

Low-Skilled Immigration and the Labor Supply of Highly Skilled Women[†]

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Low-skilled immigrants represent a significant fraction of employment in services that are close substitutes of household production. This paper studies whether the increased supply of low-skilled immigrants has led high-skilled women, who have the highest opportunity cost of time, to change their time-use decisions. Exploiting cross-city variation in immigrant concentration, we find that low-skilled immigration increases average hours of market work and the probability of working long hours of women at the top quartile of the wage distribution. Consistently, we find that women in this group decrease the time they spend in household work and increase expenditures on housekeeping services. (JEL J16, J22, J24, J61)

Low-skilled immigrants work disproportionately in service sectors that are close substitutes for household production. For example, whereas low-skilled immigrant women represent 1.9 percent of the labor force, they represent more than 25 percent of the workers in private household occupations and 12 percent of the workers in laundry and dry cleaning services. Low-skilled immigrant men account for 29 percent of all gardeners in America's largest cities although they represent only 3.3 percent of the labor force.

The importance of low-skilled immigrants in certain economic activities has been raised as part of the discussion on immigration policies. For example, in an article about immigration reform in the United States, *The Economist* 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

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*lawns. ... Californians ... depend on immigrants for even such intimate tasks as bringing up their children.*¹

— (*The Economist* 2007)

If, as found by Cortes (2008), the recent waves of low-skilled immigration have led to lower prices of services that are close 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. The link between immigration and changes in the prices of these market-provided household services indicates that even without a direct effect on wages, low-skilled immigration has the potential to generate effects on natives' decisions related to time use.

This paper studies this unexplored channel, focusing particularly on the impact that low-skilled immigration has on female labor supply. We first develop a simple model to investigate which groups of the female population are more likely to change their time-use decisions as prices for household related services decrease; we then test the model's predictions using census data on immigration and labor supply, and information on time devoted to household work and reported expenditures on housekeeping services.

Our empirical strategy is to exploit the cross-city variation in the concentration of low-skilled immigrants. To address the potential endogeneity of the location choices of immigrants, we instrument for low-skilled immigrant concentration using the historical (1970) distribution of immigrants of a country to predict the location choices of recent immigrant flows.

There are two main concerns with the validity of our instrumental variables strategy. First, cities that attracted more immigrants in 1970 might be systematically different from other cities, violating the identification assumption. To address this concern, we include specifications that allow cities to experience different decade shocks based on their 1970 value of key variables, such as female educational attainment distribution, female labor force participation, and industry composition. The second concern is that low-skilled immigration might have an impact on the labor supply of women through other channels besides lowering prices of household services, in particular, through interactions in market production. To tackle this issue, we present specifications that use men of similar skill level as a control group, and we test that the estimated relative increase in the labor supply of women as a result of low-skilled immigration is not driven by an increase in their wages relative to men. The relevance of the household services/time-use decision mechanism is also tested by comparing the estimated pattern of the immigration effect by skill level with the pattern predicted by our simple time-use model, and by looking at the mirror decisions of work at home and consumption of household services.

We first estimate reduced form regressions of female labor supply outcomes by wage groups as a function of the supply of low-skilled workers, as our model predicts that only women with high wages are the ones who will be affected by the reduction in prices of household services resulting from a low-skilled immigration

¹ *The Economist*. 2007. "Debate Meets Reality: America's Illegal-Immigration Problems Have No Easy Solution." May 17. http://www.economist.com/node/9200903?story_id:E1_JNDDJDD.

influx. We find a large positive and statistically significant effect of low-skilled immigration on the hours worked per week of working women at the top quartile of the female wage distribution. Consistent with our framework, much smaller, but still statistically significant, effects are found for women above the median, and no effects are found for women with wages below the median. Looking at women grouped by the median male wage of their occupation and at women at the top of the educational distribution, we confirm significant positive effects on the intensive margin of the labor supply of highly skilled women but find no similar effects on labor force participation (that is already high in our group of interest).

Occupations with the highest wage levels (such as physicians and lawyers for example) are also characterized by people having to work long hours in order to have a successful career.² Low-skilled immigrants, on the other hand, are regarded as providing cheaper and more flexible household services than those provided by native workers and companies.³ Thus, part of the effects we estimate can come from a match between the services demanded by women in occupations that require long hours and the more flexible services provided by low-skilled immigrants. We test this hypothesis estimating regressions of indicator variables for working more than 50 and 60 hours on our immigration variable. Focusing on women working in occupations where men have long hours of work, we find large positive and statistically significant effects of low-skilled immigration in the probability that women also work long hours.

The sign and statistical significance of all our results are robust to specifications that use men as a control group and that include city \times decade fixed effects. However, the magnitudes are smaller, between one-fourth and one-fifth of those that include only women. This difference likely reflects that men's time-use decisions might also be affected by the lower prices of household services, and that part of the effects estimated using the women sample were coming through other channels, for example, complementarities in production.

Overall, our estimates suggest that the low-skilled immigration wave of the period 1980–2000 increased by 20 minutes a week the time women in the top quartile of the wage distribution devoted to market work. Our more conservative estimates suggest that at the very least, four of those minutes can be attributed to low-skilled immigrants reducing prices of household services. The low-skilled immigration wave has also increased the probability that women working in occupations that demand long hours work more than 50 and 60 hours a week by 1.8 and 0.7 percentage points, respectively.

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

²For example, whereas the cross-occupation average of usual hours worked per week for men is 35.5, and the share working more than 50 hours is 7.4 percent and more than 60 hours is 2.6 percent, the same numbers for physicians are 47 hours, 44 percent, and 28 percent, and for lawyers are 42 hours, 31 percent, and 10 percent.

³For example, a study by Domestic Workers United (2006) in New York City reports that nearly half of domestic workers (most of which are immigrants) work overtime, often more than 50 and 60 hours per week, and that even when they are working a five day week, the days extend to 10–12 hours. Zoe Baird, who lost her chance to be attorney general for hiring illegal immigrants, supposedly placed the following ad in three local newspapers: "Child Care Nanny. Live-in Nanny for 7 Mo. old Boy in warm family setting. Light housekeeping, cook dinners. Long term position with appreciative family in beautiful home. Non-smoker. Driver. Citizen or green card only." She and her husband received not one response (Anna Crittenden 2001).

the recently released 2003–2005 American Time Use Survey (ATUS) and from the 1980 Panel Study of Income Dynamics (PSID), we find that the immigration wave of the 1980s and 1990s reduced by close to seven minutes a week the time women at the top of the wage distribution spent weekly on household chores.

Finally, using the Consumer Expenditure Survey (CEX), we find that low-skilled immigration has increased the likelihood that highly skilled women consume market provided household services and their expenditures in these services.

Our findings with respect to highly skilled women have important implications. First, we provide evidence of a specific channel, different from wages, through which low-skilled immigration might be affecting the labor supply of highly skilled native workers. In particular, we find that women with high wages (and potentially their families) are benefiting from low-skilled immigration because of the reduction in the prices of services that are close substitutes for household production.⁴ Furthermore, our results suggest that looking purely at the effect on wages might not show all the various effects immigration has on the different skill groups. This paper, therefore, provides a new perspective on the literature of the labor market effects of low-skilled immigration, particularly to our understanding of the effects of immigration across the wage and educational attainment distribution.⁵

Second, the results suggest that the availability of flexible housekeeping, including child care services among others, at low prices might help women in occupations demanding long hours or irregular work schedules to advance in their careers.⁶ 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).⁷ On the other hand, it provides some evidence against recent theories that highly skilled women are opting out of demanding careers because they place a higher value on staying home with their children.⁸ Overall, it suggests that differences in preferences are not the only reason that highly educated women are not more actively involved in the labor market.

Outline.—The rest of the paper is organized as follows. The next section presents the theoretical framework. Section II describes the data and the descriptive statistics. Section III presents the empirical strategy and discusses the main results, and in Section IV we conclude.

⁴Phanwadee Khananuskul (2004) is, to the best of our knowledge, the only previous study that relates low-skilled immigration with the labor supply of high-skilled women. The author finds that an increase in the proportion of low-skilled female immigrants in a metropolitan area raises the proportion of private household workers and lowers their wages. She does not, however, find a significant effect on the labor supply of college educated women.

⁵See Gordon H. Hanson (2009) for a recent survey of the literature on the effects of migration.

⁶Jonah B. Gelbach (2002) and Michael Baker, Jonathan Gruber, and Kevin Milligan (2008) show some results regarding the labor supply effects of differences on the cost of child care driven by government subsidies or the admission rules to public schools. Daniele Coen-Pirani, Alexis León, and Steven Lugauer (2010) look at the same household production-labor supply connection, but focus in the increased availability of household appliances in the United States during the 1960s.

⁷For example, Mona Harrington and Helen Hsi (2007) say that “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 a huge impediment to a balanced work/family life.”

⁸The 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.”

I. Theoretical Framework

In this section, we present a simple time-use model that illustrates the interactions between wage levels, the decision to purchase household services, the market price of household services, and labor supply. Its purpose is to derive implications about which groups of the population are more likely to change their time-use decisions as prices for household related services decrease. At the end of the section we also investigate if women who face larger household demands (for example, women with young children) display a differential sensitivity to prices, and discuss how career concerns might interact with the price of household services.

A. Set Up

An agent allocates her time between leisure, household production, and market work. She receives a wage w per unit of time devoted to market work.

The agent consumes two goods. First, there is a homogeneous consumption aggregate that can only be bought in the market; we normalize its price to 1. Second, the agent's household requires a certain number of units of a household service to function; this service can be produced at home or bought in the market at a price p . The household needs exactly R units of this service; the marginal benefit of units beyond R is 0.

Denote by y the amount of the consumption good, l the hours of leisure, h the hours of household work, n the hours of market work, x the units of the household service purchased on the market, and I the nonwage income of the household. Assume that there is only one working agent per household and normalize total time available to the agent to 1.

Utility is given by

$$(1) \quad u(y) + \psi(l),$$

where $u(\cdot)$ and $\psi(\cdot)$ are concave and satisfy $u'(y) \rightarrow \infty$ as $y \rightarrow 0$ and $\psi'(l) \rightarrow \infty$ as $l \rightarrow 0$. Household production is described by the function $f(h)$, which we assume to have decreasing marginal returns to time spent working at home and to satisfy $f'(h) \rightarrow \infty$ as $h \rightarrow 0$. This condition implies that a person will never outsource all of her household work. The agent also faces two constraints: a budget constraint and a time constraint (which can be reduced into a full income constraint).

Four important results arise from the solution of the model. First, people with higher wages (for a given level of I and p) supply labor in the market. Second, for a given w and I , a decrease in p might induce a person to purchase market-provided household services, or to purchase even more. Third, for a given p and I , people with higher wages are more likely to buy household services. Finally, only those who purchase services will change their decisions at the margin when p changes.⁹

⁹The details of the solution of the model are presented in the Appendix.

