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Spillovers from High-Skill Consumption to Low-Skill Labor Markets

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ABSTRACT

Spillovers from High-Skill Consumption to Low-Skill Labor Markets*

Census data show that since 1980 low-skill workers in the United States have been increasingly employed in the provision of non-tradeable time-intensive services – such as food preparation and cleaning – that can be broadly thought as substitutes of home production activities. Meanwhile the wage gap between this sector and the rest of the economy has shrunk. If skilled workers, with their high opportunity cost of time, demand more of these time-intensive services, then wage gains at the top of the wage distribution (such as those observed in the last three decades) are expected to raise the consumption of these services, consistent with these stylized facts. Using both consumption expenditure data and city-level data on employment and wages of workers of different skills, we provide several pieces of evidence in favor of these demand shifts, and we argue that they provide a viable explanation for the growth in wages at the bottom quantiles observed in the last fifteen years.

JEL Classification: J21, J22, J23, J31

Keywords: service jobs, market substitutes for home production, low-skill employment and wages, wage growth polarization

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I. Introduction

Many influential papers have documented a large and ubiquitous widening of the U.S. wage distribution in the 1980s (Bound and Johnson, 1992; Katz and Murphy 1992; Juhn, Murphy and Pierce, 1993). Early consensus was that this phenomenon reflected a secular rise in the demand for skills attributable to skill-biased technological change (SBTC).[1] As documented in Autor, Katz and Kearney (2006, 2007), wage inequality has continued to increase in the last fifteen years, this time in an asymmetric way: as in the past, wage growth has been the fastest for top earners, while—in stark contrast with previous trends—it has been higher (or at least not lower) at the bottom than in the middle of the wage distribution. Over the same period, employment shares in both the highest and lowest skill occupations increased, while employment shares in middling occupations contracted. The recent improvements in relative wages and employment of the least-skilled are hard to reconcile with a simple SBTC model.

Autor, Katz and Kearney (2006, 2007) argue that wage and employment growth polarization is consistent with a more nuanced form of technological change, that is a model in which information technology can only replace human labor routine tasks (Autor, Levy and Murnane, 2003; ALM henceforth). Because jobs that can be routinized are not distributed uniformly across the wage distribution (Goos and Manning, 2007), the secularly declining price of computer capital has non-monotone impacts on the demand for skill throughout the earnings distribution: it raises demand for the non-routine abstract tasks that are used by educated professionals and managers (and that are complementary to technology), while it lowers demand for the routine tasks that tend to be performed by moderately skilled workers. Even if technology has no direct impact on the non-routine manual tasks performed by low-skill workers, computerization might cause these tasks to grow as a share of labor input because of general equilibrium effects (Baumol, 1967).[2] The implicit

[1] See Katz and Autor (1999) and Acemoglu (2002) for reviews of the large literature on the causes of wage inequality; Krueger (1993) and Berman, Bound and Griliches (1994) for more details on the SBTC hypothesis and Card and DiNardo (2002) for a discussion of problems and puzzles associated with this hypothesis.

[2] Goos and Manning (2007) show that the ALM "routinization" hypothesis is a good explanation for the phenomenon of "job polarization" observed in the United Kingdom since

assumption in this framework is that the economy produces only one aggregate output using different types of labor that have varying degrees of substitutability/complementarity with computer capital. Under this assumption, improvements in technology induce changes in the relative demand for different labor inputs.

Census data, however, suggest that the manual tasks performed by unskilled individuals in the United States, besides being complements in production in industries where skilled individuals are also employed, can be reasonably modeled as the primary labor input in a sector that includes time-intensive services like food preparation, cleaning, repair and delivery, which can be broadly defined as market-substitutes for home production activities. Skilled workers (with their high opportunity cost of time) are expected to be net buyers of these services. Consumer expenditure data show that, consistent with this prediction, consumption of these services, as a fraction of total expenditure, increases in an individual's wage rate. These facts suggest that wage gains for skilled workers (and the rise they induce in the demand for outsourced home production activities) might affect low-skill labor markets through "consumption spillovers." If so, the steady wage growth experienced by workers at the top of the wage distribution in the last three decades (due to some form of skill-biased technological progress, among other forces[3]) would explain some of the increase in the relative demand for unskilled work.

This paper investigates the claim that the employment and earnings opportunities of unskilled workers in the United States depend on the consumption choices of skilled workers through their demand of outsourced home production activities ("home services"). Given that these services cannot be traded outside of a local market, the predictions of our "consumption hypothesis" need to be tested on city-level data.

We find that a higher share of college graduates in the workforce of a city is associated with a higher fraction of low-skill workers employed in home services. The

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1975. Spitz-Oener (2006) applies and develops the ALM hypothesis in her study of the process of job polarization in Germany since 1979.

[3] There is mounting evidence that the growth in wage inequality is increasingly concentrated at the top of the wage distribution (Autor, Katz and Kearney, 2006; Lemieux, 2006b), and that there is a marked increase in the convexity of the relationship between earnings and schooling (Mincer, 1998). Besides technology, the literature has been exploring other explanations for this phenomenon (Piketty and Saez, 2003) and ways to model it (Dechênes, 2006; Lemieux, 2006a).

result holds when using the presence of a land grant institution as an instrument for the supply of college graduates (Moretti, 2004b). While this finding is consistent with the consumption effects we hypothesize, it is not peculiar to (and potentially contradictory to) explanations for the link between concentration of human capital in a city and (low-skill) labor outcomes based on production complementarities and (within-sector) human capital externalities. To the extent that skilled and unskilled workers are complements in production, then a higher share of college graduates in the workforce of a city should be associated with higher productivity of unskilled workers. If there are human capital spillovers, then the productivity of unskilled workers would be expected to be even higher (Moretti 2004a, 2004b). Assuming that spillovers are stronger within sectors, both production complementarities and human capital spillovers predict that uneducated workers should be more productive (and more likely to be employed) in those industries where the skilled workers are also more likely to be employed. On the contrary, outsourced home production activities are documented to be the sector with the lowest concentration of skilled workers.

Manning (2004) previously emphasized the dependence of unskilled employment opportunities to physical proximity of skilled workers. His analysis, as ours, is motivated by the idea that skilled workers should be more likely to buying-in service time in order to free themselves from home production tasks. His empirical investigation focuses on the positive association between presence of skilled workers in a city and concentration of unskilled work in the general set of non-traded activities. We instead separate services that can be thought as substitutes for home production activities (e.g. personal and household services) from other non-traded activities (e.g. retail trade and health services), and find a positive association between a city college share and the employment share of unskilled work in the former set of services, but not in the latter. This result separates the "consumption hypothesis" from a model in which employment shifts among unskilled workers reflect general spillovers into non-tradeable sectors, arising from the fact that higher skilled workers have more income to spend on locally produced non-traded goods.

We also estimate the relationship across cities between relative wage growth at the top of the wage distribution and relative wage growth at the bottom (both with respect to the growth at the median) over the period 1980-2005. The consumption hypothesis predicts that where and when wage growth is the highest for high-skilled workers, the demand for market substitutes of home production activities should increase the most,

exerting an upward pressure on the wages of the workers—predominantly low-skilled—that deliver these services. Consistent with this view, we find that the association between relative wage growth at the top and relative wage growth at the bottom of a city wage distribution is larger in cities with a larger proportion of low-skilled workers employed in outsourced home production activities in a base year. Consider two cities that both experience a 10 percent relative wage growth at the top, but have a one-standard deviation difference (6 percentage points) in the share of low-wage earners employed in home services. The city with the higher share of low-skill workers employed in home services is estimated to experience faster relative wage growth at the bottom by 1.32 points. The strength of the association between wage growth at the two tails of a city wage distribution, on the contrary, does not vary with the share of college graduates in the workforce of the city. We take this as evidence that neither complementarities in production between labor inputs nor human capital externalities have an effect on unskilled wage growth similar to the one that our story generates.

Based on these pieces of evidence, we argue that the proposed consumption-driven explanation for low-skill labor outcomes contributes to the recent debate in the literature on wage inequality. Given a secular rise in the demand for the cognitive and interpersonal tasks performed by highly educated wage-earners, this approach uncover an explanation for the recent twisting in wage growth at the bottom of the distribution that is complementary with those based on the non-monotone impact of technological progress.[4] The idea is simple: the large wage gains experienced by top earners in the last three decades, and the induced rise in their opportunity cost of time, increased the demand for low-skill workers performing time-intensive services that represent market substitutes for home production activities. In favor of this kind of demand shifts is evidence of positively correlated quantity and price changes in low-skill labor markets. Between 1980 and 2005 the share of U.S. wage earners in the lowest tenth percentile of the wage distribution who are employed in home services has increased by forty percent, from 23 to 31 percent. Over the same period, the (negative) wage gap between home services and other sectors has shrunk by as much as thirty percent.

[4] Cleaning, restaurant work and the other low-skill jobs that are the focus of this paper all involve tasks that machines cannot (yet) perform, so that they represent a subset of those jobs that are expected to absorb an increasing share of labor input because technology has little impact on them (Baumol, 1967).

Because the explanatory power of consumption spillovers from skilled to unskilled wage growth mechanically increases in the share of unskilled work employed in home services, and because this share has been growing over time, consumption spillovers have the appealing feature to offer a simple explanation for why relative wage growth at the bottom of the wage distribution might arise with some lag with respect to relative wage growth at the top. On the contrary, explanations based exclusively on the impact of technological change are consistent with the phenomenon of wage growth polarization observed in the last 15 years only if the effects of technological progress on the relative demand for skill are assumed to have changed over time, from monotone in the 1980s to non-monotone in the 1990s.

II. The market of home services

The objective of this section is to illustrate and test the main intuition of the "consumption hypothesis" put forward in this paper: the notion that consumers and providers in the market of housework services belong to different skill groups.

Consider an economy with two sectors (a production and a "housework" sector) and two types of workers ("skilled" or "unskilled"). In the production sector, firms produce a composite good y using a technology in both skilled and unskilled labor. The housework sector includes time-intensive services x (such as cooking and cleaning the house) that the individual can either produce domestically (using her own time), or purchase in the market (by buying-in someone else's time). As long as skilled workers have a comparative advantage at producing y, then they are net buyers of housework services, while unskilled workers are net sellers. This result follows from the standard theory of home production and allocation of time, as pioneered by Mincer (1963) and Becker (1965) and formalized by Gronau (1977). If the value that the individual places on her time equals the wage rate, then skilled workers are predicted to do less home production than unskilled workers, and consume more market substitutes for home production activities.

In what follows we test the prediction that consumers of services that substitute for home production activities are disproportionately high-skill workers, while providers are predominantly low-skill workers.

A. The consumers of home services

Data

The Consumer Expenditure Survey (CEX) is currently the only micro-level data reporting comprehensive measures of consumption expenditures for large cross-sections of households in the United States.[5] It consists of two independent nationally representative surveys, one based on retrospective interviews about expenditures in the previous twelve months (the Interview Survey, IS thereafter) and one based on weekly diaries (the Diary Survey, DS). In this paper we use data drawn from the DS samples, because weekly record keeping should more accurately account for the kind of expenditures that we want to measure: Services that are substitutes for home production activities are likely to constitute small and frequent purchases, difficult to recall over longer periods of time. Some of them (e.g. housekeeping and personal care services) are indeed exclusively surveyed in the DS.

In the DS, households self-report their purchases over two consecutive one-week periods. The survey also includes information on household characteristics (e.g. family size and composition) and numerous characteristics for each member (e.g., age, gender, relationship to the reference person, education, employment and wage income in the twelve months before the interview).

