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Are child care worker wages impacted by the forces of supply and demand? An examination of state-level data

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Are child care worker wages impacted by the forces of supply and demand? An examination of state-level data

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Contents

Introduction.....	2
Economic assumptions about labor markets and wages: Models of supply and demand.....	2
Should child care worker wages follow the model?	3
Child care worker characteristics	3
Factors that influence child care worker wages	4
General influences on women’s wages	4
Specific wage influences related to child care work	6
The wage ceiling in the labor market for child care workers	7
Research methods	8
Findings	11
Discussion and conclusion.....	12
References.....	14
Tables.....	16
Table 1. U.S. Median hourly wage data, 2002, 2007, and 2016.....	16
Table 2. Descriptive statistics: Source variables.....	17
Table 3. Descriptive statistics: Model variables	19
Table 4. Change in mean value and t test results for source variables, 2002 and 2007	20
Table 5. Correlation between model variables.....	21
Table 6. Regression model output: Predicting change in median child care worker hourly wage	22
Table 7. Regression model output: Predicting change in mean child care worker hourly wage	23
Figures	24
Figure 1. A model of supply and demand in a competitive market	24
Figure 2. Supply and demand in a labor market	25
Figure 3. Shifts in labor market supply and demand	26
Figure 4. U.S. Employment in the most common personal care and service occupations, 2002, 2007, and 2016.....	27
Figure 5. The invisible wage ceiling in the market for child care workers.....	28

Introduction

Demand for child care services has increased steadily in conjunction with women's increased workforce participation over the latter half of the twentieth century and first part of the twenty-first century. Despite a significant increase in demand, which would be expected to place upward pressure on worker wages in a competitive labor market, wages for workers in this field hover near the poverty line and appear resistant to change. Do the forces of supply and demand, which are expected to set the wage rate in competitive labor markets, apply in the market for child care workers? In this paper, I explore this question using descriptive statistics and regression modeling with state-level data from the U.S. Census Bureau and Bureau of Labor Statistics. I discuss multiple factors which place downward pressure on women's wages, generally, and on child care worker wages specifically. These factors are hypothesized to create a wage ceiling in the market for child care workers, which prevents the wage from reaching an efficient equilibrium point.

Indicators of supply and demand were not found to be significantly associated with changes in child care worker wages over a five-year period spanning 2002 to 2007. Changes in overall economic conditions, and conditions for low-wage workers, were found to have some effect on child care worker wages. The wage ceiling appears resistant to changes in supply and demand, but is impacted to some extent by conditions in the larger economy.

The rest of this paper is organized as follows: in the next section, I give an overview of a basic neoclassical economic model to explain wages as determined by forces of supply and demand in labor markets. Then, I will present child care work as a feminized labor market that exists within a unique segment of the service sector (care work) which experiences particular downward pressure on wages. Based on an invisible wage ceiling created by these pressures, I hypothesize that traditional forces of supply and demand will have minimal or no impact on child care worker wages. Next, I use multiple regression modeling to examine the extent to which the forces of supply and demand are at work in the child care labor market over a five-year period spanning 2002 to 2007. I then discuss implications of this research.

Economic assumptions about labor markets and wages: Models of supply and demand

Economists use models to understand the buying and selling behavior that takes place in markets. A basic economic model of a market demonstrates supply and demand as factors which collectively determine the market price for a good or service. For the purpose of conceptualizing a model, a competitive market is considered to be made up of the many buyers and many sellers of a particular good or service. For example, there are separate markets for cars, homes, cups of coffee, tax preparation services, and child care. In general, as the market price of a good or service goes down, demand for that good or service will go up. At lower prices, consumers will opt to purchase more of a good or service (to a point). If the market price were to increase, all else equal, consumers would want to purchase less of the (now comparatively more expensive) good or service, and demand would go down. On the other hand, as the market price increases, supply of a good or service will increase as well. Producers will want to produce and sell more goods or services at higher prices, since profits will increase per unit sold. Supply will decline as the market price goes down and producers yield smaller profits per unit sold.

