	(0.035)	(1.665)	(0.054)	(0.040)

All estimations include city, decade*region fixed effects and demographic controls. Panel I and II's regressions also include city*dummy for children fixed effects. Errors are clustered at the city*decade level. Number of Obs. is 109597.

Table 9. The Effect of Low-skilled Immigration on Women's Labor Supply by Education Group

	Explanatory Variable:L(LS Imm + LS Nat./LF)					
	Usual Hrs. Work	Lab Force Part.	Hrs. Work | H>0	Prob(H>=50)	Prob(H>=60)	N.obs
Education Level of Woman						
Professional Degree or PhD	4.722	-0.018	7.106	0.191	0.081	109597
	(1.180)	(0.027)	(1.198)	(0.035)	(0.024)	
Masters Degree	-0.781	-0.082	1.641	0.071	0.031	300418
	(0.740)	(0.021)	(0.518)	(0.018)	(0.001)	
College Graduate	-0.404	-0.094	2.500	0.109	0.047	674281
	(0.742)	(0.023)	(0.602)	(0.019)	(0.009)	
Some College	-2.643	-0.100	0.520	0.008	0.000	1451732
	(0.823)	(0.027)	(0.444)	(0.007)	(0.004)	
High School Grad	-7.221	-0.184	-0.107	0.001	0.006	1793265
	(1.307)	(0.035)	(0.408)	(0.005)	(0.003)	
High School Dropout	-4.785	-0.094	0.064	-0.003	0.004	716399
	(1.306)	(0.031)	(0.673)	(0.006)	(0.004)	

All regressions include city and region*decade fixed effects and demographic controls (age, age squared, marital status, race, children). Standard Errors are clustered at the city*decade level.

Table 10. The Effect of Low-skilled Immigration on Women's Household Work
(PSID and ATUS Data)

	Dependent Variable: Hours per week spent doing HHld chores			
	(1) OLS	(2) IV	(3) IV	(4) IV
L((LS Imm. +LS Nat.) /LF)	0.365	-1.159		1.600
	(1.092)	(4.504)		(4.415)
L((LS Imm. +LS Nat.) /LF) interacted with a dummy for:				
More than College			-15.383	-17.004
			(7.150)	(7.107)
College			0.343	
			(5.953)	
Some College			-4.578	
			(5.090)	
High School Grad			7.476	
			(8.553)	

Each column represents a separate regression. All estimations include city, decade*region fixed effects and demographic controls. Errors are clustered at the city*decade level.

Table 11. Low-skilled Immigration and the Consumption of Housekeeping Services
(CEX data 1980-2000)

	Dependent Variable					
	Dummy for Expenditures>0			Level of Expenditures		
	OLS	IV	IV	OLS	IV	IV
L((LS Imm. +LS Nat.) /LF)	-0.032	0.036	0.046	-29.58	-5.89	4.60
	(0.030)	(0.050)	(0.055)	(14.55)	(29.46)	(34.48)
Ln ((LS Imm.+LS Nat.)/ LF)*more than college			0.342			361.03
			(0.319)			(268.97)

Number of observations : 13319

Each column represents a separate regression. All estimations include city, decade*region fixed effects and demographic controls.
Errors are clustered at the city*decade level.

Appendix 1. IV Estimations of the Effect of LS immigration on US prices (from Cortes (2006))

	Dependent Variable is Log(Price Index):			
	Ind. highly intensive in the use of LS Immigrants		All Goods and Services	
	Non-Traded	Traded	Non-Traded	Traded
Ln(LS workers / LF)	-0.552	0.212	-0.225	0.089
	(0.173)	(0.200)	(0.111)	(0.066)
Region*Decade FE	Yes	Yes	Yes	Yes
No. of Observations	360	720	1980	1850
No. of Industries	6	12	33	37

Notes: All regressions include city, decade, and industry*decade fixed effects.

Standard Errors clustered at the city*decade level are reported in parenthesis.

Services included in the non-traded highly intensive in LS Immigrants are: Baby-sitting, housekeeping, gardening, dry cleaning, shoe repair and barber shops

Appendix 2. Occupations of Women with a Professional Degree or PhD (Census 1990)

	%
Managers	37.27
Lawyers	14.15
Physicians	7.23
Subject instructors (HS/college)	6.98
Psychologists	2.67
Dentists	0.98
Veterinarians	0.93