For each household we calculate both a measure of monthly total expenditure[6], and a measure of expenditure in goods and services that substitute for home production activities. The latter measure includes purchases of food and drinks away from home; repair and maintenance, delivery, babysitting, housekeeping and personal care services. Table A1 provides details on the way in which specific consumption items are mapped into these categories. We investigate the correlation between the household's budget share in home services and the head's education and hourly wage. Given that the standard theory of home production and allocation of time applies to one-person households, to shed light on the potential differences across family types, we also run separate analyses for (i) husband/wife families where only the head

[5] The CEX is collected by the Bureau of Labor Statistics mainly to compute weights for the Consumer Price Index (CPI), but it has also been used for studying the evolution of consumption inequality (Cutler and Katz, 1991; Attanasio and Davis, 1996; Krueger and Perri, 2003; Attanasio, 2003; Battistin, 2003; Attanasio, Battistin, Ichimura, 2004).

[6] Monthly expenditures are defined as 2.16 times the expenditures observed over two weeks (or, for the small fraction of households that only fill one weekly diary, 4.33 the expenditure observed over one week).

works, (ii) husband/wife families where both spouses work, and (iii) other households (which are predominantly single-adult families).

Stylized facts

We report findings from an analysis of the 1996 and 2004 Diary Surveys.[7] We focus on households headed by individuals at least 18 and no more than 65 who worked for salary in the twelve months before the interview. The family head is conventionally fixed to be the male in all husband/wife families.

Figure 1 plots expenditures in home services as a fraction of household total expenditures, by year and education of the head. Both in 1996 and in 2004, the household budget share of home services monotonically increases with the education attainment of the head. In 1996, for example, home services represented 9 percent of the total expenditures of households headed by high-school dropouts, but 14 percent of those of households headed by college graduates.[8] Figure 2 shows how the relationship between the budget share of interest and the head's educational level varies across family types. As expected, our model applies better to single-adult families:[9] Even if the budget share of home services increases with the education of the head for any family type, differences across educational groups are more marked in single-adult families.

We also study whether consumption of those services that are market substitutes for the output of home production is positively correlated with hourly wages.[10] Figure 3 plots the fitted values from Ordinary Least Squares (OLS) regressions of the household budget share of home services on the head's log hourly wage, separately for 1996 and 2004. The estimated coefficients are reported in column 1 of Table 1. We find evidence of a statistically significant positive relationship, virtually stable over time. The table also reports estimated coefficients from regressions separately run for different family types (columns 2 through 5). In 1996, a ten percent increase in the head's hourly wage is associated with a 0.1 percentage point increase in the budget share of home services in both husband/wife families where the woman does

[7] Yearly diary surveys are available since 1990. Two earlier years (1980 and 1981) are also available, but these surveys do not separately identify items of interest such as housekeeping or babysitting services.

[8] The figure also shows the contribution of specific consumption categories of home services. In both years, the largest component is represented by meals at restaurants or cafés.

[9] In a husband/wife household each member's allocation of time stems from a bargaining process that might result in some degree of specialization.

[10] Hourly wages are calculated as annual earnings divided by annual hours of work, and this precludes a separate analysis of the labor supply decision.

not work (column 2) and in other single-earner families (column 5). The association between head's hourly wage and budget share is instead not statistically different from zero in husband/wife families where the woman does work (column 3). For these families, however, the relationship between budget share of home services and the woman's wage is positive (column 4), suggesting that when the woman works, the opportunity cost of home production time is more closely tied to her wage than the male's wage.

The stylized facts presented so far support the view that, as predicted by standard economic theory, consumption of goods that substitute for home production activities increases in the opportunity cost of time. We also calculate earned income elasticities of the consumption of home services. Table 2 reports the estimated coefficients from regressions of the logarithm of household expenditures in home services on the logarithm of total household income from wages. In 1996 and 2004, a 1 percent increase in household wage income is associated respectively with a .45 and a .42 percent increase in expenditures in home services (column 1). The estimation is also separately run for households from each fourth of the wage income distribution (columns 2 through 5). The income elasticity of consumption of home services is estimated to be substantially higher for households in the higher portion of the distribution. This finding shows that consumption of home services does not level off beyond a certain earnings threshold, but it is instead particularly responsive to income increases among higher wage-income groups. Importantly, this finding is robust to the following specification check. Given that in this exercise we use current income as a proxy for permanent income, some of the differences across income groups may arise from the fact that current income proxies permanent income differently for different income groups. Restricting the sample to include only households headed by workers who are at least 35 years old should mitigate this problem, as current income is expected to be a better proxy for permanent income in this "older" group. As shown in Table 2, also in this sample is the income elasticity of consumption of home services substantially higher for higher income groups.

B. The providers of home services

To evaluate the skills of the providers of home services, we use data drawn from the IPUMS extracts of the 1980, 1990 and 2000 decennial censuses and the 2005 American Community Survey (Ruggles et al., 2004). We define skills either in terms

of educational achievement (high-school drop-outs, high-school graduates, individuals with some college education but no degree, and college graduates) or of relative position in the wage distribution (wage-earners at different percentiles of the wage distribution). We use either industry of work or occupation to identify those service jobs that substitute for home production.

Table A2 (in Appendix) provides details on the mapping between industrial classification and nine categories of employment. "Home service" jobs include personal services, repair, entertainment, protective, cleaning and child care services. All of these services cannot be traded outside of the local labor market. Given the relevance of the distinction between traded and non-traded jobs in the later analyses of local labor markets, we also separately identify the following categories of jobs: other clearly non-traded jobs (e.g., retail trade, except eating and drinking places that belong to the first group; health and social services); clearly traded jobs (agriculture, mining and manufacturing); construction; wholesale, transport and utilities; financial services; business services; public administration; and education.[11]

Table A3 provides details on the occupational classification. Home services include private household, food preparation, cleaning, and personal service occupations. Other non-tradeable jobs include sales and health service occupations.

Table 3 and Table 4 report employment shares in different sectors/occupations by education and wage percentile, respectively.[12] There are substantial differences in the employment distributions by skill groups in any year, and differences have grown over time. Employment in clearly traded sectors has declined for all skill levels between 1980 and 2005. However, while among those who have not completed high school, there has been a pronounced shift towards home services but not towards other clearly non-traded activities, among more educated groups there has been as

[11] The basic criterion of assignment of non-traded status consists in whether the producer of a good or service has to be located in physical proximity to the consumer for the job to be done. In some cases there is considerable ambiguity in applying the criterion of physical proximity. For instance, many financial and business services are increasingly performed and delivered electronically. While residential construction jobs surely satisfy the proximity requirement, some other construction jobs (e.g., production plants, infrastructures) may fail the proximity requirement, because those financing, or ultimately using the construction projects, are not necessarily local residents. See Manning (2004) for a discussion of more issues related to assigning non-traded status to different industries.

[12] The analysis is restricted to respondents aged 16 through 65 who were employed in the civilian labor force at the time of the survey, were not unpaid family workers, and did not live in group quarters. For consistency with later analyses, the sample is also restricted to respondents who resided in census-defined metropolitan areas.

well some growth in non-traded activities other than home services. Peculiar to the workforce with a college degree is a large shift towards financial and business services. As shown in Table 4, occupational differences across skill groups are found to grow even more markedly over time when skills are identified by a worker's relative position in the wage distribution. Between 1980 and 2005 the fraction of U.S. wage earners in the lowest tenth percentile of the wage distribution employed in home services increased from 23 to 31 percent, while the fraction employed in business and financial services remained approximately 8 percent. Over the same period, the fraction of U.S. wage earners in the highest tenth percentile of the wage distribution employed in home services was stable at 3 percent, while the fraction employed in business and financial services increased from 8 to 32 percent.

Figure 4 shows the educational distribution of the workforce in different sectors as of 2000. Home services are the sector with the highest concentration of workers without a high school degree (28 percent of the workforce) and the lowest concentration of college graduates (12 percent). Only the workforce in the construction sector has a similar skill composition (25 percent are high school dropouts and 10 percent are college graduates), while in other sectors high-school dropouts are heavily underrepresented and college graduates overrepresented.

Figure 5 shows that home services, together with traded and construction sectors, employ a higher-than-average share of immigrants. Whereas immigrants represented 16 percent of the total labor force in 2000, they represented around 23 percent of the workers in home services. Not surprisingly, the low-skilled immigrants' share in these services is particularly large (equal to 10 percent, that is two times larger than their share in the total labor force).

Table 5 reports different statistics (mean, median, 10^{th} percentile and 90^{th} percentile) for hourly wages by education and sector from 1980 to 2005. The last two columns report the gap (defined as the ratio) between hourly wages paid in home services and other sectors, at the beginning and the end of the period respectively. For the entire period and for all educational levels, wages in home services are lower than wages in other sectors. This evidence is consistent regardless of the summary statistic we look at, and confirm the well-known fact that home services are traditionally low-paid jobs. The wage gap, however, has shrunk significantly among low-educated workers (that is, the group that experienced the largest employment shift into home services) while it has remained stable or expanded in other groups. The positive

correlation between wage and employment changes points to the importance of demand shifts.

III. Cross-city analysis: The relationship between college share and low-skill employment distribution by sectors

To this point we have shown that consumers and providers in the market of services that substitute for home production activities tend to belong to different skill groups: consumers are disproportionately high-skill workers, while providers are disproportionately low-skill workers. We have also shown that this sector absorbs an increasing share of the unskilled workforce in the United States, and that unskilled workers in this sector earn wages that have been growing relative to the wages paid in the rest of the economy. These stylized facts are consistent with the existence of demand shifts for unskilled work stemming from a rise in the consumption of home services, such as the one we would expect among skilled workers in response to the wage gains they experienced in the last three decades.

Because of the non-tradeable nature of home services, demand forces in this sector can be better studied on city-level data. This is the focus of the remainder of the paper. In this section we derive and test for a cross-sectional prediction arising from consumption spillovers: the relationship between the share of skilled workers in a local labor market (a "city") and the fraction of unskilled workers employed in home services should be positive, because a higher share of skilled workers should shift the composition of aggregate demand in the city towards home services.

C. Theoretical framework

To illustrate this point, we follow Manning (2004) and consider an economy where individuals are assumed to be equally productive at producing the composite "home" good x (including, for example, food preparation and cleaning), while they are either skilled or unskilled at producing the other goods, represented by y. The economy is made up of many cities that all contain both skilled and unskilled individuals.

In each city, firms produce good y (that can be sold on the national economy) using a Cobb-Douglas production function $y = A\, N_{uY}^{\sigma_u} N_{sY}^{\sigma_s}$, where N_{jY} is the number of workers of skill $j=u,s$ working in the y-sector. Both the aggregate and skill-specific productivity shifters A and σ_j's (j=u,s) might vary across cities, but the condition $\sigma_u<\sigma_s$ always holds. Assuming competitive labor markets, this condition entails that wages for skilled workers will be higher than wages for unskilled workers, $w_u<w_s$.

The output of the "housework" sector can only be locally traded. In this sector workers can either use their own time and produce the good domestically (x_h), or they can purchase it in the local market from private household workers (x_m).

Individuals maximize utility $U(y,x,L)$—where $x=x_m+x_h$, and L is leisure—under the following constraints: (1) the time constraint $T_m+T_h+L=1$, where T_m is work-in-the-market time, T_h is work-at-home time and the endowment of time is normalized to one;[13] (2) the budget constraint $p_y y+p_{xm}x_m= w_j T_m$, $j=u,s$; and (3) the production function of x, which is assumed to be linear in time, and to be the same for goods produced at home and in the market.