B. The Effects of an Inflow of Low-Skilled Immigrants

Based on Cortes (2008), we model an inflow of low-skilled immigrants as a decrease in p . Furthermore, we assume the immigration inflow has no effect on wage levels, at least for the group that purchases household services in the market. It follows, according to our simple model, that women with higher wages will be more likely to respond to immigrant induced changes in p . The model also suggests that if we observe time-use effects of immigration in other groups, especially those characterized by low wages, they are likely to come through other channels besides changes in p .

*Effect on Household Work (h).—*For agents with high enough productivity outside the household such that it is optimal for them to outsource part of the household production, a decrease in p will reduce the number of hours worked at home. We should not see changes in hours spent in household production for households with lower wages (but not low enough that we expect them to compete with immigrants in the labor market).

Two additional points are worth mentioning. First, a decrease in p might induce some agents who were previously not buying household services—but who had high enough wages to be close to the threshold—to start doing so. Second, under a fairly simple household production function (for example $f(h) = \ln(h)$), within high-salaried agents that already work and purchase household services, the ones with lower salaries will decrease their household work by more than those with higher salaries if p falls.¹⁰ This means that conditional on initially purchasing household services, the effect of a fall in p might be decreasing in the wage. Therefore, we expect the effect of a fall in p on household work to be stronger for the high-salaried group as long as the much lower share of women purchasing household services in other groups dominates the intensive margin effect.

*Effect on Labor Supply (n).—*As with the effect on h , only certain agents' labor supply decisions will be affected by a drop in p . Only agents that are both working in the market and purchasing household services will show any change on their labor supply in response to a drop of p ; as we mentioned before these agents are characterized by high wages.

The effect on n will depend on how hours worked in household production and leisure change after a decrease in p . From the previous subsection, it is clear that $\partial h^*/\partial p > 0$. Given that changes in p keep the relative price of leisure versus consumption good unchanged, the effect on leisure happens through a change in disposable income only. Its direction will depend on whether leisure is a normal or inferior good. If leisure is an inferior good or if it doesn't respond to income changes, then hours worked in the market are going to unambiguously increase when p goes down. If leisure is a normal good (as in our case because the utility function is separable

¹⁰ Intuitively, agents with very high wages are already spending very little time working at home; therefore, compared to an agent with a high but relatively lower wage, her marginal productivity in household production is relatively large. The shape of the production function given by our assumptions about $f''(\cdot)$ and $f'(0)$, imply further decreases in h require larger reductions in p .

in y and l), then the direction of the effect will depend on the relative magnitudes of $\partial h/\partial p$ versus $x \cdot (\partial l/\partial \text{Income})$. Therefore, whether labor supply increases or decreases after a change in p can only be determined empirically.

In our particular case, we can show that the total effect can be decomposed as

$$(2) \quad \frac{\partial n^*}{\partial p} = -\frac{\partial h^*}{\partial p} + \frac{wxu''(\cdot)}{w^2u''(\cdot) + \psi''(\cdot)}.$$

Note that if the income effect is fairly small, we have that

$$\frac{\partial \left| \frac{\partial n^*}{\partial p} \right|}{\partial w} < 0.$$

From equation (2), we can also conclude that all else being equal, agents with higher unearned income (and therefore higher use of market-provided household services, x) will react less to changes in p .

Summarizing, the model predicts that (only) women with high wages will be affected by the reduction in prices of household services resulting from a low-skilled immigration influx. This is true because for given household characteristics and preferences, women with higher wages buy market services and supply labor in the market. For this group of women a decrease in prices will likely reduce the hours spent in household production, and might increase the hours worked in the market if leisure is not very sensitive to income. Within the group of women affected by the change in p , those with the higher wages, the ones with lower wages will react more. Finally, higher unearned income is associated with a smaller labor supply response.

Household Composition: Children at Home.—As we have argued before, in order for p to have an effect on a woman's labor supply and time spent at home production, she must be purchasing household services in the market. An important characteristic affecting the demand for household services is the presence of a child at home, and although some services are provided for free by institutions, such as public schools, when children are not old enough to attend school the burden of the care provision lies on the family. In this section, we explore how time-use decisions, participation in the market of household services, and the response to immigrant-induced reduction in prices of market substitutes are affected by the presence of a child at home (age less than six so that they cannot receive most of the services available from schools). For simplicity, we model this case as a household requiring a higher number of units of household services, R , to function properly.¹¹

¹¹ Although a simplification, we think that this way to model the presence of children at home captures the fact that more tasks must be performed at home. We could also assume that a woman must perform a certain number of tasks when she has a child at home; when she performs these tasks, then we can argue that $f'(\cdot)$ with children is less or equal to without children at home. We can think of this reflecting that the person is more tired after performing the child-related work or that more of the same chores must be done (i.e., the house cleaning is more demanding with children, and so it takes more hours to perform "house cleaning"). A change in $f'(\cdot)$ in this direction produces qualitatively similar results, and, if added, it reinforces the channels we explain in this subsection.

Labor Force Participation and the Decision to Purchase Household Services.—In our simple model, “participation” in the market for household services, i.e., the decision of whether and how much household services to buy from the market, is directly linked to the total amount of services needed for the home. Labor supply is also affected by the level of R , but the direction of the effect will depend on other parameters of the model, with the intensive and extensive margins showing different responses in some cases.¹²

For example, consider the case of an agent that does not purchase market services. In this case, a larger R has two effects: it increases the cost of time because the agent spends more time doing household work, thus reducing leisure and/or labor supply; and it lowers the marginal productivity of time devoted to household work. Eventually, for a sufficiently large increase in R , this agent might start purchasing services. A different situation arises if we take the case of an agent who supplies labor and purchases household services. In this case an increase in R translates into a higher demand for market services x , and a higher labor supply to cover part of the bill of the additional market services.

All in all, compared to otherwise identical women, mothers of young children are more likely to buy market provided household services. Also, conditional on purchasing household services, mothers buy more units of the household service than nonmothers.

Sensitivity to Changes in Prices of Household Services.—How is the time-use response to an immigration-induced reduction in p affected by having young children? While the model delivers clear predictions about level differences in time use and expenditures in household services by motherhood status, predictions about differences in sensitivity to prices are less clear. Consider, for example, the case of a woman with a sufficiently high wage such that she outsources part of her household work, $x^* > 0$, and also supplies labor in the market, $n^* > 0$. From our discussion earlier in this section, we know the labor supply response to a change in p depends on how hours devoted to household work react and on the magnitude and sign of the income effect on leisure. For these women, the derivative $(\partial h^*/\partial p)$ is independent of R , so differences in the sensitivity of labor supply to prices between mothers and non-mothers depend only on differences in the income effect on leisure. If leisure is a normal good, and given that mothers spend a larger fraction of their total income purchasing market-provided household services, the income effect of a reduction in p will be larger. Consequently, mothers would increase their leisure (and thus decrease their labor supply) relatively more than nonmothers. An opposite effect will be observed if leisure is an inferior good or if there is a strong degree of complementarity between household work and consumption, or if certain household activities have an intrinsic utility value.¹³

¹² A more detailed analysis can be found in the Appendix, where we also make use of the solution to the model to expand the discussion.

¹³ There are other potential channels that can generate a link between these two elements. Consider, for example, the case of R being a variable of choice, in which case it would respond to p , or if household production actually contributes to utility (for example, by turning the “market” good y into a consumable good).

Taking the model's predictions to the data complicate matters even more, given that we will not be able to separate women according to their consumption of market-provided household services.¹⁴ Therefore, the observed differences between mother's and nonmother's response to price changes will come from three sources. First, given that mothers are more likely to purchase household goods, they are more likely to be affected by a price change. Second, conditional on purchasing household services, their labor supply reacts less relative to nonmothers if leisure is a normal good. Finally, differences in R can also affect changes in the extensive margin of labor supply in response to the changes in p , thus changing the *composition* of the groups constructed for the empirical work. One plausible situation would be a mother that was working reduced hours before and not purchasing household services, and that with the reduction in p it shifts into a situation where she works more hours and uses market-provided services.

In sum, we cannot use our empirical estimation of the relative sensitivity of the labor supply of women with (young) children as a test of the validity of our model. However, given that women with young children are a natural group of interest, we explore their differential labor supply response to prices in Section IIIC.

Career Concerns.—The simple model outlined in this section focuses on a static labor supply/household production decision. However, it is reasonable to think that the labor supply decisions of women with high wages (who are the most affected by changes in p in our model) are also likely to reflect choices about career paths, and thus, include intertemporal issues not captured by our model. For example, recent empirical evidence by Marianne Bertrand, Claudia Goldin, and Lawrence F. Katz (2010) suggests that in high-wage occupations, in particular those in the corporate and financial sectors, shorter work hours and career interruptions carry a huge penalty in terms of future earnings growth, explaining to a large degree the significant gender gap observed a few years after graduation. Given that a reduction in the price and an increase in the flexibility of services that are close substitutes for household production allow women to extend their working hours, in our empirical work we will study whether more highly skilled women choose to work very long hours in response to low-skilled immigration flows. The effects at the top of the distribution of hours worked might be more marked than the responses of average hours of work and labor force participation if, as expected, career concerns are important for a significant fraction of highly skilled women.¹⁵

II. Data and Descriptive Statistics

We now describe the basic details of the data we use to measure immigration, labor market outcomes, and household production outcomes.

¹⁴ As it is explained later in Section IIIC, our empirical work separates women according to wages and other labor market characteristics, but we cannot classify them at the same time according to (potential) wages and use of market-provided household services.

¹⁵ For a lengthier discussion see the Appendix.

TABLE 1—SHARE OF LOW-SKILLED IMMIGRANTS IN THE LABOR FORCE (*Percentage*)

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
Buffalo	1.48	0.72	0.47
Chicago	4.99	5.09	5.86
Cincinnati	0.44	0.23	0.34
Cleveland	1.82	0.89	0.65
Columbus	0.43	0.25	0.81
Dallas-Fort Worth	2.13	5.17	8.63
Denver-Boulder	1.18	1.42	4.13
Detroit	1.76	0.93	1.35
Honolulu	4.71	3.66	3.18
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	8.91	7.82	8.15
Philadelphia	1.39	0.91	1.06
Phoenix	2.19	3.30	6.41
Pittsburgh	0.57	0.27	0.21
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
Weighted Average 116 cities	3.36	3.80	4.31

Notes: Numbers computed using data from the US census. Low-skilled workers are defined as those without a high school degree.

Immigration Data.—This paper uses the 5 percent sample of the 1980, 1990, and 2000 Census Integrated Public Use Microdata Samples to measure the concentration of low-skilled immigrants among cities.¹⁶ Low-skilled workers are defined as those who have not completed high school and 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 and not enrolled in school.