Figure 1 presents a model of supply and demand in a competitive market composed of many buyers and sellers of a particular good or service. In this example, the market price for the good or service will settle at the equilibrium point, where the supply curve intersects with the demand curve (at P^* and Q^*). If

the market price were set too high, the good or service would be over-produced and under-consumed, leading to a surplus (excess supply). Producers would lower the price to the point where everything that was produced could be sold, at P^* and Q^* . If the market price were set too low, the good or service would be under-produced and many consumers would be unable to consume it (a shortage). Under these conditions, consumers would be willing to pay more for the good or service and this willingness would drive the price up to P^* and the quantity sold up to Q^* , the point at which demand is equal to supply.

A model of the labor market puts individual workers in the role of suppliers (laborers supply their labor to the market for a price – the wage) and employers in the role of demanders (they demand labor to produce the goods and services that are sold in various markets). There are markets for different types of labor (e.g., teachers, mechanics, doctors, chefs). Generally, jobs that require higher levels of human capital (skills, education, and training) will command higher wages. Within a given labor market, as wages go up, more individuals (labor suppliers) are willing to work outside of the home and supply labor to the market. As wages go down, the opportunity cost of spending time at home decreases, and workers will be less willing to work outside the home. Conversely, for employers (organizations that demand labor), as the wage goes down, more (relatively cheap) labor will be demanded, and as the wage goes up, less (relatively expensive) labor will be demanded. Figure 2 displays a model of a labor market.

Certain factors can influence wage levels in a labor market. For example, if a labor market is flooded with new workers over time, the supply curve will shift outward (demonstrating an increase in the number of available workers at any given wage) and ultimately drive the market wage down to a new equilibrium point. Alternately, if the number of qualified workers in the labor market decreases over time, the supply curve will shift inward, driving wages up (Figure 3). On the demand side, if demand for the good or service produced by an employer increases over time, this can shift the demand curve outward (demonstrating an increase in labor demanded to produce the good or service) and ultimately drive the market wage upward to a new equilibrium point (Figure 3). Conversely, if demand for an employer's product or service goes down over time, this can shift the demand curve inward, with employers hiring fewer workers and the wage declining as available workers compete for relatively fewer jobs.

Should child care worker wages follow the model?

If the market for child care workers was a competitive labor market, we would expect that the wage would be set by forces of supply and demand, as described above. However, there are several factors that suggest that the market for child care workers may not function as a typical labor market. These factors create an invisible wage ceiling which keeps wages low, while also ensuring that a reserve supply of willing workers will be available to fill vacated jobs when current workers leave in search of better opportunities or for other reasons. A discussion of child care worker characteristics, factors that influence wages, and the concept of a wage ceiling, are presented below.

Child care worker characteristics

Child care work is characterized by low education levels, low wages, few benefits, and high turnover (Whitebook, 1999). Workers provide care in a variety of settings, including daycare centers, private homes - their own (home-based daycare facilities) and their clients' (nannies), schools, and businesses. This occupation is dominated by women. Ninety-four percent of the nation's 1.28 million child care workers are female, and a majority (nearly sixty percent) are white (Bureau of Labor Statistics, 2017a). Roughly thirty percent of workers have a high school diploma, and nearly forty percent have some sub-baccalaureate college experience, less than a bachelor's degree (Gould, 2015).

In 2016, the typical hourly wage for a child care worker was \$10-11 per hour, with a mean wage of \$11.02 and a median wage of \$10.18. This translates to a median annual wage of \$21,170 and a mean annual wage of \$22,930 (Bureau of Labor Statistics, 2017b). For a family of three, a child care worker's

full-time wages would fall close to the poverty threshold of \$20,420 for the year 2016 (Department of Health and Human Services, n.d.). This assumes that the worker held full-time hours and was employed all year. Employer-provided benefits are rare for child care workers. Just 15 percent of these workers have employer-provided health insurance coverage (compared to roughly 50 percent of workers in other occupations), and only 9.6 percent have employer-provided pension coverage (compared to 39 percent of other workers). Employees in nonprofit daycare centers earn the highest wages, followed by those in for-profit daycare centers, with self-employed providers who offer care in their own homes earning the least (Whitebook, 1999).

Factors that influence child care worker wages

“Pink collar” jobs in fields dominated by women pay less than other jobs (Folbre, 2001). A longstanding precedent exists for paying low wages for jobs (like child care and cleaning services) that were traditionally performed by women in the home, and, more generally, for paying women less than men for any type of market-based work.