In this framework, the choice of the optimal bundle (y,x,L) is governed by preferences and relative prices prevailing in the market. The allocation of work time between home and market (and the composition of x between x_h and x_m) is determined instead by an individual's productivity in home production relative to her shadow price of time, represented by the wage rate w_j, $j=u,s$. Given that skilled workers have a comparative advantage at producing y, in this stylized model they do not perform any housework. As a result, the wage at which domestic help can be hired is equal to w_u, and unskilled workers are indifferent between doing the housework themselves or hiring someone else to do it for them. In the presence of a strictly positive agency cost, $c>0$, the market demand for household services X_m^D in each city will be given by the sum of the individual demand schedules of skilled individuals, x_m^d. The individual demand for x_m is, in turn, an increasing function of a skilled worker's opportunity cost

[13] As in Gronau (1977), we are assuming perfect substitutability between market goods and home products, and between work in the market and work at home. This assumption rules out the possibility that an individual may attach extra value to goods produced by herself rather than someone else, and that some housework activities provide extra benefits beyond the consumption value of household production. Even if these conditions are somewhat unrealistic for the case of childcare activities, they are likely to hold for activities like cleaning the house, doing the laundry, maintenance and repair services and waste management.

of time (that is, her own wage w_s) and a decreasing function of the cost of purchasing the services in the market, that is: $X_m^D = N_s x_m^d = N_s f(w_s, w_u, c)$, $\delta f/\delta w_s > 0$, $\delta f/\delta w_u < 0$, $\delta f/\delta c < 0$, [14] where N_s is the number of skilled workers in the city.

The following equilibrium condition arises from this setting: the fraction of unskilled workers employed in the housework sector is increasing in the demand for home goods. Given that the demand for home goods is higher in cities with a higher proportion of skilled individuals in the workforce, then:

Prediction 1: the fraction of unskilled workers employed in home services is increasing in the share of skilled workers in the city.

This condition follows from the fact that, in our stylized framework, only skilled workers hire domestic help. Prediction 1, however, would also arise in a more general setting, as long as housework services are items that make up a larger proportion of total individual consumption as skills (and so, the opportunity cost of time) rise. This is in turn supported by the analysis of consumption data presented in section II.A.

Prediction 1 is exclusive to the consumption mechanism we highlight in this paper. If, as assumed in the model, labor inputs are imperfect substitutes in the production sector, but not in the housework sector, then in cities with a higher share of skilled workers, unskilled workers are more productive (and more likely to be employed) in the production sector. As documented in section II.B, home services are the sector with the lowest concentration of skilled workers. This makes Prediction 1 robust to the case of imperfect substitution in both sectors.

In addition, Prediction 1 is not confounded by the existence of human capital spillovers. Given that the share of skilled workers is lower in home services than in any other sector, if human capital externalities in a city are assumed to be proportional in the share of skilled workers (Moretti 2004a, 2004b and 2004c) and to be stronger within sectors,[15] then Prediction 1 does not arise from the effects of human capital externalities.

[14] In particular, in this setting $x_m^d > 0$ only if the gap between skilled and unskilled wages is sufficiently high to compensate for the agency cost.

[15] In favor of this notion, Moretti (2004c) finds evidence that human capital spillovers between manufacturing plants that belong to similar industries are larger than spillovers between manufacturing plants that belong to industries that are different; also, he finds that spillovers between industries that are in the same city and are economically close are larger than spillovers between industries that are in the same city but are economically distant.

D. Empirical analysis

Identification issues

We test Prediction 1 by studying the cross-sectional association between the share of skilled workers in the workforce of a city and the distribution of unskilled workers across sectors. OLS estimates of this association might, however, be biased in favor of Prediction 1. If the share of skilled workers is higher in city C_1 than in city C_2 because in C_1 skilled workers are particularly productive at producing *y*, then this sector will be high-skill intensive. To rule out this potential bias, we use the location of land-grant institutions as an instrument for differences in the supply of skilled workers across cities (Moretti, 2004b). Land grant colleges were established in the late 19th century as a result of a movement to provide accessible higher education to people in each U.S. state. Consistent with the intention, the geographic distribution of land-grant universities is quite even. Moretti (2004b) also reports that the demographic characteristics of metropolitan areas with and without land-grant colleges are similar in most respects. Evidence in favor of the validity of the instrument is provided in Shapiro (2006), who shows that the correlation between human capital distribution and the presence of a land-grant college is essentially zero in the late 1800's, moderate in the early 1900's and the largest between 1940 and 1980. The fact that the correlation arose only after these institutions could have played a significant causal role supports the exogeneity of land-grant status with respect to preexisting differences among metropolitan areas.

Empirical Model and Results

To form a panel of cities, we define average measures for workers 16-65 years old residing in Census-defined metropolitan areas in the years 1980, 1990, 2000 and 2005.[16] Metropolitan Statistical Areas (MSA's) are counties or combinations of counties centering on a substantial urban area. There are between 290 and 300 MSAs in each year.[17] For unskilled individuals (high-school dropouts, HSD), we define

[16] The sample is further restricted to wage and salary earners in the civilian labor force who did not live in group quarters. All figures are obtained weighting individual observations by the product between the individual frequency weight and a measure of labor supply (the product between weeks worked and hours usually worked per week).

[17] In some cases the set of counties that make up an area changes over time. Also, as population grows and people migrate to urban areas, new metropolitan areas emerge, so the number of metropolitan areas has increased from 288 in 1980 to 299 in 2005. Even if we do not correct for potential inconsistencies over time, other work suggests that results should not be significantly affected by this issue. For example, in his analysis of the correlation between employment growth and growth in the share of college graduates across MSA's, Shapiro

average employment shares in each sector *s*, in a given city *c* and year *t* ($Emp\_Share^{HSD,s}_{ct}$), and we estimate the following model:

$$(1) \qquad Emp\_Share^{HSD,s}_{ct} = \alpha + \beta(CollegeShare)_{ct} + \gamma_t + \delta X_{ct} + \varepsilon_{ct}$$

where $CollegeShare_{ct}$ is the fraction of college graduates in a city-year workforce,[18] γ_t are year fixed effects, and X_{ct} is a vector of city characteristics that vary over time: the proportion of women, blacks and Hispanics in the total workforce of the city, and the fraction of the unskilled workforce that is foreign-born, aged 16-24, 25-34, 35-44 and 44-55.

OLS and Instrumental Variables (IV)[19] estimates of β from Equation (1) are reported respectively in columns 1 and 3 of Table 6. For comparison, columns 2 and 4 report the estimated coefficient on $CollegeShare_{ct}$ from equations where the dependent variable is the employment share of skilled workers (defined as college graduates) in a given sector. Each row of Table 1 reports estimation results for one of the sectors (or occupations) that we have defined in section II.B (see Tables A1 and A2 for details).

To implement IV estimates, we code a binary variable indicating whether a metropolitan area contains a land-grant institution.[20] We use the full set of interactions between this variable and year dummies as instruments for $CollegeShare_{ct}$. First-stage estimates for this specification show that the presence of a land-grant institution raises the share of the workforce who are college graduates by around 4 percentage points in 1980, 5 percentage points in 1990 and 6 percentage points in 2000 and 2005.

As the consumption hypothesis predicts (Prediction 1), the presence of more skilled workers in a city is associated with a higher fraction of unskilled workers employed in home services (row 1 in Table 6). Both OLS and IV estimates predict

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(2006) shows that his results are robust to examining only those areas whose definitions did not change over time.

[18] The average college share across cities and years is 0.24, with a standard deviation of 0.08.

[19] The estimation method is the two-step efficient Generalized Method of Moments (GMM).

[20] The following MSA's have one or more land-grant colleges (Nevins, 1962): Albany-Schenectady-Troy, NY; Athens, GA; Baton Rouge, LA; Boston, MA; Champaign-Urbana-Rantoul, IL; Columbia, MO; Columbia, SC; Columbus, OH; Des Moines, IA; Fargo-Moorhead, ND-MN; Fayetteville-Springdale, AR; Fort Collins-Loveland, CO; Gainesville, FL; Greensboro-Winston-Salem-High Pt., NC; Hartford, CT; Honolulu, HI; Knoxville, TN; Lafayette-West Lafayette, IN; Lansing-East Lansing, MI; Lexington-Fayette, KY; Lincoln, NE; Macon-Warner Robins, GA; Madison, WI; Minneapolis-St. Paul, MN-WI; Nashville, TN; Pine Bluff, AR; Portsmouth-Dover-Rochester, NH-ME; Providence, RI; Raleigh-Durham, NC; Reno, NV; Richmond-Petersburg, VA; Riverside-San Bernardino, CA; Sacramento, CA; San Francisco, CA; State College, PA; Tallahassee, FL; Tucson, AZ; Washington, DC-MD-VA and Wilmington, DE-MD.

that a one-standard deviation (8 percentage points) increase in the share of college graduates is associated with one-fourth of a standard deviation (1.6 percentage-point) increase in the fraction of high-school dropouts employed in home services. On the contrary, the same association is not statistically different from zero when estimated for the workforce with a college degree. This seems to suggest that the result for unskilled workers is not due to complementarities or human capital externalities.

As shown in column 3, row 2 of Table 6, the effect of the college share in the city workforce on the fraction of high-school dropouts employed in non-traded activities other than home services is both economically and statistically insignificant. This result separates the consumption hypothesis we have formulated from the predictions of a model in which employment shifts reflect general spillovers into non-tradeable sectors, simply due to the fact that the higher skilled workers have more income to spend on locally produced non-traded goods. Also, the fact that the OLS estimate is larger than the IV estimate is consistent with the existence of a positive bias in cross-sectional comparisons.

Finally, the coefficients on college share estimated for other sectors suggest that complementarities and human capital externalities are a plausible explanation for the employment opportunities of unskilled workers in some sectors of the economy other than non-traded activities. In cities with a higher share of skilled workers, both skilled and unskilled workers are less likely to be employed in manufacturing and other strictly traded sectors, and more likely to be employed in financial and educational services.

IV. Cross-city analysis: The relationship between wage growth at the top and at the bottom of the wage distribution

In the previous section we have established that cities with a higher fraction of skilled individuals in the workforce have a higher share of unskilled workers employed in home services, consistent with a model in which skilled workers, with their high opportunity cost of time, outsource home production activities by buying low-skill intensive services. We now turn to derive and test the implications of the existence of consumption spillovers for the distribution of wages in a city. The main

intuition is that our approach unveils a mechanism through which rising wages at the top of the distribution might feedback into higher wages at the bottom. Where and when wage growth is the highest for high-skilled workers, the demand for home services should increase the most, exerting an upward pressure on the wages of the workers that perform these jobs, who are predominantly the least skilled.

In the context of the model presented in section III.C, if a city experiences a skill-biased change in the production sector, or any other shock that enhances the relative productivity of skilled workers, then it should also experience growth in the demand for home services. If there is not perfect labor mobility, then the increased demand for home services might result in increasing wages for low-skill workers. Empirical evidence does show that it is reasonable to assume limited labor mobility among the low-skill workforce (Bound and Holzer, 2000).

The upward pressure on the unskilled wages arising from consumption spillovers should mechanically be larger in those cities with a larger fraction of unskilled workers employed in home services in a base period, so that:

Prediction 2: the association between wage growth at the top of the wage distribution and wage growth at the bottom is increasing with the fraction of unskilled workers employed in home services in the base period.

E. Empirical analysis

We explore Prediction 2 by examining the relationship across cities between relative wage growth at the top of the wage distribution and relative wage growth at the bottom (both with respect to the growth at the median). The larger the share of low-wage earners employed in outsourced home production activities, the larger the association should be. We use data from the IPUMS extracts of the 1980, 1990 and 2000 censuses and the 2005 American Community Survey, and we calculate changes in log real hourly wages (*lw*) by percentile from 1980 to 1990, from 1990 to 2000 and from 2000 to 2005.[21] Earnings growth figures are calculated at the city level,[22] and weighted by the product of IPUMS frequency weights and the number of hours worked in the previous year.

[21] Hourly wages are calculated by dividing wage and salary income by annual hours worked (the product between weeks worked and hours usually worked per week). We obtain real wages (in 1989 dollars) using the national level CPI as the deflator.

[22] We restrict the analysis to the 241 MSAs that are defined in the entire period.