Table 1 shows the evolution of the share of low-skilled immigrants in the labor force for the 30 largest cities in the United States. As observed, there is significant variation in immigrant concentration both across cities and through time. This is the variation we will exploit in our empirical strategy.

Market Work Data.—We also use the census to quantify the labor supply of native women, and restrict the sample to individuals who were between age 20 and 64. We start by describing the labor market behavior of working women by

¹⁶ See Steven Ruggles et al. (2010).

TABLE 2—DESCRIPTIVE STATISTICS—CENSUS DATA ON NATIVE WOMEN'S LABOR SUPPLY BY WAGE PERCENTILE

	0–25th percentile			25–50th percentile		
	1980	1990	2000	1980	1990	2000
Usual hrs. per week $ H > 0$	34.40	34.45	35.26	36.20	37.03	38.03
Work at least 50 hrs. (percent)	0.05	0.07	0.09	0.03	0.07	0.10
Work at least 60 hrs. (percent)	0.02	0.04	0.04	0.01	0.02	0.03
Age	34.84	34.84	35.89	35.69	36.48	38.30
Married	0.55	0.50	0.46	0.57	0.54	0.52
Child younger than 18	0.45	0.41	0.41	0.41	0.38	0.39
Child younger than 6	0.16	0.17	0.16	0.13	0.14	0.13
	50–75th percentile			75–100th percentile		
	1980	1990	2000	1980	1990	2000
Usual hrs. per week $ H > 0$	37.05	38.14	39.29	34.06	37.23	38.31
Work at least 50 hrs. (percent)	0.03	0.08	0.12	0.04	0.09	0.15
Work at least 60 hrs. (percent)	0.01	0.02	0.03	0.01	0.02	0.04
Age	36.86	37.87	39.86	38.74	39.73	42.29
Married	0.57	0.55	0.55	0.57	0.58	0.60
Child younger than 18	0.38	0.37	0.38	0.38	0.38	0.40
Child younger than 6	0.12	0.14	0.13	0.13	0.15	0.14
	90–100th percentile					
	1980	1990	2000			
Usual hrs. per week $ H > 0$	29.69	35.81	37.03			
Work at least 50 hrs. (percent)	0.03	0.09	0.16			
Work at least 60 hrs. (percent)	0.01	0.02	0.04			
Age	39.90	40.90	42.96			
Married	0.57	0.59	0.61			
Child younger than 18	0.40	0.38	0.41			
Child younger than 6	0.14	0.16	0.15			

Notes: Only women who reported a positive wage are included. Wage distribution was constructed by region.

wage percentile—as they will be our main focus in the empirical analysis (Table 2). We also present descriptive statistics by education level (Table 3) because, even if education is only a proxy for market wage, we observe labor supply variables for every woman, including those not working.

As Table 2 shows, women at the bottom of the hourly wage percentile work fewer hours a week, are younger, and are less likely to be married. On the other hand, women above the median tend to work more hours a week, and women in the top quartile and top decile, in particular, are much more likely to work more than 50 or 60 hours.

Labor force participation and the number of hours worked a week increase systematically with the education level of the woman (see Table 3). Women with a graduate degree, a college degree, and some college present a significant increase in their labor force participation between 1980 and 1990. During the past decade, participation of all education groups has stabilized, and if anything it has gone down. It is important to note that close to a third of professional women (mostly doctors, lawyers and PhDs) reported working 50 hours or more a week in 2000, a double-fold increase from 1980 and at least two times 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.

TABLE 3—DESCRIPTIVE STATISTICS—CENSUS DATA ON NATIVE WOMEN'S LABOR SUPPLY BY EDUCATION LEVEL

	At most high school graduate			Some college		
	1980	1990	2000	1980	1990	2000
<i>Sample share</i>	0.61	0.46	0.37	0.24	0.32	0.34
Labor force participation	0.56	0.62	0.63	0.69	0.78	0.77
Usual hrs. per week $ H > 0$	35.46	36.02	36.87	34.81	36.27	36.95
Work at least 50 hrs. (percent)	0.02	0.04	0.05	0.03	0.06	0.08
Work at least 60 hrs. (percent)	0.01	0.02	0.02	0.01	0.02	0.03
Married	0.66	0.58	0.54	0.57	0.55	0.54
Child younger than 18	0.46	0.41	0.39	0.43	0.41	0.41
Child younger than 6	0.16	0.16	0.14	0.17	0.18	0.15

	College grad			Master's degree		
	1980	1990	2000	1980	1990	2000
<i>Sample share</i>	0.09	0.16	0.19	0.04	0.05	0.07
Labor force participation	0.72	0.82	0.80	0.80	0.87	0.85
Usual hrs. per week $ H > 0$	35.31	37.54	38.61	35.97	38.49	39.91
Work at least 50 hrs. (percent)	0.04	0.10	0.14	0.06	0.14	0.19
Work at least 60 hrs. (percent)	0.01	0.03	0.04	0.02	0.04	0.06
Married	0.63	0.58	0.60	0.62	0.62	0.63
Child younger than 18	0.40	0.37	0.40	0.39	0.38	0.37
Child younger than 6	0.17	0.18	0.18	0.17	0.15	0.14

	Professional degree or PhD		
	1980	1990	2000
<i>Sample share</i>	0.02	0.02	0.02
Labor force participation	0.84	0.88	0.86
Usual hrs. per week $ H > 0$	37.51	41.18	42.27
Work at least 50 hrs. (percent)	0.12	0.25	0.29
Work at least 60 hrs. (percent)	0.05	0.10	0.12
Married	0.51	0.59	0.61
Child younger than 18	0.29	0.37	0.39
Child younger than 6	0.11	0.18	0.16

Household Work Data.—We combine information from the 2003–2005 ATUS with the PSID to measure time devoted to household work.

Since 2003, the Bureau of Labor Statistics (BLS) has been running the ATUS, a monthly survey, whose sample is drawn from the Current Population Survey (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 are randomly assigned; weekends are oversampled, they represent 50 percent of the sample. The overall response rate is 58 percent and the aggregated sample for 2003–2005 consists of approximately 38,000 observations.

Until the ATUS, only scattered time use surveys were available for the United States—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 between 1970 and 1986 included 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

TABLE 4—DESCRIPTIVE STATISTICS—TIME USE OF WOMEN FROM 1980 PSID AND 2003–2005 ATUS

	Female wage percentile					
	0–25th		25–50th		50–75th	
	1980	2000s	1980	2000s	1980	2000s
Hrs./week on household chores	22.29 (15.24)	12.55 (14.66)	20.05 (13.10)	13.33 (14.83)	17.34 (11.26)	11.79 (12.54)
Hrs./week on household chores (by men in same wage bracket)	8.35 (8.28)	5.17 (10.11)	8.38 (8.41)	5.42 (9.65)	6.77 (6.96)	6.54 (10.25)
Hrs./week market work (conditional on reporting wage)	35.90 (10.83)	34.09 (12.14)	36.83 (8.67)	37.49 (9.70)	38.10 (7.77)	39.49 (8.04)
Age	34.15	37.75	33.57	40.32	34.83	41.41
Married	0.64	0.44	0.64	0.50	0.60	0.53
Child younger than 18	0.67	0.47	0.63	0.00	0.56	0.48
Child younger than 6	0.37	0.22	0.34	0.18	0.26	0.19
Observations	609	1,233	586	1,287	488	1,392

	Female wage percentile			
	75–100th		90–100th	
	1980	2000s	1980	2000s
Hrs./week on household chores	18.53 (13.01)	11.84 (13.19)	19.48 (12.97)	11.38 (12.29)
Hrs./week on household chores (by men in same wage bracket)	7.71 (7.02)	6.92 (10.78)	7.59 (6.67)	6.63 (10.46)
Hrs./week market work (conditional on reporting wage)	36.97 (8.34)	39.75 (9.42)	35.12 (9.99)	39.75 (10.47)
Age	35.89	43.19	37.00	43.63
Married	0.71	0.59	0.73	0.60
Child younger than 18	0.55	0.49	0.62	0.50
Child younger than 6	0.27	0.20	0.33	0.21
Observations	500	1,574	172	691

Notes: Cut-off percentile values are based on census data, explaining differences in sample size by quartile. Only women who reported a positive wage are included in the table. Numbers in parenthesis correspond to the standard deviations.

for food, and shopping for clothes/household items, multiply this aggregate by 7 and divide it by 60. We hope to capture any difference in the definition of household work using decade dummies. For both surveys, our sample consists of women ages 21–64 who have completed the survey.

Table 4 presents the descriptive statistics of our time use data. For all women, hours spent on household work decreased significantly between 1980–2000. In both years, time spent on household chores is significantly smaller for women above the median wage. The time men spent doing household work is between one-half and one-third the amount women with similar wages spent. Note that PSID's and ATUS's statistics on usual hours worked and general demographic characteristics are not very different from the census.

Consumption Data.—We use the CEX 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 housekeeping services. Second, we also consider the amount spent on each of these services,

TABLE 5—DESCRIPTIVE STATISTICS—CONSUMER EXPENDITURE SURVEY

	0–25th percentile			25–50th percentile		
	1980	1990	2000	1980	1990	2000
Dummy for positive exp. in housekeeping	0.034	0.042	0.022	0.041	0.055	0.039
Housekeeping exp. $E > 0$	172.5	165.9	176.0	124.3	174.6	141.3
(1990 dollars)	(192.2)	(183.6)	(193.2)	(119.3)	(124.4)	(177.7)
Observations	575	567	710	512	524	661
	50–75th percentile			75–100th percentile		
	1980	1990	2000	1980	1990	2000
Dummy for positive exp. in housekeeping	0.045	0.042	0.079	0.142	0.184	0.181
Housekeeping exp. $E > 0$	137.0	172.1	175.6	279.5	212.2	207.4
(1990 dollars)	(170.3)	(143.0)	(201.3)	(412.7)	(160.6)	(210.4)
Observations	631	584	801	627	582	803
	90–100th percentile					
	1980	1990	2000			
Dummy for positive exp. in housekeeping	0.171	0.283	0.263			
Housekeeping exp. $E > 0$	297.7	222.8	232.2			
(1990 dollars)	(454.8)	(154.6)	(255.8)			
Observations	210	221	310			

Notes: Cut-off percentile values are based on census data explaining differences in sample size by quartile. Only women who reported a positive wage are included in the table. Numbers in parenthesis correspond to the standard deviations.

a measure we identify as capturing mostly the intensive margin.¹⁷ As observed in Table 5, the probability of consuming household services increases significantly with the wage percentile of the wife/female head of the household. Whereas in 2000, for only 3 percent of households where such a female had a wage below the median, that fraction rises to 8 percent, 18 percent, and 26 percent when considering females at the third quartile, top quartile, and top decile, respectively. Note that this pattern is consistent with the predictions of the model, where only women with high wages or high unearned income will purchase household services. Expenditures on household services tend to increase with the wage percentile of the main adult female in the household. Households with a wife or female household head at the top quartile of the wage distribution (conditional on reporting positive expenditures) spent close to 30 percent more in housekeeping services than other households.