The Bureau of Labor Statistics (2015a) places child care work in the Personal Care and Service (PCS) category of occupations. Other jobs in this category include personal care aides (workers who provide physical assistance and social support to help clients with everyday living), barbers, hairdressers, cosmetologists, animal care and service workers, and recreation workers (Bureau of Labor Statistics, 2015a). The most common occupations in the PCS category in 2016, based on number of workers nationally, were personal and home care aides (comprising 33.1 percent of PCS workers), child care workers (12.6 percent of PCS workers), and hairdressers, hairstylists, and cosmetologists (7.8 percent of PCS workers).¹ See Figure 4 for total workers in these occupations in 2016, along with historical data for the study period (2002 and 2007). These occupations have all traditionally been female-dominated; women comprised 84.9 percent, 94.4 percent, and 92.4 percent of the workforce in each occupation, respectively, in 2016 (Bureau of Labor Statistics, 2017a).

Occupations in the PCS category make up a growing portion of the economy. In 2002, PCS workers made up 2.29 percent of American workers; by 2016 this figure had grown to 3.22 percent.² A large jump in the number of personal care and home aide jobs in recent years has driven the increased prevalence of PCS workers in the economy, as shown in Figure 4. Over the past 10-15 years, typical (median hourly) wage levels in all PCS occupations have hovered at a little bit less than 2/3 of the typical wage in all occupations. Hairdressers, hairstylists, and cosmetologists fare slightly better (generally earning a little bit more than 2/3 of the median wage in all occupations). Personal and home care aides and child care workers fare slightly worse, typically earning 58-60 percent of the median wage in all occupations (see Table 1).

Child care worker wages are low in relation to workers in all occupations, and in relation to female-dominated occupations in the PCS category. Child care worker wages are influenced by both the general factors which keep wages for all women low, as well as specific factors related to the nature of care work.

General influences on women’s wages

Women have always earned less than men in the labor market. Historian Alice Kessler-Harris (1991) finds that low wages for women helped to encourage marriage and women’s dependency on a male breadwinner in the early twentieth century. Rather than paying women based on the value of their productive abilities, employers paid women based on the customary notion that they were dependents.

¹ Calculated using data from the Bureau of Labor Statistics Occupational Employment Statistics national data, May 2016, available at <https://www.Bureau of Labor Statistics.gov/oes/tables.htm>.

² Calculated using data from the Bureau of Labor Statistics Occupational Employment Statistics national data, May 2002 and May 2016, available at <https://www.Bureau of Labor Statistics.gov/oes/tables.htm>.

This meant that a woman was assumed to live with a male breadwinner (father or husband) who could command a high enough wage to support a family. Women's wages were thought of as supplemental to a family's income, and only used for incidental expenses. This idea helped to keep women's wages low and pressured women to follow the social ideal of marriage rather than risk poverty by living alone. Women who did live independently were forced to be frugal due to low wage levels.

Generally, women's wages have been kept low by social ideas about what a woman needs and the value of work traditionally done by women in the home. Women's increased participation in the labor force, including making inroads into traditionally male-dominated fields, led to some wage improvement over the latter part of the twentieth and first part of the twenty-first centuries. In 1950, women made up just 29.6 percent of the civilian labor force. By 2015, women constituted 46.8 percent of the labor force (Department of Labor, n.d.). Women's earnings as a percentage of men's have crept up over the past several decades. In 1960, working women earned 60.7 cents for every working man's dollar (Department of Labor, n.d.). By 2016, this figure had increased to 81.9 cents (Institute for Women's Policy Research, 2017). These increases have been aided by antidiscrimination policy. For example, the Equal Pay Act (1963) requires employers to pay men and women equal wages for equal work, and Title VII of the Civil Rights Act (1964) makes it illegal for employers to discriminate based on sex.