Let $Q_{ct}(\tau)$ for $\tau \in (0,1)$ denote the 100τ-quantile of the distribution of log wages (*lw*) in city *c* and year *t*. Let $\Delta\underline{Q}_{ct} = \Delta Q_{ct}(\underline{\tau}) - \Delta Q_{ct}(.5)$ and $\Delta\overline{Q}_{ct} = \Delta Q_{ct}(\overline{\tau}) - \Delta Q_{ct}(.5)$, for $\underline{\tau} < 0.5 < \overline{\tau}$. $\Delta\underline{Q}_{ct}$ and $\Delta\overline{Q}_{ct}$ represent respectively changes (between *t-1* and *t*) in log wages at percentiles $\underline{\tau}$ and $\overline{\tau}$ relative to changes in the median log wage.

A positive correlation between $\Delta\underline{Q}_{ct}$ and $\Delta\overline{Q}_{ct}$ is an indication that in cities and years where relative earnings growth has been higher at the top of the wage distribution, it has also been higher at the bottom. Row 1, column 1 of Table 7 reports this correlation for the case $\underline{\tau} = .15,\ \overline{\tau} = .85$. A 10 percent increase in the relative wage growth at the 85th percentile with respect to the median is associated with a 1.5 percent increase in the relative wage growth at the 15th percentile with respect to the median. Consistent with our consumption hypothesis, this positive relationship is found to arise only where a higher fraction of low-skill workers is employed in home services: in cities where this fraction in the base year was below the yearly mean, the association is neither economically nor statistically significant (column 2), while in cities where the fraction was above the mean the association is positive (column 3). A potential concern is that the estimated association between relative wage growth at the top and at the bottom may be spurious because of changes in the median wage. To address this issue, we estimate the correlation between wage growth at the 15th percentile relative to the 35th percentile and wage growth at the 85th percentile relative to the 65th percentile. As shown in panel B of Table 7, the results are robust to this specification check, suggesting that our findings are driven by changes at the tails rather than changes at the median.

Table 8 presents estimation results from specifications where the effect of $\Delta\overline{Q}_{ct}$ on $\Delta\underline{Q}_{ct}$ is allowed to vary with city-level variables measured in *t-1*: (i) $Home\_Share_{c(t-1)}$—the fraction of wage-earners employed in home services among workers with hourly wages below the 15th percentile (columns 1 through 4); (ii) $otherNT\_Share_{c(t-1)}$—the fraction of wage-earners employed in non-traded sectors other than home services among workers with hourly wages below the 15th percentile (column 5); (iii) $College\_Share_{c(t-1)}$—the fraction of college graduates in the workforce of a city (column 6).

In line with the findings presented in Table 7, the coefficient of the interaction term between $\Delta\overline{Q}_{ct}$ and $Home\_Share_{c(t-1)}$ is estimated to be positive and significant

(column 1). Consider two cities that both experience a 10% relative wage growth at the top, but have a one-standard deviation difference in *Home_share* (6 percentage points). The city with the higher share of low-skill workers employed in home services is estimated to experience faster relative wage growth at the bottom by 1.32 points.[23] When splitting the analysis by subsequent periods, we find that the estimated coefficient of the relevant interaction term is positive only when the model is estimated for the 1990-2000 and 2000-2005 changes. This result suggests that the explanatory power of consumption spillovers increased over time, as we would expect given that unskilled work is increasingly absorbed by the sector of home services. As shown in panel B of Table 8, our findings are robust to calculating wage growth at the bottom and at the top relative to different percentiles (35^{th} and 65^{th} respectively) rather than both relative to the median.

As shown in column 5 of Table 8, the association between wage growth at the two tails of a city wage distribution is estimated not to vary with the share of low-wage earners employed in non-tradeable activities other than home services. This finding suggests that the spillover from skilled workers' consumption to unskilled earnings opportunities does not arise from general income effects (that is, simply because skilled workers have higher income to spend on locally produced non-traded goods). It appears that the feedback between wage growth for the skilled and wage growth for the unskilled crucially depends on the size of the sector of outsourced home production activities.

An alternative explanation to the consumption mechanism we are interested in detecting is an association between high-skill and low-skill workers' wage growth that is due to production complementarities or human capital externalities. Column 6 of Table 8 presents a piece of information relevant to distinguish between the two hypotheses. When interacting the top-end relative wage growth with the share of college graduates in the base year, we do not find evidence of a positive relationship between wage growth at the two ends of the distribution.

Differences in local prices

In our analysis, we study wages unadjusted for cost of living. As a result, some of

[23] This effect is calculated from the coefficients reported in column 1 of Table 8: [-.391 +2.200*Home_share]*.1 – [-.391 +2.200*(Home_share+0.06)]*.1 = 0.0132.

the observed differences in wage growth across cities are likely to reflect differences in local prices. Under which conditions would differences in the growth of local prices deliver a non-monotone wage growth along the earnings distribution? In a setting in which individuals of different skills choose the same consumption bundle, differences in the growth of local prices should not predict a non-monotone wage growth along the earnings distribution, and so should not contaminate our results. However, our model does allow different skill groups to choose different consumption bundles: in particular, the consumption effects we are interested in detecting arise if skilled workers spend a higher fraction of their budget on the subset of non-traded services that can be thought as substitutes of home production activities. What if, for instance, unskilled workers spend a higher fraction of their budget on housing?[24] Let's consider, for example, the case of two cities, A and B. In A skilled workers experience a higher relative wage growth than in B, because of a city-specific skilled-biased technological shock. On one hand, our framework predicts that consumption spillovers should be larger in A, and this should exert an upward pressure on the unskilled wage. On the other hand, if land prices increase more in A, then unskilled wages might increase as well to compensate unskilled workers for higher living costs. This provides an alternative explanation for differential wage growth at different points of the wage distribution that might confound our hypothesis, but that only arises from assuming workers' perfect mobility and a homogenous housing market. If unskilled workers are not perfectly mobile (Bound and Holzer, 2002), their wages might not fully reflect compensating differentials for housing (or other living) costs. Also, heterogeneity in housing markets might partly shield unskilled workers from incurring the costs associated with living in a "skilled city", so that again we would not expect compensating differentials. In the case of residential segregation, however, unskilled workers' net returns from work might be lowered by high commuting costs, the more so the more their employment opportunities are represented by non-traded services consumed by skilled workers. Heterogeneity of housing markets within cities and differences in commuting times/costs should then be taken into account in order to assess the effects on the welfare of unskilled workers arising from living in skilled cities, but this is beyond the scope of this paper and is left for future research.

[24] Polinsky (1979) estimates that the income elasticity for housing was less than one in the 1970s.

VII. Conclusions

Census data show that, relative to more skilled workers, the least-skilled workforce in the United States is more largely (and increasingly) concentrated in a sector that can be broadly defined as providing time-intensive services that substitute for home production activities. Consumer expenditure data show that the fraction of household spending in these services increases with both the head's education and wage rate. These facts suggest that the employment opportunities of unskilled workers in the United States (and possibly in other developed economies) increasingly depend on the demand for outsourced home production activities by skilled workers. We provide two pieces of evidence consistent with this hypothesis. First, we find that at the city level a higher share of skilled individuals in the workforce is associated with a higher fraction of unskilled workers employed in "home services". Second, we find evidence of a positive association between relative wage growth at the top of the wage distribution and relative wage growth at the bottom, whose magnitude is increasing with the fraction of low-wage workers employed in home services. This finding is consistent with the existence of a feedback between rising wage inequality at the top of the distribution and lower wage inequality at the bottom, which arises from the consumption of outsourced home production services by high-wage workers. This suggests that our framework might contribute to the recent literature on the evolution of wage inequality in the United States: given the steady wage growth at the top of the wage distribution observed in the last three decades, and the finding that home services absorb an increasing share of unskilled work in the United States, then "consumption spillovers" might be a viable explanation for some of the twisting in the wage growth at the bottom of the wage distribution observed over the last 15 years (Autor et al., 2006, 2007).

Our paper is also related to the voluminous literature that examines the causes of city-level employment and wage growth. By highlighting a mechanism through which strong city performance in the high-skill labor markets might spillover into low-skill labor markets, our approach has similarities with the one in Beaudry, Green and Sand (2007). They show that there are substantial and persistent spillover effects on city-level average wages associated with changes in the fraction of jobs in high paying sectors. The effect they measure is pervasive: it is not restricted to one educational attainment and is present in almost all industries (and importantly for both tradeable

and non-tradeable goods). However, unskilled labor markets appear to be those most largely affected by the spillover effects from good jobs: Beaudry, Green and Sand (2007) find that cities that experience a change in industrial composition in favor of better paying jobs also experience a decrease in wage inequality that is concentrated in the bottom half of the distribution. Given that consumers of outsourced home production tasks are disproportionally workers in "good jobs", our framework provides a potential explanation for what is driving the spillover effect on unskilled labor markets.

Our paper also relates to recent findings in the literature that measures changes in the allocation of time. Aguiar and Hurst (2007) document trends in the allocation of time within the United States and find that hours of home production work have decreased between 1985 and 2003, predominantly for women—that spent more time in these activities to start with. This is broadly consistent with our intuition, and points to potential extensions to the present analysis. The role of consumption spillovers might be amplified in an analysis that incorporates compositional effects, both in the workforce (e.g., by gender and marital status) and in the overall population (e.g., by age).

Finally, our work relates to the immigration literature. Borjas and Friedberg (2007) show that, as opposed to the continuous decline in the relative earnings of new immigrants observed since the 1960s, the trend reversed in the 1990s, with newcomers doing as well in 2000, relative to natives, as they had twenty years earlier. The turnaround in the relative earnings of new arrivals is found to have occurred primarily at the top and the bottom ends of the skill distribution. As documented in Section II.B, the low-skill services that are the focus of this paper are immigrant-intensive sectors. Positive demand shifts for unskilled work driven by consumption spillovers might then partly explain the drop in the immigrant-native wage gap observed at the bottom of the distribution. It is well known, however, that immigration greatly increased the supply of high-school dropouts in recent decades (Borjas, 2003), so this explanation might appear to be at variance with the conclusion of Cortes (2006) that immigrant-induced shifts in low-skill labor force decrease the price of immigrant-intensive services, with lower wages being a likely channel through which these effects take place. Cortes' result, however, holds in specifications that use the tendency of immigrants to move to the same areas in which previous immigrants from their country live, to instrument for the endogenous

location choices of immigrants (Card, 2001). The cross-sectional correlation between immigrants' concentration and prices is instead positive, consistent with immigrants choosing their location based on the economic opportunities that the city offers, and with the immigrant-induced shifts in labor supply not being large enough to offset existing positive price (and wage) pressures.

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Table 1
Correlation between hourly wages and budget share of services that are substitutes for home production; CEX Diary Surveys 1996 and 2004

1996	All families	Husband/Wife Families			Other Families
		Woman does NOT work	Woman works		
	(1)	(2)	(3)	(4)	(5)
Head's log hourly wage	0.006**	0.010*	0.007*	0.007	0.012**
	(0.003)	(0.006)	(0.004)	(0.005)	(0.005)
Wife's log hourly wage				0.013***	
				(0.004)	
Constant	0.110***	0.071***	0.103***	0.075***	0.110***
	(0.008)	(0.016)	(0.012)	(0.016)	(0.013)
Observations	2,976	372	1,345	1,188	1,259
2004	All families	Husband/Wife Families			Other Families
		Woman does NOT work	Woman works		
	(1)	(2)	(3)	(4)	(5)
Head's log hourly wage	0.006**	0.027***	0.006	0.004	0.008*
	(0.002)	(0.006)	(0.004)	(0.004)	(0.004)
Wife's log hourly wage				0.006*	
				(0.003)	
Constant	0.121***	0.037*	0.111***	0.100***	0.133***
	(0.007)	(0.019)	(0.011)	(0.012)	(0.011)
Observations	5,116	773	2,133	2,068	2,210

Note: Sample restricted to household headed by individuals at least 18 and no more than 65 who worked for salary in the 12 months before the interview. The family head is conventionally fixed to be the male in all husband/wife families. "Other families" in column 5 include single-adult families (73% and 72% in 1996 and 2004) and other mixed families (27% and 28% in 1996 and 2004).