III. Empirical Analysis

A. Identification Strategy

We exploit the intercity variation in the (change of the) 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 this strategy. First, immigrants are not randomly distributed across

¹⁷ We do not include child care at home because the variable in the CEX was redefined between 1990 and 2000.

labor markets. 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 IIIB.

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 empirically tested natives' migration response to immigration have not found evidence of large displacement effects. David Card and John DiNardo (2000), Card (2001), and Card and Ethan G. Lewis (2005), using different samples and specifications, have all found that native mobility has virtually no offsetting effect on the relative supply shocks created by immigration. Larger, but still not perfectly offsetting displacement effects are found by George J. Borjas (2006). He estimates that 6.1 fewer native workers choose to reside in a city for every 10 new immigrants that arrive in the city. 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.

B. 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 assimilation to the new culture, see Kaivan 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 Los Angeles, the instrument allocates one-third of all Mexicans in the 1990s to Los Angeles.

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

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

where j are all countries of origin included in the 1970 census; $Immigrants_{ji1970}/Immigrants_{j1970}$ 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 United States in decade t .

All of the econometric specifications in the paper include city and region \times decade fixed effects (we use the nine census divisions). Therefore, the instrument will help in identifying the causal effect of immigration concentration on time use of native women as long as the following conditions hold:

- (1) The unobserved factors determining that more immigrants decided to locate in city i versus city i' (both cities in the same region) in 1970 are not correlated with changes in the relative economic opportunities for skilled women offered by the two cities during the 1980s and 1990s. To ameliorate the concern that

TABLE 6—SAMPLE FIRST STAGE

	ln[(LS Imm + LS Nat)/Labor Force]			
	(1)	(2)	(3)	(4)
Log ($\sum_j \text{share}_{i,j,1970} \times \text{LS Imm}_{ji}$)	0.207 (0.060)	0.189 (0.056)	0.188 (0.068)	0.200 (0.067)
Controls	Basic	Basic	Basic	Add. controls
Excludes California	No	Yes	No	No
Excludes Miami, New York City, and Los Angeles	No	No	Yes	No
Number of cities	116	104	113	116

Notes: $\ln[(\text{LS Imm} + \text{LS Nat})/\text{Labor Force}] = \ln[(\text{Low-skilled Immigrants} + \text{Low-skilled Natives})/\text{Labor Force}]$. OLS estimates. Regressions are weighted by the city’s labor force size. City and region \times decade fixed effects are included in all the regressions. Robust standard errors are reported in parentheses. Number of observations is number of cities multiplied by three. Additional controls are the following variables constructed for 1970 interacted with time dummies: share of workers in the agricultural sector, in the manufacturing sector, and in high skilled services sector, log of hourly wage of college graduate, share of women with a college degree, and LFP of college educated women.

cities that attracted immigrants in or before 1970 are systematically different from other cities, we present specifications that allow for cities within a region to experience different demand shocks based on 1970 values of key variables, such as female labor force participation, education composition of women, industry composition of employment, and wage levels.

- (2) The total (national) flow of low-skilled immigrants in a given decade (second term in the interaction) is exogenous to differential shocks to cities within a given region.¹⁸

Estimation of the first stage and a few robustness tests are presented in Table 6. The magnitudes of the coefficient suggest that at current United States immigration levels, an increase of 10 percent in the predicted number of low-skilled immigrants increases the share of low-skilled workers by around 2 percent. The inclusion of the additional controls and exclusion of California and the top migrant cities does not change the magnitude or statistical significance of the coefficient.¹⁹

Even if the identification assumption holds, an additional concern for the interpretation of the IV estimations is the violation of the exclusion restriction, i.e., that changes in the prices or the availability of household related services are not the only channels through which low-skilled immigration might be affecting the time use of American women. A natural candidate is the effect that low-skilled immigration might have on the wages of natives. To partial out the confounding channels, we present specifications that include both men and women, allowing us to use men of identical skill as

¹⁸One might be concerned that this condition is violated if city specific pull factors are the driving force in the decision of low-skilled foreigners’ migration decisions. Leah Platt Boustan (2007) notes this problem and assesses its quantitative importance. She compares results from instruments that assign either the actual or the predicted migrant flows, where the predictions are based on push factors from source areas, and finds little difference between the two.

¹⁹First-stage coefficients estimated with the individual data are presented in Table 6. Once the error terms are properly clustered, the magnitude and statistical significance is very similar to the coefficient estimated with data at the city level.

controls and to incorporate in the regressions city \times decade fixed effects. These fixed effects also help address even further potential violations of condition 1.

C. Econometric Specifications and Results

Our theoretical framework suggests that price indexes (in particular, the price index of household services in a city) should be the explanatory variable in our analysis of time use and consumption. However, there are no price indexes available that cover the universe of activities we consider, and the few that are available cover only a subset of the sample (they are available for 30 cities).²⁰ Therefore, we present basic reduced-form specifications using as the explanatory variable the log of the share of low-skilled workers in the labor force (henceforth denoted by \mathcal{L}_{it}), which is a simplified version of the price equations' main explanatory variable in Cortes (2008).

Labor Supply of Highly Skilled Women.—We start our empirical exercise by investigating the labor supply effects of changes in low-skilled immigrant concentration by wage percentile. We use the following specification, where the dependent variables of interest are usual hours a week worked, the probability of working at least 50 hours a week, and the probability of working at least 60 hours a week:

$$(3) \quad LS_{nit} = \delta^w \times \mathcal{L}_{it} + \mathbf{X}'_{nit} \mathbf{\Lambda}_t^w + \tau^w \times \text{Additional Controls}_{it} + \phi_i^w + \psi_{jt}^w + \varepsilon_{it}^w,$$

where

$$\mathcal{L}_{it} = \ln \left(\frac{LSImmigrants + LS Natives}{LaborForce} \right),$$

and w corresponds to the wage percentile of the individual, i is city, t is decade, and j is region.²¹ The variable LS_{nit} represents the labor supply variable of choice of a woman n in city i and decade t . The vector \mathbf{X}_{nit} includes individual-level characteristics, namely age, age squared, race, marital status, and the presence of children in several age brackets. Henceforth, ϕ_i and ψ_{jt} represent city and region \times decade fixed effects, respectively.

To account for the fact that the main predictive variable \mathcal{L}_{it} varies only at the city \times decade level and, moreover, that labor supply is not independent among workers in a given city, the standard errors are clustered at the city \times decade level. In our robustness checks we also show the standard errors using city clusters to address the possibility of serial correlation within cities across decades (see Appendix Table A1).

Based on our theoretical model, our hypothesis is that $\delta^w \neq 0$ for women with very high wages (i.e., for high values of w). The direction of the effect is theoretically ambiguous; however, if the income elasticity of leisure is negative or not very large,

²⁰In separate specifications, we have run some specifications for labor supply outcomes, similar to those in Section IIIC, using the prices of household services as the explanatory variable. Results are qualitatively similar to those we obtain here (they are available upon request from the authors).

²¹See Cortes (2008, 389–93) for a derivation of $\ln((LSImmigrants + LS Natives)/LaborForce)$ as the main explanatory variable in the determination of the prices of nontraded goods.

TABLE 7—LOW-SKILLED IMMIGRATION AND THE LABOR SUPPLY OF WOMEN BY HOURLY WAGE QUARTILE
(Census data 1980–2000)

Wage per hour percentiles	Usual hours $H > 0$			$P(\text{Hours} \geq 50)$			Observations
	OLS	IV	IV	OLS	IV	IV	
90–100	0.089 (0.358)	2.622 (1.337)	3.534 (1.508)	–0.004 (0.011)	0.124 (0.035)	0.085 (0.032)	383,806
75–100	0.095 (0.216)	2.375 (0.735)	2.068 (0.754)	–0.003 (0.008)	0.093 (0.026)	0.061 (0.023)	951,365
50–75	–0.160 (0.089)	1.150 (0.421)	0.657 (0.360)	–0.004 (0.004)	0.057 (0.018)	0.034 (0.015)	931,147
25–50	–0.221 (0.120)	0.363 (0.517)	0.092 (0.492)	–0.001 (0.004)	0.059 (0.017)	0.038 (0.012)	906,721
0–25	–0.295 (0.103)	–0.181 (0.432)	–0.470 (0.453)	–0.006 (0.003)	0.041 (0.015)	0.021 (0.011)	880,705
Controls	Basic	Basic	Additional	Basic	Basic	Additional	
	First stage			$P(\text{Hours} \geq 60)$			Observations
	OLS	OLS		OLS	IV	IV	
90–100	0.225 (0.051)	0.190 (0.051)		0.001 (0.004)	0.045 (0.014)	0.024 (0.012)	383,806
75–100	0.223 (0.051)	0.193 (0.051)		–0.001 (0.003)	0.036 (0.011)	0.020 (0.008)	951,365
50–75	0.207 (0.048)	0.192 (0.050)		–0.002 (0.002)	0.021 (0.007)	0.010 (0.005)	931,147
25–50	0.195 (0.045)	0.196 (0.046)		0.000 (0.002)	0.041 (0.010)	0.028 (0.007)	906,721
0–25	0.187 (0.045)	0.187 (0.047)		–0.004 (0.002)	0.033 (0.012)	0.015 (0.008)	880,705
Controls	Basic	Additional		Basic	Basic	Additional	

Notes: Table reports the coefficient of $\ln[(\text{LS Imm} + \text{LS Nat})/\text{Labor Force}] = \ln[(\text{Low-skilled Immigrants} + \text{Low-skilled Natives})/\text{Labor Force}]$. Each number comes from a different regression. All estimations include city, decade \times region fixed effects, and demographic controls: age, age squared, black dummy, married dummy, dummy for having a child 5 or younger, dummy for having a child 17 or younger. Additional controls are the following variables constructed for 1970 interacted with time dummies: share of workers in the agricultural sector, in the manufacturing sector, and in high skilled services sector, log of hourly wage of college graduate, share of women with a college degree, and labor force participation of college educated women. Errors are clustered at the city \times decade level. Female hourly wage distribution is constructed by region.

then we should expect to find a positive effect of low-skilled immigration on the labor supply of highly educated women. Additionally, and as explained in our theoretical framework, career concerns actually reinforce this effect as women will take advantage of more flexible and/or cheaper services to take up positions that require longer (and maybe irregular) hours of work.