Source: 1996 and 2004 CEX Diary Surveys.

Table 2

Earned Income Elasticities of Consumption of services that are substitutes for home production; CEX Diary Surveys 1996 and 2004

1996	All families	Family Wage Income			
		Below 25th percentile	Between 25th - 50th percentile	Between 50th - 75th percentile	Above 75th percentile
	(1)	(2)	(3)	(4)	(5)
Log Household Wage Income	0.425***	0.176***	0.864***	0.462*	0.814***
	(0.020)	(0.040)	(0.274)	(0.251)	(0.105)
Constant	0.634***	2.901***	-4.093	0.243	-3.603***
	(0.208)	(0.369)	(2.818)	(2.703)	(1.200)
Observations	2,739	619	668	733	719
Head 35+					
Log Household Wage Income	0.435***	0.100**	1.197***	0.844**	0.797***
	(0.026)	(0.051)	(0.361)	(0.349)	(0.125)
Constant	0.568**	3.623***	-7.548**	-3.894	-3.389**
	(0.279)	(0.478)	(3.762)	(3.808)	(1.441)
Observations	1,753	399	444	430	480

2004	All families	Family Wage Income			
		Below 25th percentile	Between 25th - 50th percentile	Between 50th - 75th percentile	Above 75th percentile
	(1)	(2)	(3)	(4)	(5)
Log Household Wage Income	0.451***	0.084**	1.102***	1.233***	0.880***
	(0.017)	(0.037)	(0.218)	(0.207)	(0.103)
Constant	0.469**	3.869***	-6.528***	-8.201***	-4.379***
	(0.183)	(0.350)	(2.297)	(2.285)	(1.203)
Observations	4,703	1,032	1,151	1,236	1,284
Head 35+					
Log Household Wage Income	0.536***	0.072	0.429	0.707***	1.000***
	(0.024)	(0.057)	(0.281)	(0.258)	(0.134)
Constant	-0.473*	4.016***	0.560	-2.357	-5.795***
	(0.264)	(0.560)	(3.008)	(2.877)	(1.582)
Observations	3,310	759	788	870	893

Note: Sample restricted to household headed by individuals at least 18 and no more than 65. The family head is conventionally fixed to be the male in all husband/wife families.

Source: 1996 and 2004 CEX Diary Surveys.

Table 3

Employment shares in different sectors by education and year, 1980-2005

	1980	1990	2000	2005	1980-2005 change
High-school drop-outs					
Non-trade industries	0.33	0.40	0.42	0.42	0.09
Home services	**0.15**	**0.20**	**0.23**	**0.24**	**0.09**
Other non-trade industries	0.18	0.20	0.19	0.18	0.00
Agriculture, Mining, Manufacturing	0.37	0.29	0.24	0.22	-0.14
Construction	0.08	0.10	0.14	0.18	0.10
Wholesale t., Transportation, Utilities	0.12	0.11	0.10	0.10	-0.02
Financial Services	0.03	0.03	0.03	0.02	0.00
Business Services	0.01	0.02	0.03	0.02	0.01
Public Administration	0.03	0.02	0.01	0.01	-0.02
Education	0.03	0.03	0.02	0.02	-0.01
Home service occupations	**0.18**	**0.21**	**0.23**	**0.26**	**0.08**
Other non-traded occupations	0.16	0.18	0.17	0.16	0.00
High-school graduates					
Non-trade industries	0.30	0.35	0.38	0.40	0.10
Home services	**0.10**	**0.13**	**0.15**	**0.17**	**0.07**
Other non-trade industries	0.20	0.22	0.23	0.24	0.03
Agriculture, Mining, Manufacturing	0.29	0.24	0.21	0.17	-0.12
Construction	0.07	0.08	0.10	0.12	0.05
Wholesale t., Transportation, Utilities	0.15	0.15	0.14	0.13	-0.02
Financial Services	0.07	0.07	0.06	0.06	-0.01
Business Services	0.03	0.04	0.04	0.04	0.01
Public Administration	0.06	0.04	0.04	0.04	-0.02
Education	0.03	0.03	0.03	0.03	0.00
Home service occupations	**0.10**	**0.12**	**0.14**	**0.16**	**0.07**
Other non-traded occupations	0.16	0.19	0.18	0.20	0.04
Some college					
Non-trade industries	0.32	0.34	0.37	0.40	0.08
Home services	**0.09**	**0.11**	**0.12**	**0.13**	**0.04**
Other non-trade industries	0.23	0.24	0.25	0.27	0.03
Agriculture, Mining, Manufacturing	0.22	0.19	0.15	0.13	-0.09
Construction	0.05	0.06	0.06	0.07	0.02
Wholesale t., Transportation, Utilities	0.15	0.15	0.14	0.13	-0.02
Financial Services	0.09	0.09	0.09	0.09	0.00
Business Services	0.05	0.07	0.08	0.08	0.02
Public Administration	0.08	0.07	0.06	0.07	-0.01
Education	0.04	0.04	0.04	0.04	0.00
Home service occupations	**0.09**	**0.09**	**0.11**	**0.12**	**0.04**
Other non-traded occupations	0.17	0.19	0.18	0.19	0.02

(Table 3 continue)

College graduates					
Non-trade industries	0.24	0.26	0.27	0.28	0.04
Home services	**0.04**	**0.05**	**0.05**	**0.06**	**0.02**
Other non-trade industries	0.20	0.21	0.22	0.22	0.02
Agriculture, Mining, Manufacturing	0.18	0.16	0.13	0.12	-0.06
Construction	0.03	0.03	0.02	0.03	0.00
Wholesale t., Transportation, Utilities	0.09	0.10	0.09	0.09	0.00
Financial Services	0.09	0.10	0.10	0.11	0.02
Business Services	0.10	0.13	0.16	0.16	0.05
Public Administration	0.08	0.06	0.06	0.06	-0.01
Education	0.19	0.16	0.16	0.16	-0.04
Home service occupations	**0.03**	**0.03**	**0.04**	**0.04**	**0.02**
Other non-traded occupations	0.11	0.13	0.12	0.13	0.01

Notes: For each educational group, the first ten rows report the share of the workforce employed in each group of industries (exhaustive categories). The *home service sub-industries* include the three-digit sectors: eating and drinking places, services to buildings, detective and protective services, automotive rental and leasing, taxi and limousine service, other repair services, personal services, entertainment services, child care services. The last two rows report the share of the workforce employed in two groups of non-traded occupations. *Home service occupations* include private household, protective service, food preparation and service and personal service occupations. For a detailed mapping of industry or occupation codes into the above categories, see Tables A1-A2.
Sample restricted to individuals aged 16 through 65 who were employed in the civilian labor force at the time of the survey, were not unpaid family workers, who did not live in group quarters and who resided in a Metropolitan Statistical Area (MSA).
Figures are weighted by the product of IPUMS weights and a measure of annual labor supply.
Source: IPUMS extracts from 1980-1990-2000 censuses and 2005 American Community Survey file.

Table 4
Employment shares in different sectors by wage percentile and year, 1980-2005

	1980	1990	2000	2005	1980	1990	2000	2005
Wage percentiles	*Below 10*				*Between 10 and 20*			
Non-trade industries	0.50	0.58	0.57	0.60	0.48	0.50	0.52	0.53
Home services	**0.23**	**0.28**	**0.29**	**0.31**	**0.18**	**0.20**	**0.22**	**0.23**
Other non-trade	0.27	0.30	0.28	0.29	0.30	0.30	0.30	0.30
Trade industries	0.20	0.15	0.14	0.12	0.21	0.18	0.15	0.14
Construction	0.04	0.04	0.05	0.06	0.03	0.05	0.06	0.08
Wholesale trade et al.	0.07	0.07	0.07	0.07	0.07	0.09	0.09	0.08
Financial Services	0.05	0.05	0.04	0.04	0.07	0.07	0.05	0.04
Business Services	0.03	0.04	0.05	0.04	0.03	0.04	0.05	0.04
Public Administration	0.03	0.02	0.02	0.02	0.03	0.03	0.02	0.02
Education	0.07	0.06	0.07	0.06	0.07	0.06	0.07	0.06
Wage percentiles	*Between 20 and 30*				*Between 30 and* 40			
Non-trade industries	0.41	0.43	0.45	0.46	0.34	0.37	0.40	0.41
Home services	**0.12**	**0.14**	**0.16**	**0.17**	**0.09**	**0.11**	**0.13**	**0.12**
Other non-trade	0.28	0.29	0.29	0.30	0.25	0.26	0.27	0.29
Trade industries	0.22	0.18	0.16	0.14	0.24	0.19	0.17	0.15
Construction	0.04	0.05	0.06	0.08	0.04	0.05	0.06	0.08
Wholesale trade et al.	0.09	0.10	0.10	0.10	0.10	0.11	0.12	0.11
Financial Services	0.10	0.09	0.07	0.06	0.09	0.09	0.08	0.08
Business Services	0.04	0.05	0.05	0.05	0.04	0.05	0.06	0.06
Public Administration	0.05	0.04	0.03	0.03	0.06	0.05	0.05	0.05
Education	0.06	0.06	0.07	0.07	0.07	0.06	0.08	0.08
Wage percentiles	*Between 40 and 50*				*Between 50 and 60*			
Non-trade industries	0.30	0.32	0.35	0.36	0.27	0.28	0.31	0.31
Home services	**0.07**	**0.08**	**0.10**	**0.10**	**0.06**	**0.07**	**0.08**	**0.08**
Other non-trade	0.23	0.24	0.25	0.26	0.21	0.22	0.23	0.23
Trade industries	0.26	0.21	0.17	0.15	0.28	0.22	0.18	0.16
Construction	0.05	0.06	0.06	0.07	0.05	0.06	0.07	0.07
Wholesale trade et al.	0.12	0.12	0.13	0.12	0.13	0.14	0.14	0.14
Financial Services	0.08	0.09	0.09	0.08	0.07	0.09	0.08	0.09
Business Services	0.05	0.06	0.07	0.06	0.04	0.06	0.08	0.07
Public Administration	0.08	0.07	0.06	0.06	0.08	0.07	0.07	0.07
Education	0.07	0.07	0.08	0.09	0.08	0.08	0.09	0.09

(Table 4 continue)

Wage percentiles	*Between 60 and 70*				*Between 70 and 80*			
Non-trade industries	0.22	0.24	0.27	0.27	0.17	0.21	0.24	0.24
Home services	**0.04**	**0.05**	**0.06**	**0.06**	**0.03**	**0.04**	**0.05**	**0.04**
Other non-trade	0.18	0.19	0.21	0.21	0.14	0.18	0.19	0.20
Trade industries	0.31	0.23	0.18	0.15	0.33	0.25	0.20	0.16
Construction	0.05	0.06	0.06	0.07	0.05	0.06	0.06	0.07
Wholesale trade et al.	0.16	0.17	0.16	0.15	0.21	0.18	0.15	0.14
Financial Services	0.06	0.08	0.08	0.08	0.05	0.07	0.08	0.09
Business Services	0.04	0.07	0.09	0.09	0.04	0.07	0.10	0.10
Public Administration	0.08	0.07	0.07	0.08	0.08	0.08	0.08	0.09
Education	0.07	0.08	0.09	0.11	0.07	0.08	0.10	0.10
Wage percentiles	*Between 80 and 90*				*Above 90*			
Non-trade industries	0.12	0.18	0.21	0.21	0.13	0.16	0.20	0.21
Home services	**0.02**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**
Other non-trade	0.10	0.15	0.17	0.18	0.10	0.13	0.17	0.18
Trade industries	0.34	0.26	0.21	0.18	0.32	0.25	0.20	0.19
Construction	0.07	0.06	0.06	0.05	0.07	0.06	0.04	0.04
Wholesale trade et al.	0.20	0.17	0.13	0.13	0.16	0.15	0.13	0.12
Financial Services	0.05	0.07	0.08	0.09	0.08	0.12	0.12	0.15
Business Services	0.04	0.07	0.12	0.13	0.07	0.11	0.16	0.17
Public Administration	0.08	0.08	0.09	0.10	0.08	0.06	0.06	0.07
Education	0.09	0.10	0.10	0.11	0.09	0.10	0.08	0.07

Notes: For each educational group, the first ten rows report the share of the workforce employed in each group of industries (exhaustive categories). The *home service sub-industries* include the three-digit sectors: eating and drinking places, services to buildings, detective and protective services, automotive rental and leasing, taxi and limousine service, other repair services, personal services, entertainment services, child care services. Traded industries include agriculture, mining and manufacturing. Wholesale trade et al. include transportation and utilities. For the detailed mapping of three-digit industry codes into the above categories, see Tables A1.