Table 7 presents the estimates of equation (3). We divide the working women population into quartiles (and also study the top decile), and present OLS and IV estimations.²² Our model predicts that only women in the highest percentiles of the wage distribution should change their labor supply as a result of low-skilled immigration lowering the prices of household services. As observed in the table, our IV coefficients

²²To construct the quartiles we use the wage distribution of women in each one of the nine census regions, women are then assigned to the corresponding quartiles and these groupings are used for all the metropolitan areas within each region.

exhibit a clear decreasing pattern as we move down to groups with lower wages. For women in the top 25 percent of the female wage distribution, a 10 percent increase in low-skilled immigration from current levels increases the time women in this group work by 5 to 6 minutes per week.²³ Note that the estimate is not driven entirely by the highest tenth percentile. The effect is reduced to between one-third and one-half for women earning hourly wages above the median, but below the top quartile. For women with wages below the median, we observe no significant effect of low-skilled immigration on their hours worked. Specifications that include as additional controls the 1970 values of key variables—such as labor force participation of women, education composition of women, industry composition of employment, and wage levels—interacted with decade dummies show a very similar pattern. Other robustness tests that address concerns about the importance of outliers and of endogenous internal migration of highly skilled women are presented in the Appendix Table A1.

Table 7 also shows that OLS coefficients are smaller than their IV counterparts. Ex ante it is difficult to anticipate in which direction the bias will go. If low-skilled workers tend to move to thriving economies, we would have expected OLS to have an upward bias. However, if, on the contrary, low-skilled workers stay away from cities with a high cost of living (where highly skilled women are likely to work longer hours), OLS coefficients should be smaller. Measurement error will also push OLS estimates toward zero.

Because group classification by wage percentile does not allow us to explore the effects of immigration on the extensive margin, in Table 8, we present alternative classifications that allow us to incorporate in the regressions, women that are not currently participating in the labor market (and thus do not report a wage), but that have recently been active in the labor market (and thus do report an occupation). In panel A, we present specifications that group women by the median male wage of their occupation.²⁴ We confirm significant effects on the intensive margin for women working in occupations with the highest wages (magnitudes are very similar to those in Table 7), but find that labor force participation (which was already very high for women with high potential wage) is not significantly affected.²⁵

Occupations with the highest wage levels (for example physicians and lawyers) are also characterized by people having to work long hours in order to have

²³ Given that 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:

$$\frac{dy}{d(\ln LSImmigrants)} = \frac{dy}{d\mathcal{L}} \times \frac{d\mathcal{L}}{d(\ln LSImmigrants)} = \theta \times \left(\frac{LSImmigrants}{LSImmigrants + LS Natives} \right),$$

where (Low-skilled Immigrants + Low-skilled Natives)/Labor Force 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 LS .

The last equality is based on the assumption that $d(\ln L)/d(\ln I) = 0$, 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.

²⁴ To choose the occupations included in Table 8, we first rank occupations by the median male wage, the mean hours per week worked by males, or by the share of male workers working more than 50 hours. Then we start including occupations at the top of the ranking and go down until our chosen set represents 25 (or 10) percent of the population of male workers. In this case, we categorize the occupations using the respective distributions at the national level.

²⁵ Note that workers only report an occupation if they have been out of the labor force for less than five years.

TABLE 8—LOW-SKILLED IMMIGRATION AND THE LABOR SUPPLY OF WOMEN IN OCCUPATIONS WITH HIGHEST WAGES AND LONGEST HOURS, AND OF WOMEN WITH HIGH EDUCATIONAL ATTAINMENT
(Census data 1980–2000; IV estimations)

Occupation level variables	Dependent variable					Observations
	Usual hours per week	LFP	Usual hrs. $H > 0$	$P(\text{hrs.} \geq 50)$	$P(\text{hrs.} \geq 60)$	
<i>Panel A. Male median wage per hour</i>						
Top 10 percent	0.535 (0.902)	−0.030 (0.020)	1.032 (0.780)	0.087 (0.039)	0.034 (0.020)	335,542
Top 25 percent	0.451 (0.563)	−0.036 (0.014)	0.980 (0.497)	0.069 (0.026)	0.023 (0.011)	993,549
<i>Panel B. Male mean hours per week</i>						
Top 10 percent	3.379 (0.180)	0.013 (0.032)	3.662 (0.146)	0.120 (0.051)	0.025 (0.028)	131,022
Top 25 percent	0.937 (0.798)	−0.021 (0.015)	1.287 (0.610)	0.079 (0.030)	0.019 (0.014)	565,764
<i>Panel C. Share of males working more than 50 hours</i>						
Top 10 percent	2.252 (1.203)	0.002 (0.018)	2.575 (0.981)	0.104 (0.039)	0.035 (0.022)	331,508
Top 25 percent	0.458 (0.686)	−0.016 (0.015)	1.071 (0.609)	0.081 (0.031)	0.024 (0.016)	534,567
<i>Panel D. Women's educational attainment</i>						
Professionals and PhDs	3.233 (2.146)	−0.039 (0.032)	4.890 (2.309)	0.110 (0.055)	0.039 (0.035)	95,243
Master's degree	−0.245 (0.854)	−0.050 (0.026)	1.040 (0.791)	0.047 (0.031)	0.011 (0.013)	286,158
College grads	−0.561 (0.674)	−0.067 (0.027)	1.435 (0.598)	0.079 (0.024)	0.031 (0.010)	756,040
Controls (for all panels)	Additional	Additional	Additional	Additional	Additional	

Notes: Table reports the coefficient of $\ln[(\text{LS Imm} + \text{LS Nat})/\text{Labor Force}] = \ln[(\text{Low-skilled Immigrants} + \text{Low-skilled Natives})/\text{Labor Force}]$. Each number comes from a different regression. All estimations include city, decade \times region fixed effects, and demographic controls: age, age squared, black dummy, married dummy, dummy for having a child 5 or younger, dummy for having a child 17 or younger. Additional controls are the following variables constructed for 1970 interacted with time dummies: share of workers in the agricultural sector, in the manufacturing sector, and in high skilled services sector, log of hourly wage of college graduate, share of women with a college degree, and LFP of college educated women. Errors are clustered at the city \times decade level. To choose the occupations included in the table, we first rank occupations by the relevant criteria. Then, we start including occupations at the top of the ranking and go down until our chosen set represents 25 (or 10) percent of the population of male workers.

a successful career. As mentioned in the introduction, low-skilled immigrants, on the other hand, are regarded as providing not only lower prices but much more flexible household services than those provided by native workers and companies. In this case, a significant part of the effect of immigration on labor supply would be observed not on the extensive margin, but on the intensive margin, particularly with some women moving into the upper part of the distribution of hours worked, an effect that is reinforced by career concerns in some of the most important occupations for this group of women. To test the hypothesis that low-skilled immigrants have allowed native women to work longer hours, we regress indicator variables for working more than 50 and 60 hours on our immigration variable. We focus on

native women working in occupations that demand long hours as determined by the average hours worked by men and the share of male colleagues working more than 50 and 60 hours.²⁶ As observed in Table 8, panels B and C, women working in occupations characterized by long weeks have significantly increased the time per week they spend working in the market, and they also are much more likely to report working more than 50 and 60 hours as a result of low-skilled immigration. The magnitude of the results suggests that a 10 percent increase in current immigration levels increases the probability that a woman in one of these occupations works 50 and 60 hours by 0.4 and 0.2 percentage points, respectively. To check that these estimates are not driven by an ad-hoc selection criteria, we observe that they are similar to the results we presented in Table 7, with women separated according to their wage.

Finally, panel D in Table 8 repeats the same regressions, but instead of using a classification based on earned wage or occupation, we use a classification based on educational attainment, focusing on women who report having a PhD or a professional degree, having completed a master's degree, and those with a college degree. The effects are very similar to the other panels in Table 8, and also to the main results in Table 7, with the results for women with a doctoral or professional degree being particularly large. Somewhat surprisingly, we find a negative and significant effect in labor force participation for very educated women. However, its magnitude is considerably smaller than the negative effect on women with low education levels (see Appendix Table A2), and it is not observed in the other panels.²⁷

Mothers of Young Children.—An important characteristic affecting the demand for household work is the presence of a young child at home. As intuition suggests and the model confirms, *ceteris paribus*, a mother of a young child is more likely to purchase household services in the market. In fact, in the CEX data we observe that, after controlling for age, at the top quartile of the wage distribution, women with young children (aged 0–5) are 8 percentage points more likely to report expenditures in housekeeping services than women in the same group with no young offspring. However, the *relative sensitivity* of the labor supply of mothers versus nonmothers to a price change is not unambiguously larger (refer to Section IB). Therefore, empirical specifications that allow the low-skilled immigration coefficient to differ for mothers of young children are not necessarily a direct test of our mechanism, but might shed light on the relative importance of the model's key parameters. Furthermore, if fertility also responds to the availability of household services, this specification might also incorporate endogenous family size responses (or endogenous location decisions).²⁸

²⁶ Given that we used the hour distribution of men to classify the occupations, we capture a “potential” distribution of hours for women rather than the effective distribution that is potentially endogenous to immigration (because of its effects on the availability of help).

²⁷ For completeness, we present the results from estimating the same regressions for all educational categories in Appendix Table A2. For women with low educational attainment, the effects on the intensive margin of labor supply are much smaller in magnitude and sometimes of the opposite sign.

²⁸ See Delia Furtado and Heinrich Hock (2008) for work on this area.

TABLE 9—LOW-SKILLED IMMIGRATION AND THE LABOR SUPPLY OF WOMEN:
INTERACTIONS WITH DUMMY FOR MOTHER OF YOUNG CHILD (*Census Data 1980–2000; IV estimations*)

Wage per hour percentiles	Dependent variable						Observations
	Usual hours $H>0$		$P(\text{Hours}\geq 50)$		$P(\text{Hours}\geq 60)$		
	Ln (LS Skilled)	Ln(LS skilled) × child 0–5	Ln (LS Skilled)	Ln(LS Skilled) × child 0–5	Ln (LS Skilled)	Ln(LS Skilled) × child 0–5	
90–100	3.558 (1.510)	−0.163 (0.131)	0.086 (0.032)	−0.006 (0.003)	0.024 (0.012)	−0.002 (0.001)	383,806
75–100	2.082 (0.758)	−0.080 (0.110)	0.062 (0.023)	−0.004 (0.003)	0.020 (0.008)	−0.001 (0.001)	951,365
50–75	0.678 (0.362)	−0.121 (0.096)	0.034 (0.015)	−0.003 (0.002)	0.010 (0.005)	−0.002 (0.001)	931,147
25–50	0.093 (0.491)	−0.008 (0.130)	0.039 (0.012)	−0.004 (0.002)	0.028 (0.007)	−0.002 (0.001)	906,721
0–25	−0.467 (0.452)	−0.023 (0.119)	0.021 (0.011)	−0.003 (0.001)	0.015 (0.008)	−0.001 (0.001)	880,705
Controls	Additional controls		Additional controls		Additional controls		

Notes: All estimations include city, decade × region fixed effects, and demographic controls: age, age squared, black dummy, married dummy, dummy for having a child 5 or younger, dummy for having a child 17 or younger. Additional controls are the following variables constructed for 1970 interacted with time dummies: share of workers in the agricultural sector, in the manufacturing sector, and in high skilled services sector, log of hourly wage of college graduate, share of women with a college degree, and LFP of college educated women. Errors are clustered at the city × decade level. Female hourly wage distribution is constructed by region.