Sample restricted to individuals aged 16 through 65 who were employed in the civilian labor force at the time of the survey, were not unpaid family workers, who did not live in group quarters and who resided in a Metropolitan Statistical Area (MSA). Earnings percentiles based on hourly wages, defined as annual wages divided by annual labor supply (the product between number of weeks worked and usual number of hours worked per week).

Figures are weighted by the product of IPUMS weights and annual labor supply.

Source: IPUMS extracts from 1980-1990-2000 censuses and 2005 American Community Survey file.

Table 5
Hourly wages (in $1989) by educational level and sector of employment, 1980-2005

		1980	1990	2000	2005	*Wage gap*	
High school dropouts						**1980**	**2005**
Home services	mean	6.98	6.57	6.70	6.30	0.66	0.75
	median	5.71	5.29	5.34	5.17	0.63	0.73
	10th percentile	2.47	2.75	2.78	2.69	0.58	0.75
	90th percentile	12.34	11.34	11.11	10.62	0.68	0.74
Other sectors	mean	10.63	9.20	8.72	8.43		
	median	9.11	7.80	7.12	7.05		
	10th percentile	4.28	3.76	3.57	3.60		
	90th percentile	18.09	15.99	14.57	14.37		
High school graduates							
Home services	mean	8.17	7.77	8.01	7.70	0.70	0.71
	median	6.85	6.41	6.72	6.46	0.67	0.69
	10th percentile	3.36	3.27	3.44	3.23	0.64	0.70
	90th percentile	13.97	13.46	13.38	12.93	0.73	0.73
Other sectors	mean	11.62	10.77	10.73	10.78		
	median	10.21	9.62	9.25	9.37		
	10th percentile	5.26	4.81	4.73	4.61		
	90th percentile	19.24	17.93	17.79	17.78		
Some college							
Home services	mean	8.65	8.74	9.08	8.89	0.69	0.68
	median	7.27	7.21	7.45	7.39	0.67	0.65
	10th percentile	3.39	3.47	3.70	3.45	0.62	0.64
	90th percentile	14.80	15.00	15.10	15.28	0.72	0.71
Other sectors	mean	12.48	12.34	12.53	13.04		
	median	10.90	10.87	10.67	11.30		
	10th percentile	5.45	5.29	5.34	5.36		
	90th percentile	20.56	20.19	20.56	21.66		
College graduates							
Home services	mean	12.25	12.57	13.53	13.50	0.70	0.64
	median	9.41	9.71	10.30	10.06	0.62	0.59
	10th percentile	4.51	4.55	4.80	4.36	0.62	0.55
	90th percentile	21.93	22.44	24.55	25.21	0.76	0.61
Other sectors	mean	17.51	18.23	19.87	21.24		
	median	15.10	15.38	15.81	16.94		
	10th percentile	7.24	7.37	7.50	7.94		
	90th percentile	28.94	30.29	33.02	41.37		

Note: Sample restricted to individuals employed for salary 16-65 years old residing in an MSA. "*Home Services"*: services that can be thought as substitutes of home production (see Table A1). Figures are weighted. The wage gap reported in the last two columns is calculated as the ratio between hourly wages paid in home services and other sectors, in 1980 and 2005 respectively. Source: IPUMS extracts from 1980-1990-2000 censuses and 2005 American Community Survey file.

Table 6
The effect of the share of college graduates on the structure of employment, 1980-2005

Education	High-School Dropouts	College Graduates	High-School Dropouts	College Graduates
Estimation	OLS	OLS	IV	IV
	(1)	(2)	(3)	(4)
Sectors				
Home services	0.188***	-0.025	0.202*	-0.013
	(0.054)	(0.022)	(0.119)	(0.042)
Other non-traded	0.209***	-0.157***	0.068	-0.318***
	(0.033)	(0.070)	(0.086)	(0.084)
Traded	-0.617***	-0.024	-0.813***	-0.581***
	(0.087)	(0.047)	(0.164)	(0.120)
Construction	0.057	-0.017*	0.291***	-0.029
	(0.042)	(0.007)	(0.028)	(0.022)
Wholesale/	-0.020	-0.009	-0.020	-0.215***
Transport/Utilities	(0.025)	(0.022)	(0.066)	(0.054)
Financial Services	0.056**	0.106	0.086**	0.059
	(0.012)	(0.044)	(0.037)	(0.090)
Business Services	0.010	0.316***	-0.081**	0.196***
	(0.010)	(0.032)	(0.030)	(0.064)
Public Admin.	0.035*	0.003	-0.058	0.472***
	(0.018)	(0.041)	(0.039)	(0.113)
Education	0.081***	0.246***	0.121***	0.344**
	(0.013)	(0.053)	(0.037)	(0.165)
Occupations				
Home services	0.269***	0.050***	0.360***	-0.016
	(0.048)	(0.015)	(0.105)	(0.030)
Other non-traded	0.042	0.020	0.145*	-0.161***
	(0.034)	(0.025)	(0.081)	(0.055)

Notes: Each entry is a separate regression. The dependent variable is the fraction of employment in each sector/occupation among the relevant education group (in a city-year cell). Entries are the coefficients on the fraction of college graduates in the city workforce. All specifications include year fixed effects, city-year controls (the proportion of women, blacks, Hispanics) and education-city-year controls (the fraction of foreign-born; the fraction aged 18-24, 25-34, 35-44 and 44-55). In columns 5 and 6: two-step efficient generalized method of moments (GMM) estimates; instruments are the interactions between a dummy for the presence of a land-grant college in the city and year dummies. First-stage coefficients and standard errors: Land Grant*year 1980: 0.041 (0.009); Land Grant*year 1990: 0.048 (0.011); Land Grant*year 2000: 0.063 (0.013); Land Grant*year 2005: 0.061 (0.012).
Standard errors (in parentheses) adjusted for serial correlation within MSA.
Source: IPUMS extracts from 1980-1990-2000 censuses and 2005 American Community Survey file.

Table 7

Association between Relative Wage Growth at the Bottom and at the Top of a city wage distribution, by the Share of Low-Wage Earners employed in Home Services

Sample: Share of low-wage earners employed in home services	any	below average	= or above average
	(1)	(2)	(3)
A. Dependent Variable: [$\Delta Q_{ct}(.15) - \Delta Q_{ct}(.5)$]			
Regressor:			
[$\Delta Q_{ct}(.85) - \Delta Q_{ct}(.5)$]	0.155***	0.059	0.188***
	[0.052]	[0.056]	[0.065]
B. Dependent Variable: [$\Delta Q_{ct}(.15) - \Delta Q_{ct}(.35)$]			
Regressor:			
[$\Delta Q_{ct}(.85) - \Delta Q_{ct}(.65)$]	0.127**	-0.023	0.191***
	[0.054]	[0.058]	[0.066]
City fixed effects	Yes	No	No
Year fixed effects	Yes	Yes	Yes
Observations	723	378	345

Notes: The dependent variable is the change over time in log real hourly wages at the 15th percentile of a city wage distribution net of the change in log real hourly wages at the median (panel A) or at the 35th percentile (panel B). 241 MSA's and three periods (1980-1990, 1990-2000, 2000-2005) are considered, for a total of 723 observations. The explanatory variable is the change in log real hourly wages at the 85th percentile of a city wage distribution net of changes in log real hourly wages at the median (panel A) or at the 65th percentile (panel B).
In columns 2 and 3 the sample is restricted to cities in which the fraction of wage-earners below the 15th percentile employed in home services in year *(t-1)* was respectively below and above the average fraction across cities in that year.
Standard errors in brackets. * significant at 10% ** significant at 5% *** significant at 1%
Source: 1980-1990-2000 censuses and 2005 American Community Survey.

Table 8

Association between Relative Wage Growth at the bottom and at the top of a city wage distribution; the Marginal Effect of the Home Service sector.

Sample period	Full	80-90	90-00	00-05	Full	Full
	(1)	(2)	(3)	(4)	(5)	(6)
A. Dependent Variable: [$\Delta Q_{ct}(.15)$-$\Delta Q_{ct}(.5)$]						
Regressors:						
[$\Delta Q_{ct}(.85)$- $\Delta Q_{ct}(.5)$]	-0.391*	0.262	-1.161***	-0.424	-0.240	0.190
	[0.205]	[0.249]	[0.296]	[0.355]	[0.267]	[0.139]
Home_Share$_{t-1}$	0.264***	0.010	0.242***	-0.030		
	[0.083]	[0.075]	[0.075]	[0.082]		
[$\Delta Q_{ct}(.85)$-$\Delta Q_{ct}(.50)$]	2.200***	-0.120	4.360***	2.200		
*Home_Share$_{t-1}$	[0.819]	[1.082]	[1.128]	[1.384]		
otherNT_Share$_{t-1}$					-0.172**	
					[0.070]	
[$\Delta Q_{ct}(.85)$-$\Delta Q_{ct}(.50)$]					1.319	
* otherNT_Share$_{t-1}$					[0.884]	
CollegeShare$_{t-1}$						-0.232*
						[0.132]
[$\Delta Q_{ct}(.85)$-$\Delta Q_{ct}(.50)$]						-0.108
* CollegeShare$_{t-1}$						[0.503]
B. Dependent Variable: [$\Delta Q_{ct}(.15)$-$\Delta Q_{ct}(.35)$]						
Regressors						
[$\Delta Q_{ct}(.85)$-$\Delta Q_{ct}(.65)$]	-0.508**	-0.083	-0.964***	-0.273		
	[0.210]	[0.252]	[0.280]	[0.385]		
Home_Share$_{t-1}$	0.130*	-0.043	0.126*	0.037		
	[0.068]	[0.056]	[0.064]	[0.067]		
[$\Delta Q_{ct}(.85)$-$\Delta Q_{ct}(.65)$]*	2.576***	0.979	3.840***	1.331		
Home_Share$_{t-1}$	[0.830]	[1.131]	[1.038]	[1.502]		
City fixed effects	Yes	No	No	No	Yes	Yes
Year fixed effects	Yes	No	No	No	Yes	Yes
Observations	723	241	241	241	723	723