Table 9 shows the specifications that allow the coefficient of our key explanatory variable to vary with having a young child at home. We group women into quartiles according to the wages. We find that mothers of young children, if anything, react marginally less to changes in low-skilled labor supply. Although many of the interactions are statistically significant, they are very small in magnitude. As we mentioned in Section IB, it was not clear *ex ante* if women with a young child should be more sensitive to the changes in low-skilled labor supply driven by immigration.

Our results for the top wage groups are consistent with a story where there are not huge differences by motherhood status in the likelihood of purchasing at least some kind of household services, where leisure is a normal good, and where the effect through increased participation in the labor market is small (as we effectively document in Table 8). Interestingly, we observe that the differences in the effects on labor supply outcomes across wage groups is maintained, suggesting that, in the case of the channel proposed in this paper, the effects of low-skilled immigration are heterogeneous between wage groups but mostly homogeneous within them.

Men as a Control Group.—It is not common practice in the literature to include both genders in the same specification, perhaps because their labor supplies are considered to behave very differently as economic conditions change.

However, in our case, we believe that using men as a control group is reasonable for a few reasons. First, we will be comparing men and women mostly on labor supply indicators at the intensive margin. Second, we will focus on groups of the

population at the top of the wage distribution (but not the very top), where arguably, men and women are likely to respond more similarly to economic incentives.

We use the following basic specification:

$$(4) \quad LS_{nit} = \delta^w \times \mathcal{L}_{it} + \delta_f^w \times \mathcal{L}_{it} \times female_{nit} + X'_{nit} \Lambda^w + female_{nit} \\ \times X'_{nit} \Lambda_f^w + \tau^w \times \text{Additional Controls}_{it} + \phi_i^w + \psi_{jt}^w + \varepsilon_{it}^w,$$

and a more comprehensive one in which we include city \times decade fixed effects, and thus cannot separately identify δ^w and τ^w . Note that although we condition the city and region \times decade fixed effects to have the same coefficients for men and women, we allow for some demographic characteristics, in particular, having a child five years old or younger, to affect labor supply differently by gender.

Using men as a control group allows us to address two important concerns with our empirical strategy. First, we are able to include city \times decade fixed effects and therefore control for potential unobserved determinants of the location choices of immigrants in 1970 that might still be relevant for labor supply decisions today—assuming they do not affect men and women differently.²⁹ Second, by controlling for the direct effect of \mathcal{L}_{it} in some specifications or by including city \times decade fixed effects in others, we control for alternative channels through which low-skilled immigrants affect the labor supply of skilled workers, for example, through complementarities in the production process.

Including men in our regressions presents important limitations, the main one being that our estimate of the labor supply effects of declining prices for household services should be considered a lower bound. Lower prices of household services might also change time-use decisions by men, both directly if they participate in household production and indirectly through interactions between the time-use decisions of men and women (Alexander Gelber 2008). This is particularly true if, as we argue, our source of variation affects the price and/or availability of services like laundry, dry cleaning, housekeeping, food preparation, etc., which are likely to be close substitutes of home production activities also performed by men, even if they are single.

Estimation of (4) for various labor market variables is presented in Table 10. All results confirm that high-skilled women have reacted more than comparable men to the inflow of low-skilled immigrants. In terms of magnitudes, panel A is the most directly comparable to our previous results, and suggests that at least one-fifth of the estimated labor supply effects of low-skilled immigration can be attributable to lower prices of household services. Acknowledging that men and women supply labor at different levels, in panel B, we use as the dependent variable the log of hours worked to estimate elasticities, and we obtain qualitatively very similar results.

To address the possibility that our interactions with the female dummy are not capturing the effects of lower prices of household services but another channel that

²⁹ In estimations not presented here, but available upon request, we include not only city \times decade fixed effects, but also the additional controls interacted with a female dummy to allow for systematic differences in cities to have differential effects on the labor supply of women. Results are very similar to those presented in Table 10.

TABLE 10—LOW-SKILLED IMMIGRATION AND THE LABOR SUPPLY OF WOMEN:
MEN AS A CONTROL GROUP (*IV estimations*)

Wage per hour percentile	Ln(LS skilled)	Ln(LS skilled) × Female	Ln(LS skilled) × Female	Observations
	(1)		(2)	
<i>Panel A. Usual hours $H > 0$</i>				
90–100	1.734 (0.784)	0.881 (0.210)	0.863 (0.210)	1,486,875
75–100	1.487 (0.616)	0.479 (0.106)	0.468 (0.105)	2,999,286
50–75	1.020 (0.426)	0.330 (0.083)	0.333 (0.083)	1,830,994
25–50	0.511 (0.403)	0.274 (0.082)	0.275 (0.082)	1,518,873
0–25	0.184 (0.376)	0.141 (0.129)	0.143 (0.129)	1,428,603
Controls	Additional controls		Basic	
City × decade FE	No		Yes	
	(3)		(4)	
<i>Panel B. Log(Usual hours $H > 0$)</i>				
90–100	0.068 (0.028)	0.044 (0.012)	0.043 (0.012)	1,486,875
75–100	0.048 (0.019)	0.022 (0.005)	0.021 (0.005)	2,999,286
50–75	0.021 (0.011)	0.011 (0.003)	0.011 (0.003)	1,830,994
25–50	−0.003 (0.013)	0.005 (0.002)	0.005 (0.002)	1,518,873
0–25	−0.010 (0.014)	0.000 (0.004)	0.000 (0.004)	1,428,603
Controls	Additional controls		Basic	
City × decade FE	No		Yes	
	(5)		(6)	
<i>Panel C. Log(Wage)</i>				
90–100	0.022 (0.026)	−0.016 (0.007)	−0.016 (0.007)	1,486,875
75–100	0.087 (0.027)	−0.009 (0.003)	−0.009 (0.003)	2,999,286
50–75	0.018 (0.007)	0.003 (0.001)	0.003 (0.001)	1,830,994
25–50	0.013 (0.007)	0.005 (0.001)	0.005 (0.001)	1,518,873
0–25	0.094 (0.033)	−0.005 (0.006)	−0.005 (0.006)	1,428,603
Controls	Additional controls		Basic	
City × decade FE	No		Yes	

Notes: Table reports the coefficient of $\ln[(\text{LS Imm} + \text{LS Nat})/\text{Labor Force}] = \ln[(\text{Low-skilled Immigrants} + \text{Low-skilled Natives})/\text{Labor Force}]$ interacted with female dummy. All estimations include city, decade × region fixed effects, and demographic controls: age, age squared, black dummy, married dummy, dummy for having a child 5 or younger, dummy for having a child 17 or younger. Additional controls are the following variables constructed for 1970 interacted with time dummies: share of workers in the agricultural sector, in the manufacturing sector, and in high skilled services sector, log of hourly wage of college graduate, share of women with a college degree, and LFP of college educated women. Errors are clustered at the city × decade level. Men are classified into wage categories based on female wage distribution.

also affects men and women differently (for example, low-skilled immigrants being better complements in production to high-skill labor, in particular, occupations where women tend to concentrate), we estimate equation (4) using as the dependent variable the log of hourly wage. As observed, if anything, women have received relatively lower wages compared to men in cities that have experienced large inflows of low-skilled immigrants.

Summarizing, low-skilled immigration has important effects on the labor supply decisions of women at the top of the wage distribution. Our coefficients suggest that the immigration wave of 1980 to 2000 increased by close to 20 minutes a week the amount of time women at the top quartile of the wage distribution devote to market work. At the very least, four of those minutes can be attributed to low-skilled immigrants reducing prices of household services. Low-skilled immigrants also have had a significant effect on the probability of working long hours. Women working in occupations that demand long hours have increased their probability of working more than 50 and 60 hours a week by 1.8 and 0.7 percentage points, respectively. This last result is also consistent with a situation where career concerns play a role in the labor supply decision of women at the top of the skill distribution, and low-skilled immigrants reduce the burden of opting for career paths with long work hours.

On the other hand, we find no evidence that low-skilled immigrants have increased the labor force participation of highly skilled women, defined as those working in high-wage occupations or who are very educated. Our results with respect to hours worked and labor force participation imply that the effect on total hours worked comes mostly from the effect on the intensive margin of the labor supply decision, in contrast to the results obtained where variation in wages (and taxes) and nonlabor income has previously been used.³⁰ Although the result might seem surprising, we believe it is not unreasonable. First, most of the labor supply literature that has found much larger responses of the labor supply of women at the participation margin than at the hours worked margin focus on low-income single mothers or on wives as secondary earners (see Emmanuel Saez 2002). Second, our sample is characterized by very high levels of participation (close to 90 percent), so we expect effects to happen mostly at the intensive margin. Third, the size of the variation in prices induced by immigration is relatively small, and it might not be enough to generate a transition from zero hours to a number significantly larger than zero (job opportunities with very low hours of work might not be available), but might be enough to affect the decision at the margin for women who are already working. Moreover, changes in p are not directly equivalent to changes in wages or nonlabor income, thus the total effect on labor supply might also differ because of this.

Time Devoted to Household Work.—In the previous section, we have found significant effects of low-skilled immigration on the labor supply of highly skilled women. Now we turn our attention to the study of the effects on household work. Unlike labor supply, the theoretical effect of a decrease in price of household services is to unambiguously decrease domestic work (conditional on the total demand

³⁰ See, for example, James J. Heckman (1993).

for household services at home represented by R in our model), at least for women who were already purchasing household services in the market.

To test if highly skilled women have reduced their time doing household work as a result of increases in low-skilled immigration, we use the following specification:

$$(5) \quad HW_{nit} = \pi \times \mathcal{L}_{it} + \nu \times \mathcal{L}_{it} \times Top_quartile_{nit} \\ + \mathbf{X}'_{nit}\Lambda_t + \phi_i + \psi_{jt} + \varepsilon_{ijt},$$

where HW_{nit} represents hours a week woman n spends doing household work in city i and year t ; and $Top_quartile_{nit}$ is a dummy variable for whether the wage of the wife or female head of the household is above the seventy-fifth percentile of the female wage distribution.