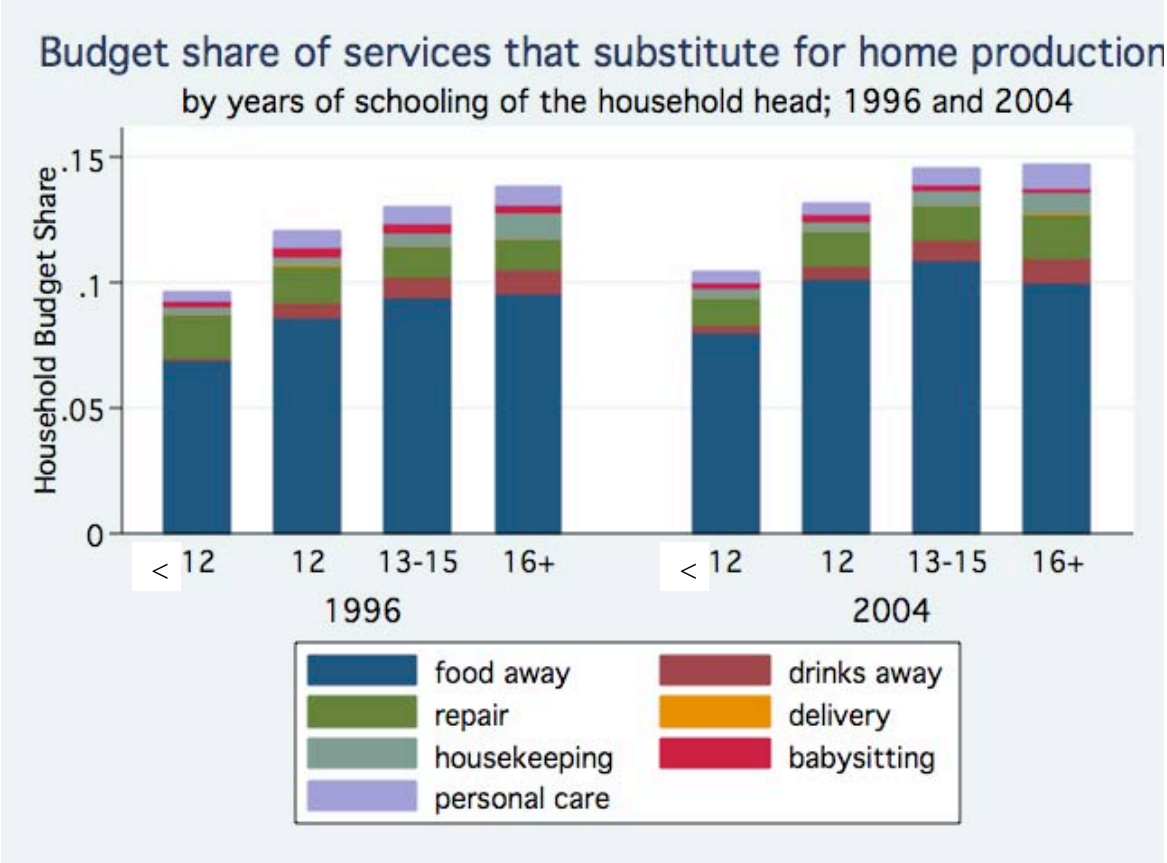
Notes: The dependent variable is the change over time in log real hourly wages at the 15th percentile of a city wage distribution net of the change in log real hourly wages at the median (upper panel) or at the 35th percentile (lower panel). 241 MSA's and three periods (1980-1990, 1990-2000, 2000-2005) are considered, for a total of 723 observations. The explanatory variables include: the change in log real hourly wages at the 85th percentile of the wage distribution net of changes in log real hourly wages at the median (upper panel) or at the 65th percentile (lower panel); the share of workers with wages below the 15th percentile employed in home services (*Home_Share*) or in other non-tradeable services (*otherNT_Share*) in the base year; the share of college graduates in a city in the base year (1980, 1990 and 2000 respectively).

Standard errors in brackets. * significant at 10% ** significant at 5% *** significant at 1%

Source: 1980-1990-2000 censuses and 2005 American Community Survey.

Figure 1

Is the consumption of home services increasing with the opportunity cost of time?

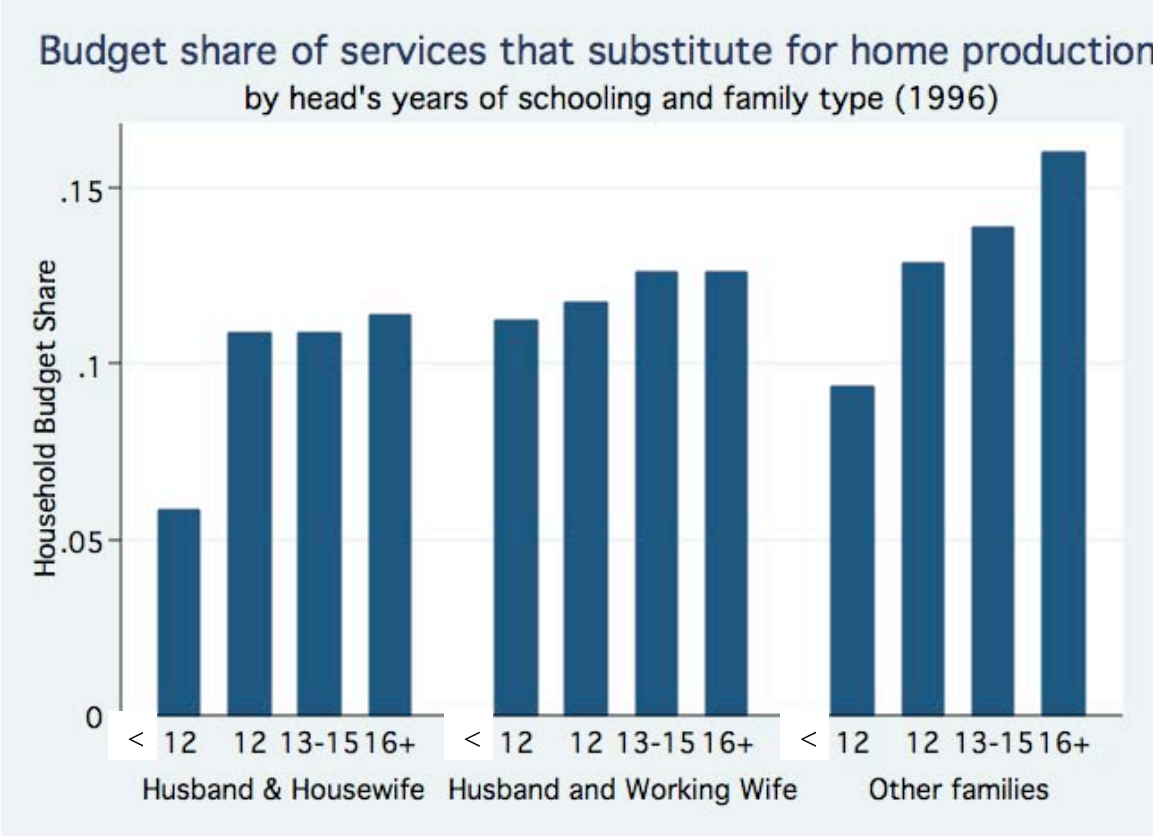


Note: All figures are weighted using weights provided by the Bureau of Labor Statistics. The sample is restricted to households headed by individuals at least 18 and no more than 65 who worked for salary in the twelve months before the interview.

Source: 1996 and 2004 CEX Diary Surveys.

Figure 2

Differences across family types in the relationship between household budget share of home services and head's educational attainment

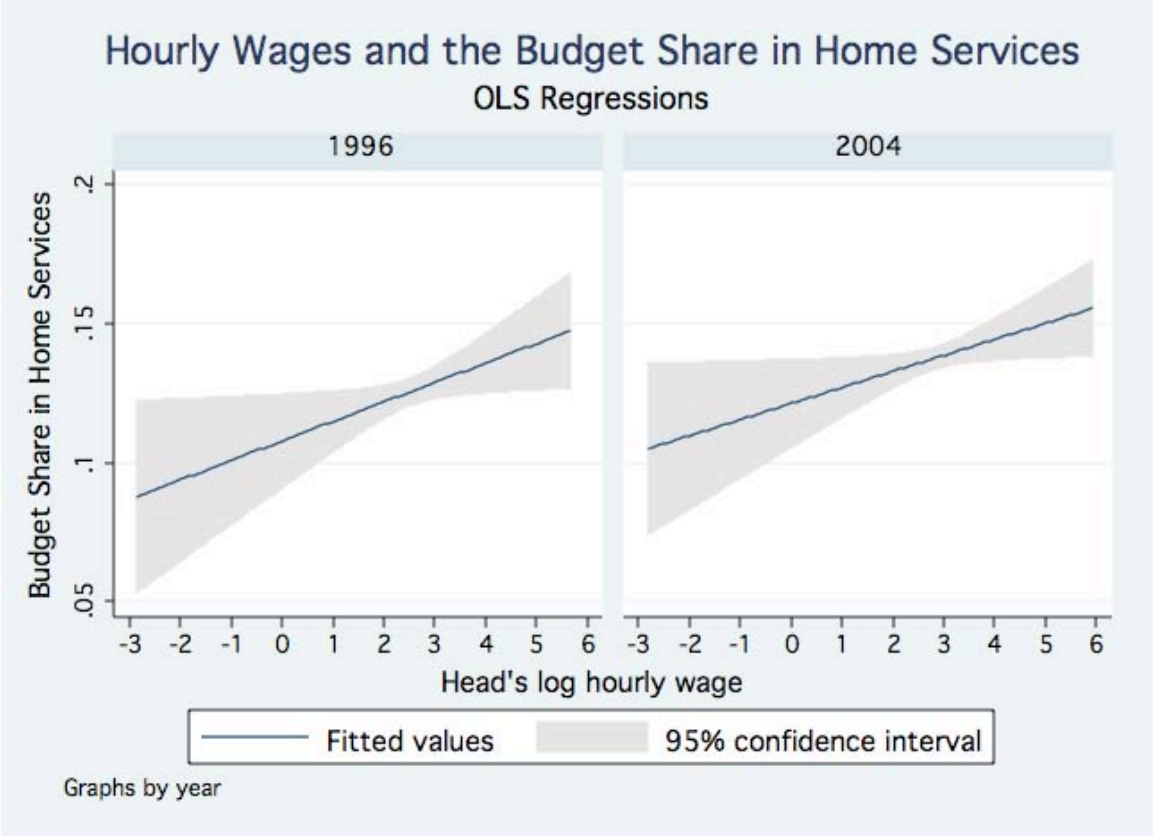


Note: All figures are weighted using weights provided by the Bureau of Labor Statistics. The sample is restricted to households headed by individuals at least 18 and no more than 65 who worked for salary in the twelve months before the interview. "Other families" include single-adult families (73%) and other mixed families (27%).

Source: 1996 and 2004 CEX Diary Surveys.

Figure 3

Correlation between log hourly wages of the head and household budget share in home services

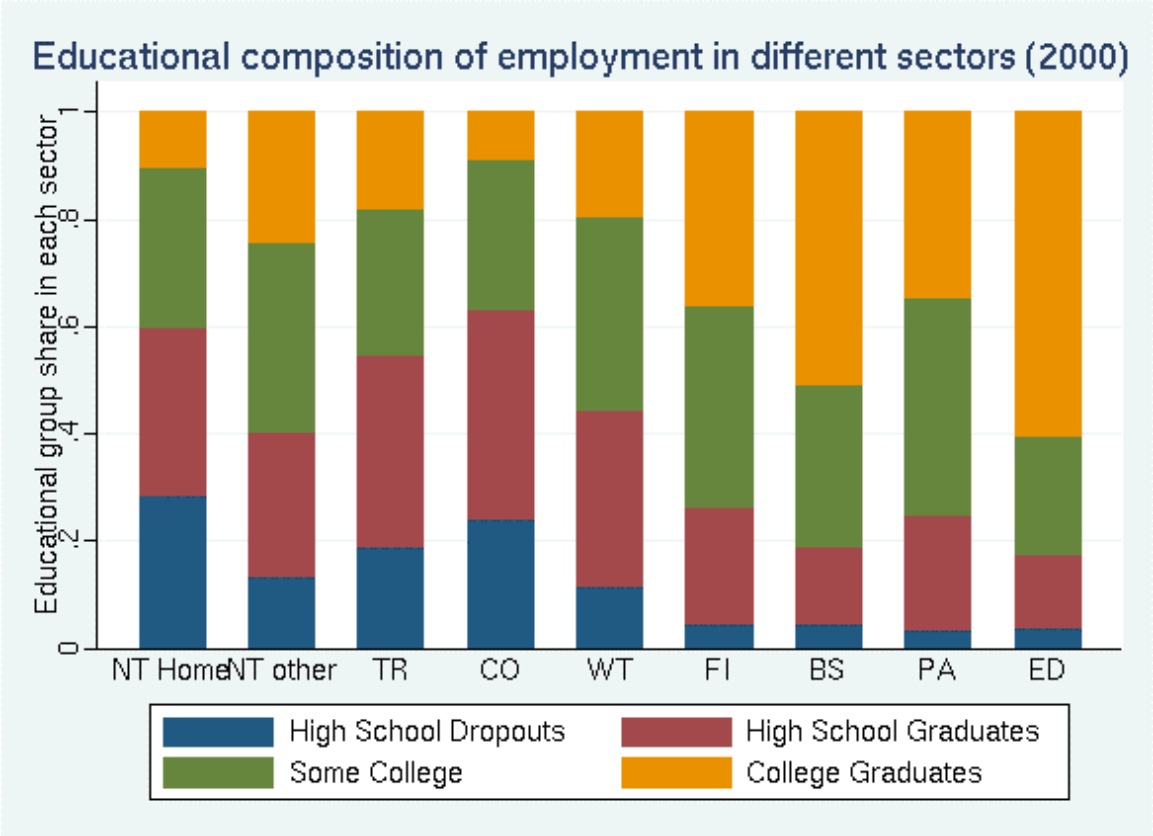


Note: OLS fit and 95% confidence interval. The slope coefficient is 0.006 in both years (standard errors of .003 and 0.002 in 1996 and 2004 respectively).