Note that because of the reduced number of observations, we cannot run the same regression for each wage group as we did with census data. Therefore, we estimate one regression and restrict the coefficients on individual characteristics and the city and decade \times region fixed effects to be equal for all groups. We do allow for the effect of low-skilled immigration to be different for women at the top of the wage distribution with the interaction term $\mathcal{L}_{it} \times Top_quartile_{nit}$. The fixed effects are the same as in equation (3).

Panel A in Table 11 presents the estimations of equation (5).³¹ To make the results of this section comparable to labor supply estimations using census data, we start by showing results when we use as the dependent variable *usual market hours worked per week* (panel A1). As observed, the sign and statistical significance of the key coefficients in the labor supply models are robust to a significantly more restrictive specification. The magnitudes, however, suggest smaller effects.

For the case of hours performing household work activities (panel A2), we find a negative and statistically significant interaction coefficient for women in the top quartile of the wage distribution. This group of women, as our previous results show, experienced the largest change in (the intensive margin of) labor supply. We find a positive, although not statistically significant, direct effect for all other groups. The magnitude of the interaction coefficients suggests that the low-skilled immigration flow of the period 1980–2000 reduced by seven minutes a week the time devoted to household work by women at the top quartile. Note that this number is between the increase in market work implied by the most flexible specification (20 minutes, Table 7) and the more restricted version (4 minutes, A1 in Table 11).

Consumption of Housekeeping Services.—Our simple framework also predicts that consumption of these market services should increase, in terms of units purchased, for all households that were already purchasing them. At the same time, the fraction of households that purchase these goods is also likely to increase. In this case, our data does not have direct information about the number of units purchased,

³¹ Similar results are obtained when we test for the interaction effect of immigration with top education level instead of top quartile (See Appendix Table A3). Note that when education is used, we can include all observations and not only those of working women.

TABLE 11—THE EFFECT OF LOW-SKILLED IMMIGRATION ON HOUSEHOLD WORK AND ON CONSUMPTION OF HOUSEKEEPING SERVICES OF WOMEN AT THE TOP OF THE WAGE DISTRIBUTION

Dependent variable	A1. Usual market hours worked per week (census)			A2. Hours per week spent doing household chores		
	OLS	IV	IV	OLS	IV	IV
<i>Panel A. Women's household work (1980 PSID and 2003–2005 ATUS data)</i>						
$\ln((\text{LS Imm.} + \text{LS Nat.})/\text{LF})$	−0.157 (0.142)	2.219 (0.658)	2.414 (0.695)	1.367 (0.882)	4.701 (3.286)	5.234 (3.398)
$\ln((\text{LS Imm.} + \text{LS Nat.})/\text{LF}) \times$ Top quartile	−0.149 (0.129)	0.398 (0.165)		−0.117 (0.351)	−0.739 (0.414)	
$\ln((\text{LS Imm.} + \text{LS Nat.})/\text{LF}) \times$ Top decile			0.877 (0.333)			−1.024 (0.707)
Dependent variable	B1. Dummy for expenditures > 0			B2. Level of expenditures (unconditional)		
	OLS	IV	IV	OLS	IV	IV
<i>Panel B. Consumption of housekeeping services (CEX data 1980–2000)</i>						
$\ln((\text{LS Imm.} + \text{LS Nat.})/\text{LF})$	−0.031 (0.011)	0.117 (0.082)	0.091 (0.077)	−5.0 (4.3)	−34.8 (19.5)	−39.1 (22.7)
$\ln((\text{LS Imm.} + \text{LS Nat.})/\text{LF}) \times$ Top quartile	0.015 (0.010)	0.028 (0.012)		12.2 (3.4)	13.5 (4.1)	
$\ln((\text{LS Imm.} + \text{LS Nat.})/\text{LF}) \times$ Top decile			0.011 (0.022)			20.7 (6.8)

Notes: Each column represents a separate regression. All estimations include city, decade \times region fixed effects, and demographic controls. Errors are clustered at the city \times decade level. Number of observations in A1 is 3,669,938 (census data), in A2 is 7,669, and in B1 and B2 is 7,577.

but we do have information on the number of dollars spent on a subset of these services (housekeeping services).³² We assume that all households that do not report any expenditures are not purchasing services in the market.

To test for the effects of low-skilled immigration on the consumption of household services, we estimate a specification identical to (5), using as outcomes two different “consumption” variables: a dummy variable for positive reported expenditures in housekeeping services, and the dollar amount spent on them. Both outcomes are constructed using CEX data.

We expect $\pi, \nu > 0$, 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 who are most likely to be close to the threshold. If the elasticity of demand for housekeeping services is greater than one, π and $(\pi + \nu)$ should also be positive in the regression where the dependent variable is the level of expenditures in housekeeping services.

Our empirical estimates are summarized in Table 11, panel B.³³ Panel B1 reports the estimation when the dependent variable is a dummy for positive expenditures

³² Unfortunately, the BLS changed the definition of child care services in the mid-1990s, so we cannot use expenditures in child care as our dependent variable.

³³ Similar results are obtained when we test for the interaction effect of immigration with top education level instead of top quartile (See panel B in Appendix Table A3). Note that when education is used we can include all observations and not only those of working women.

in housekeeping services, and panel B2 when the variable of interest is the level of expenditures in dollars. The magnitudes and signs of the coefficients suggest interesting patterns. The interaction with the dummy for wife or female head in the top quartile is positive in both panels, and statistically significant at the 5 percent level. We find no statistically significant effect for other quartiles. The magnitude of the coefficients suggests that the low-skilled immigration flow of the 1980s and 1990s increased by a city-average of half a percentage point the probability that households with a highly skilled wife/female head report positive expenditures in housekeeping services and by about \$2 per quarter the amount spent on the same services. Given that women at the top quartile reduced their time doing household work by about 84 minutes a quarter, \$2 seems a little low. However, we should keep in mind that expenditures on housekeeping services do not include expenditures on services such as gardening, grocery shopping or laundry, activities that were included in the computation on time spent doing household work. Thus, our results provide a lower bound for the effect of immigration on the purchases of services in the market.

IV. Concluding Remarks

This paper shows that low-skilled immigration into the United States can generate effects on the labor supply of natives that go beyond the standard analysis of the impact 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.

Using census data, we estimate that the low-skilled immigration wave of the 1980s and 1990s increased by about 20 minutes a week the time women at the top quartile of the wage distribution spent working in the market. The average increase hides important changes in the distribution of hours. We find no effect on the extensive margin and significant effects on the intensive margin. In particular, we find that low-skilled immigration has allowed highly skilled women to increase significantly their probability of working more than 50 and 60 hours. This result is important because many women in this group, for example, lawyers, physicians, and women with PhDs, work in fields where long hours are required to succeed.

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 this group devotes 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.

Given that our findings suggest that only women at the top of the skill distribution are being positively affected by the reduction in the prices of services that are substitutes for household production, we provide additional evidence that the effects of low-skilled immigration on the welfare of the native population are heterogeneously distributed, benefiting some groups more than others. In our particular case, we find that very highly skilled women seem to be able to choose labor supply profiles that they could not afford before.

Additionally, the fact that highly skilled 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 affect the decision.

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 very concentrated at the top of the skill distribution.

APPENDIX

A. A Time Use and Labor Supply Model

Let us consider the model outlined in Section I. In this simple model, an agent allocates her time between leisure, household production, and market work. She receives a wage w per unit of time devoted to market work.

There are two goods: a homogeneous consumption aggregate that can only be bought in the market (we normalize its price to 1); and a *household service*, of which exactly R units are required for the household to function. This service can be produced at home or bought in the market at a price p . Assume that there is only one working agent per household and normalize total time available to the agent to 1.

Recall that utility is given by

$$u(y) + \psi(l),$$

where y is the amount of the consumption good; l are the hours of leisure; and $u(\cdot)$ and $\psi(\cdot)$ are concave and satisfy $u'(y) \rightarrow \infty$ as $y \rightarrow 0$ and $\psi'(l) \rightarrow \infty$ as $l \rightarrow 0$. Household production is described by the function $f(h)$, where h are the total hours devoted to household work, which we assume to have decreasing marginal returns to time spent working at home and to satisfy $f'(h) \rightarrow \infty$ as $h \rightarrow 0$. This condition implies that a person will never outsource all of their household work. Finally, denote by n the hours of market work, x the units of the household service purchased on the market, and I the nonwage income of the household.

Optimization Problem.—The agent's optimization problem is

$$(P1) \quad \max u(y) + \psi(l)$$

subject to

$$[\lambda] \quad x + f(h) = R$$

$$[\mu] \quad I + wn = px + y$$

$$[\phi] \quad n + h + l = 1$$

$$n \geq 0, \quad x \geq 0;$$

where λ , μ , and ϕ are the lagrange multipliers on the household services, budget, and time constraints, respectively.

The first-order conditions are

$$(6a) \quad u'(y) - \mu = 0$$

$$(6b) \quad \psi'(l) - \phi = 0$$

$$(6c) \quad \lambda f'(h) - \phi = 0$$

$$(6d) \quad \lambda - \mu p \leq 0$$

$$(6e) \quad \mu w - \phi \leq 0,$$

where the last two first-order conditions hold with equality when the nonnegativity constraints on x and n do not bind.

B. Solution

The agent's wage and unearned income and the price of the market services are the elements that determine whether a woman (or a household) supplies labor in the market and/or purchases some of the household services from market providers rather than producing them at home. As expected, women with a higher alternative cost of time, which equals the wage for those who work, also will be the ones (more likely) to purchase household services in the market. In our simple setup there are four possible situations depending on whether the agent works in the market and/or purchases household services. We show the conditions under which each case would be observed.

CASE 1: Agent works in the market but does not purchase household services ($x^ = 0, n^* > 0$): Using the first order conditions we can show that this case happens if*

$$(B1) \quad f'(\bar{h}) > \frac{w}{p} \quad \text{and} \quad w > \frac{\psi'(1 - \bar{h})}{u'(l)},$$

where \bar{h} is the solution to $f(\bar{h}) = R$. In words, the market wage is so low that it is more efficient for the agent to produce all of the household good herself (even in the presence of decreasing marginal returns) than to work in the market and use her wage to purchase the service. Also, her unearned income is low enough that she needs to work in order to be able to consume some units of good y . The optimal level of n^* can be obtained from

$$(B2) \quad wu'(I + wn^*) = \psi'(1 - n^* - \bar{h}).$$

From the equation above it is easy to see that for agents in this group changes in the market price of the household services will not affect their time use decisions as long as (B1) still holds. Note also that, as in most time use models, higher unearned income is associated with fewer hours worked in the market.

CASE 2: Agent does not work in the market and does not purchase household services ($x^ = 0, n^* = 0$): The wage and unearned income of agents in this group satisfy the following inequality:*

$$(B3) \quad w < \frac{\psi'(1 - \bar{h})}{u'(I)} < pf'(\bar{h}).$$

The first inequality implies that the wage is not high enough to compensate for the cost of foregone leisure in terms of the gain in extra units of consumption good. This inequality is likely to hold the lower the wage and the higher the unearned income. However, unearned income cannot be too high, or the second inequality will not hold. The second inequality guarantees that the agent does not buy market services; services are too expensive given the current rate at which time could be traded for goods bought in the market. Note that in this case, as in the previous one, changes in the price of the market household do not affect the labor supply decision and the hours worked in household production as long as (B3) still holds.

CASE 3: Agent purchases household services but does not work in the market ($x^ > 0, n^* = 0$): In this case the wage is low enough such that the first inequality in equation (B3) holds, but the agent has sufficient unearned income to buy enough of good y and to pay for household services in order to enjoy more leisure. How much time spent in household production (h^*) will be given by the following equation:*

$$(B4) \quad \frac{\psi'(1 - h^*)}{f'(h^*)} = pu'(I - p(R - f(h^*))).$$

We can differentiate equation (B4) to show that h is increasing in p . Using the optimal h , we can then obtain y and x , and rewrite the condition for w as

$$(B5) \quad w < \frac{\psi'(1 - h^*)}{u'(I - p(R - f(h^*)))} = pf'(h^*).$$

CASE 4: *Agent purchases household services and works in the market* ($x^* > 0$, $n^* > 0$): *Agents in this group have high enough wages such that*

$$f'(\bar{h}) < \frac{w}{p},$$

and will choose h^* such that

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

Household work is thus increasing in p and decreasing in w . Given its inverse relation with h , the quantity of household goods purchased in the market, x , is decreasing in p and increasing in w . We can then obtain the labor supply, n^* , using

$$(B6) \quad u'(I - p(R - f(h^*)) + wn^*)w = \psi'(1 - h^* - n^*).$$

Notice that the hours of market work will depend on the price of household services; how exactly will be discussed in the next section. Finally, we obtain the demand for consumption goods using the budget constraint

$$y^* = I + wn^* - p(R - f(h^*)).$$

Four important results arise from the solution of the model. First, people with higher wages (for a given level of I and p) supply labor in the market. Second, for a given w and I , a decrease in p might induce a person to purchase market-provided household services, or to purchase even more. Third, for a given p and I , people with higher wages are more likely to buy household services. Finally, only those who purchase services will change their decisions at the margin when p changes.

C. Household Composition: Children at Home

In our simple model, “participation” in the market for household services, i.e., the decision of whether to buy services from the market, is nondecreasing in the total amount of services needed for the home. To see this we can look at cases we described in the previous section. When the agent does not supply labor in the market and does not purchase market services the conditions in (B3) hold. The right-most condition is the one that relates to the decision to purchase goods; it states that at the price p the cost of purchasing a unit of services in the market is higher than the cost at which the unit can be produced at home giving up one hour of leisure. In this case, an increase in R has two effects. First, it increases the value of leisure, and, second, it reduces the marginal productivity of time devoted to household production. For a sufficiently large increase in R , the inequality is overturned, and the agent finds it cheaper to purchase some household services in the market.

In the case where the agent does work in the market and does all the household work without help, the condition in equation (B1) holds. In this case, w reflects the value of time, and an increase in R implies that more hours of work at home

are needed; consequently the marginal productivity goes down, $f'(\bar{h})$. At the same time the agent will reduce her labor supply n^* , accommodating the larger number of hours of household work she performs. At the end, the agent might find it convenient to purchase services in the market for a given w and p when R is sufficiently large, or to stop participating in the labor market. Similarly, when the woman does not work in the market, but does outsource part of the household work, a larger R implies more purchases of household services.

Finally, for agents working in the market and purchasing household services (Case 4), women with a higher R outsource more units of the household service and work more hours in the labor market. The reason is that in this case, the optimal number of hours of home production, h^* , is independent of R , so the agent will have to pay for the extra units of household work by *increasing* labor supply and *reducing* consumption of the homogeneous good.³⁴

Summarizing, compared to otherwise identical women, mothers of young children are more likely to buy market provided household services. Also, conditional on purchasing household services, mothers buy more units of the household service than nonmothers.

D. Career Concerns and Women in Occupations with Long Hours

While career concerns reflect dynamic gains, we can gain some intuition for this case if we introduce a small modification to our model. Assume that a woman does not face a single market wage w , but rather she is offered the following contract:

$$\text{if } n \geq \underline{n} \rightarrow w^h \text{ per hour}$$

$$\text{if } n < \underline{n} \rightarrow w_l \text{ per hour,}$$

with $w^h > w_l$. Consider the case of a woman who would choose $n^* < \underline{n}$ with the wage w_l . In this case, the woman faces the decision of whether to take high wage with long hours (probably working \underline{n} hours), which will require purchasing more household services in the market, or the job with the shorter hours, which gives a lower wage but allows her to avoid purchasing a large number of units of household services. A reduction in p will increase both the utility of working short hours and working long hours. However, this reduction in p will increase more the utility of working long hours, as that position implies a larger share of household services in the consumption basket, and also increases the wage net of the cost of household services for the extra hours. Thus, when career concerns are relevant for women at the top of the skill distribution, we may observe a larger reaction than that predicted if we were to consider only the pure labor supply effect, i.e., the one we derived for a given w . The positive reaction to a lower p should be particularly large at the top of the distribution of hours worked.

³⁴ We can see this if we differentiate equation (B6) with respect to R , and then use the fact that h^* is not a function of R in this case.

E. Additional Tables

TABLE A1—LOW-SKILLED IMMIGRATION AND THE LABOR SUPPLY OF WOMEN AT THE TOP QUARTILE OF THE WAGE DISTRIBUTION (*Robustness checks—IV estimation*)

	Dependent variable			Observations
	Usual hours	<i>P</i>	<i>P</i>	
	<i>H</i> > 0	(Hours>=50)	(Hours>=60)	
Baseline	2.375 (0.735)	0.093 (0.026)	0.036 (0.011)	951,365
Standard errors clustered at city level	2.375 (0.984)	0.093 (0.037)	0.036 (0.015)	951,365
Excludes California	2.032 (0.666)	0.092 (0.022)	0.035 (0.010)	829,116
Excludes New York City, Los Angeles, and Miami	2.513 (0.958)	0.084 (0.032)	0.028 (0.011)	837,524
Nonmover sample	2.005 (0.725)	0.057 (0.170)	0.018 (0.008)	463,589

Notes: Nonmover sample is restricted to women who reported that five years ago they were living in the same house or same county. Table reports the coefficient of Log (low-skilled immigrants + low-skilled natives/labor force). Each number comes from a different regression. All estimations include city, decade × region fixed effects, and demographic controls: age, age squared, black dummy, married dummy, dummy for having a child 5 or younger, and dummy for having a child 17 or younger. Errors are clustered at the city × decade level unless otherwise specified. Female Hourly Wage distribution is constructed by region.

TABLE A2—LOW-SKILLED IMMIGRATION AND THE LABOR SUPPLY OF WOMEN BY EDUCATION GROUP (*IV estimations*)

Education level	Dependent variable					Observations
	Usual hours	LFP	Usual hours	<i>P</i>	<i>P</i>	
			<i>H</i> > 0	(Hours>=50)	(Hours>=60)	
Graduate education	0.639 (0.634)	−0.064 (0.025)	3.081 (1.031)	0.084 (0.033)	0.036 (0.016)	381,401
Professionals and PhDs	4.354 (1.906)	−0.032 (0.027)	6.644 (2.209)	0.171 (0.060)	0.058 (0.032)	95,243
Master’s degree	0.014 (0.799)	−0.065 (0.028)	2.227 (0.855)	0.066 (0.029)	0.032 (0.015)	286,158
College graduates	−1.160 (0.708)	−0.112 (0.035)	2.192 (0.674)	0.112 (0.029)	0.047 (0.012)	756,040
Some college	−1.361 (0.751)	−0.094 (0.029)	1.035 (0.425)	0.018 (0.007)	0.008 (0.004)	1,550,904
HS grad less	−4.382 (1.668)	−0.138 (0.043)	0.439 (0.401)	0.000 (0.004)	0.003 (0.002)	2,484,416

Notes: Table reports the coefficient of $\ln[(\text{LS Imm} + \text{LS Nat})/\text{Labor Force}] = \ln[(\text{Low-skilled Immigrants} + \text{Low-skilled Natives})/\text{Labor Force}]$. Each number comes from a different regression. All estimations include city, decade × region fixed effects, and demographic controls: age, age squared, black dummy, married dummy, dummy for having a child 5 or younger, and dummy for having a child 17 or younger. Errors are clustered at the city × decade level unless otherwise specified.

TABLE A3—LOW-SKILLED IMMIGRATION, HOUSEHOLD WORK, AND CONSUMPTION OF HOUSEKEEPING SERVICES OF WOMEN: BY EDUCATION LEVELS

	Dependent variable					
	A1. Usual market hours worked per week (census)			A2. Hours per week spent doing household chores		
	OLS	IV	IV	OLS	IV	IV
<i>Panel A. Women's household work (1980 PSID and 2003–2005 ATUS Data)</i>						
$\ln((\text{LS Imm.} + \text{LS Nat.})/\text{LF})$	−1.009 (0.178)	−2.184 (0.885)	−1.275 (0.753)	3.745 (1.400)	15.651 (4.173)	15.639 (4.156)
$\ln((\text{LS Imm.} + \text{LS Nat.})/\text{LF}) \times$ College or more	0.452 (0.210)	0.944 (0.259)		−0.731 (0.362)	−1.137 (0.402)	
$\ln((\text{LS Imm.} + \text{LS Nat.})/\text{LF}) \times$ Graduate education			0.424 (0.222)			−1.783 (0.566)
	Dependent variable					
	B1. Dummy for expenditures > 0			B2. Level of expenditures (unconditional)		
	OLS	IV	IV	OLS	IV	IV
<i>Panel B. Consumption of housekeeping services (CEX data 1980–2000)</i>						
$\ln((\text{LS Imm.} + \text{LS Nat.})/\text{LF})$	−0.033 (0.011)	0.021 (0.041)	0.039 (0.043)	−19.161 (7.534)	−31.606 (22.558)	−19.796 (20.167)
$\ln((\text{LS Imm.} + \text{LS Nat.})/\text{LF}) \times$ College or more	0.022 (0.007)	0.027 (0.009)		20.890 (5.760)	20.675 (6.477)	
$\ln((\text{LS Imm.} + \text{LS Nat.})/\text{LF}) \times$ Graduate education			0.027 (0.017)			26.244 (10.342)

Notes: Each column represents a separate regression. All estimations include city, decade \times region fixed effects, and demographic controls. Errors are clustered at the city \times decade level. Number of observations in A1 is 5,170,617, in A2 is 11,828, and in B1 and B2 is 13,142.

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