Source: 1996 and 2004 CEX Diary Surveys.

Figure 4

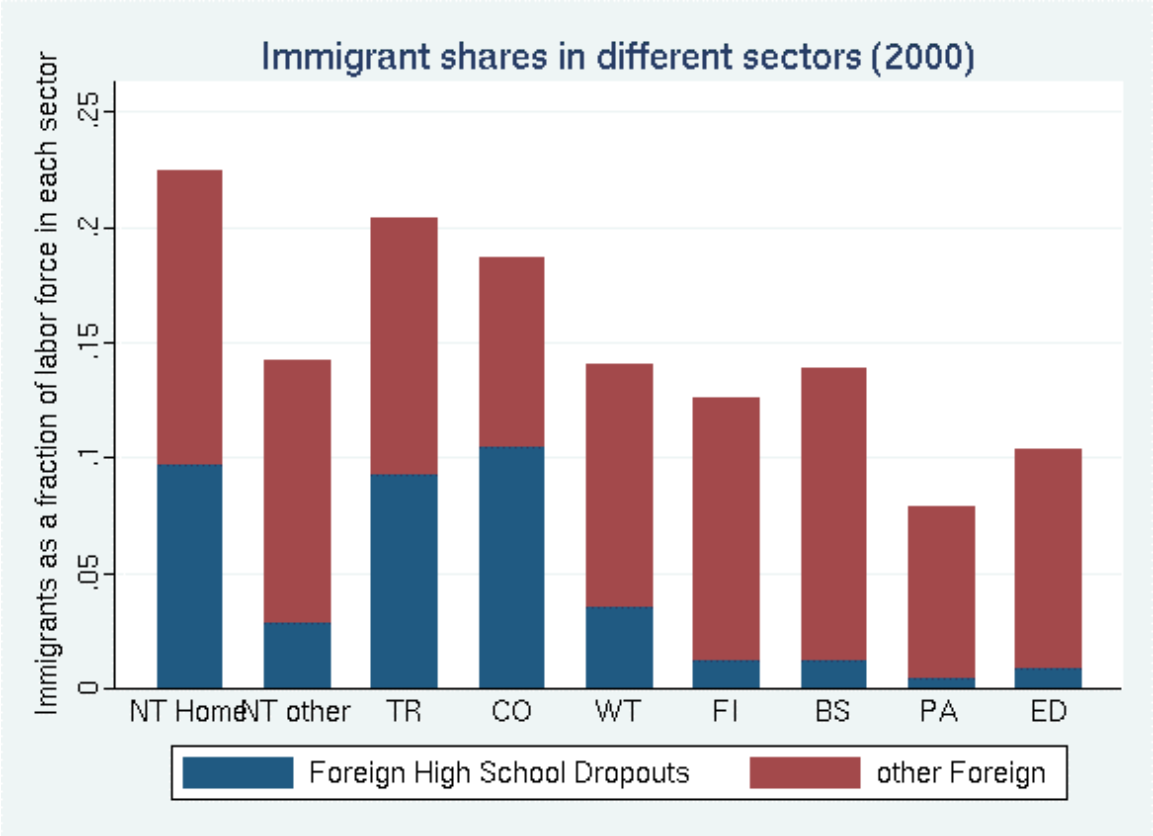
Low-skill and high-skill intensive services



Legend: NT: clearly non-traded sectors/occupations, of which NT Home includes services that can be thought as substitutes of home production (e.g. personal and cleaning services); TR: clearly traded (agriculture, mining and manufacturing); CO: construction; WT: wholesale, transportation, utilities; FI: financial services; BS: business services; PA: Public Administration; ED: education (see Tables A2-A3).
Source: 2000 census.

Figure 5

Immigrant intensive sectors



Legend: NT: clearly non-traded sectors/occupations, of which NT Home includes services that can be thought as substitutes of home production (e.g. personal and cleaning services); TR: clearly traded (agriculture, mining and manufacturing); CO: construction; WT: wholesale, transportation, utilities; FI: financial services; BS: business services; PA: Public Administration; ED: education (see Tables A2-A3).
Source: 2000 census.

Table A1
Assigning expenditure items to categories of home services

Category	Universal Classification code (UCC): 1996 files
Food away from Home	190110 Lunch at restaurants, cafes, etc... 190210 Dinner at restaurants, cafes, etc... 190310 Snacks and non alcoholic beverages, including tip 190320 Breakfast and brunch at restaurants, cafes, etc... 190901 Food or board, at school and rooming/boarding houses
Drink away from Home	200510 Beer and ale away from home 200520 Wine away from home 200530 Other alcoholic beverages away from home
Repair and Maintenance	230000 Repair, maintenance, and improvements for built in dishwasher, garbage disposal, and range hood 230110 Maintenance of property, including items such as ceiling repair, black top, brick, or masonry work, air conditioner repair, roof and awning repair, house painting, papering, chimney cleaning, electrical inspection, furnace inspection and repair, wiring, pest control, carpenter, plumber, etc... 230140 Repair disposal, dishwasher, range hood 270210 Water and sewerage maintenance 270410 Garbage, trash collection 270900 Septic tank cleaning 340610 Repair of television, radio, and sound equipment, excluding installed in vehicles 340620 Repair of household appliances; including stove, vacuum, washer, dryer, sewing machine, refrigerator, and calculator; excluding garbage disposal, range hood, and built-in dishwasher 340630 Furniture repair, refurnishing, or reupholstery 340903 Miscellaneous home services and small repair jobs not already specified 340913 Repair and alterations of miscellaneous household equipment, furnishings, and textiles 440110 Shoe repair and other shoe services 440130 Alteration, repair, tailoring of apparel and accessories 440150 Watch and jewelry repair
Delivery Services	340120 Delivery services
Babysitting Services	340210 Babysitting or other home care for children
Housekeeping Services	340310 Housekeeping service, such as housekeeping, cooking, maid service, interior decorating, and carpet and upholstery cleaning services 340410 Gardening and lawn care services, such as mowing, tree services, fertilizing, and yard work

(Table A1, continue)

	340510 Moving, storage, and freight express 340520 Non-clothing household laundry or dry cleaning not coin operated 440210 Apparel laundry and dry cleaning not coin operated
Personal Care Services	650110 Personal care services for females, including haircuts 650210 Personal care services for males, including haircuts

Notes: The classification is based on the Universal Classification Code (UCC) Titles in the 1996 CEX Expenditure files. Some UCC have been added over time. For example, the 2004 classification includes more detailed codes on meals away from home.
The basic criterion to assign the status of "home services" to an expenditure item is whether it represents a market substitute for the output of home production.

Table A2
Sectors that deliver services that substitute for home production activities

Category (IPUMS variable IND1990)	Codes	Classification
Agriculture, Forestry and Fisheries	10-32	TR
Mining	40-50	TR
Construction	60	CO
Manufacturing	100-392	TR
Transportation	400, 410-432	WT
Except: **Bus service and urban transit**	**401**	**NT other**
Taxi and limousine service	**402**	**NT Home**
Communications	440-442	WT
Utilities and Sanitary Services	450-472	WT
Wholesale Trade	500-571	WT
Retail Trade	**580-691**	**NT other**
Except: **Eating and Drinking Places**	**641**	**NT Home**
Finance, insurance and real estate	700-712	FI
Business and Repair Services	721, 731-732, 741	BS
Except: **Services to buildings**	**722**	**NT Home**
Detective and Protective Services	**740**	**NT Home**
Automotive Rental and Leasing	**742-751**	**NT other**
Other Repair Services	**752-760**	**NT Home**
Personal Services	**761-791**	**NT Home**
Entertainment and Recreation services	**800-810**	**NT Home**
Health and Social Services	**812-40,852, 861, 870-81**	**NT other**
Except: **Child Care Services**	**862-863**	**NT Home**
Legal Services	841	BS
Educational Services	842-851, 860	ED
Engineering, Management & Professional Services	882-893	BS
Public Administration	900-932	PA

Notes: The codes refer to the IPUMS variable IND1990, which is a modified version of the 1990 Census Bureau industry classification scheme and provides a consistent set of industries codes for Census years 1980, 1990 and 2000, and for the American Community Service data from 2001 on (Ruggles et al. 2004).
IND1990 was created in the IPUMS using a series of technical papers published by the Census Bureau that provide detailed analyses of how the industrial coding scheme for each census year differed from the scheme used during the previous census year. These industrial "crosswalks" are based on samples of cases that are "double coded" into the industrial schemes of the current and previous census year. The original Census Bureau crosswalks are available via links, at http://usa.ipums.org/usa/chapter4/chapter4.shtml#crosswalks

Legend: NT: clearly non-traded sectors, NT Home: non-traded sectors delivering services that substitute for home production activities, NT other: other non-traded sectors; TR: clearly traded sectors; CO: construction; WT: wholesale, transport and utilities; FI: financial services; BS: business services; PA: Public Administration; ED: education.

Table A3
Occupations that deliver services that substitute for home production activities

Category (IPUMS variable OCC1990)	Codes
NT Home	
Private household occupations	405 - 407
Protective service occupations	415 - 427
Food preparation and service occupations	434 - 444
Cleaning and building service occupations (except households)	448 - 455
Personal service occupations	456 - 465
Gardeners	486
Animal caretakers (except on farms)	487
Laundry workers	748
Taxi cab drivers and chauffeurs	809
Garbage and recyclable material collectors	875
NT other	
Sales occupations	243 - 283
Information clerks	316 - 323
Health service occupations	445 - 447
Washing, cleaning and pickling machine operators	764
Bus drivers	808 - 813
Freight, stock and material handlers (except garbage collectors)	875 - 889

Notes: The codes refer to the IPUMS variable OCC1990, which is a modified version of the 1990 Census Bureau occupational classification scheme that provides a consistent set of occupations codes for Census years 1980, 1990 and 2000, and for the American Community Service data from 2001 on (Ruggles et al. 2004).
Specifics on the methods applied to insure consistency can be found in the BLS Working Paper "Proposed Category System for 1960-2000 Census Occupations", Peter B. Meyer and Anastasiya M. Osborne, U.S. Bureau of Labor Statistics, Working Paper 383, September 2005, available at http://usa.ipums.org/usa/chapter4/OCCBLS_paper.pdf
Legend: NT Home: clearly non-traded occupations delivering services that substitute for home production activities; NT other: other non-traded occupations.