Female-dominated occupations (including housekeepers, personal care aides, and home health aides – jobs historically performed by women in the home) generally pay less than male-dominated occupations, even when similar levels of skill are required (Institute for Women's Policy Research, 2017). The underpinnings of the low valuation assigned to work traditionally done by women in the home date back to the industrial revolution. As the economy became industrialized in the late 18th and early 19th centuries, families largely abandoned a farm homestead lifestyle and migrated to more urban areas. Men sought to gain wealth in market-based endeavors, as entrepreneurs and employees. They were seen as successful if they became prosperous enough to support their wives staying at home as “women of leisure” (Blau, Ferber, & Winkler, 2010). Not all families achieved this goal: many immigrant women held jobs outside of the home and African American women have always worked outside of the home. Yet social aspirations around the idea that a husband had achieved wealth and status if his wife stayed at home as a woman of leisure persisted. In order for a home-based wife to truly lead a leisurely existence, a staff of house servants would need to be hired to perform all of the housework and child care. This was a reality for very few households. Most families with a stay-at-home wife could not afford the luxury of hiring staff, and wives continued to perform the work of caring for children and other family members, cooking, cleaning, and otherwise managing the home. The actuality of this hard work was hidden underneath the social ideal of “women of leisure” (Blau, Ferber, & Winkler, 2010). The separation of the market as a place of “work” and the home as a place of “leisure” solidified the notion that market-based work is worth more than the care and productive work that is performed in the home. By the early 1900s, when men dominated paid work and brought home valued paychecks, the unpaid work traditionally done by women in the home was progressively seen as less valuable than work for pay (Amott & Matthaei, 2006).

As women steadily increased participation in the workforce over the second half of the twentieth century, the care work that had once taken place at home became more and more commodified (e.g., performed by child care workers and personal care aides). These jobs were, and continue to be, low-paid. Low pay in labor markets for care work may be related to the association of this work with women, or social constructions that view women's work as unimportant or low-skilled relative to work performed by men (England and Folbre, 1999).

Enduring social norms such as the influence of custom that is discussed by Kessler-Harris (1991) and the devaluation of female-dominated “pink collar” occupations described by Folbre (2001) put downward pressure on women's wages. Specific wage influences related to child care workers are described in the next section.

Specific wage influences related to child care work

Beyond the general reasons for the gender wage gap discussed above, child care worker wages are subject to additional downward pressures. These pressures relate to social norms, the cost of purchasing child care services, the nature of care work, and the ease of replacing workers due to work-first welfare policy.

As shown in Table 1, wage differentials exist among the most common jobs in PCS occupations. Hairdressers, hairstylists, and cosmetologists typically earn higher wages than child care or personal care workers. The relative wage advantage afforded to hair care and cosmetology workers may in part be a result of higher entry-level education requirements relative to workers in child care and personal care occupations. Education and training are commonly seen as pathways to the development of skills and technical abilities that increase an individual's productive capabilities and enable her to command higher wages in the labor market (Becker, 1994). The Bureau of Labor Statistics (2015a) cites a postsecondary nondegree award (i.e., the completion of a state-licensed cosmetology program) as a typical entry-level requirement for hair care and cosmetology workers. A high school diploma or equivalent is the typical entry-level requirement for child care workers, and no formal education credential is generally required for entry into personal care aide jobs (Bureau of Labor Statistics, 2015a).

Why do hair care and cosmetology require more formal skills than occupations that oversee the safety and well-being of children and adults? Child care workers, for example, prepare meals for children, organize their activities, develop and follow age-appropriate schedules, and oversee hygiene and basic needs (Bureau of Labor Statistics, 2015b). Prior to women's influx into the labor market over the last several decades, these activities had traditionally been performed in the home. As described above, work that is associated with a homemaker's tasks is generally undervalued and seen as based on women's "natural" abilities, not skills and technical knowledge. For child care workers, training is short-term and typically occurs on the job (Bureau of Labor Statistics, 2015b). Few education requirements and limited opportunities for training mean that there are generally few returns to education. In other words, caregiving requires very little formal education, and the occupation is not structured in such a way to offer workers enhanced responsibilities or higher wages if they were to invest time and effort into earning postsecondary credentials. A lack of opportunity within the child care field contributes to a high rate of employee turnover among workers. Whitebook (1999) found an extremely high turnover rate among child care workers, with around one-third leaving their jobs each year, often in search of better opportunities. The low education requirements and high turnover associated with child care work stand in contrast to the societal value placed on quality child care, which is seen as important to the country's social and economic well-being (Child Care Aware, 2015).

Despite high rates of turnover, there is no shortage of new workers available to step in to recently vacated jobs. The large reserve of willing workers was created, in large part, by the work-first welfare policy of the past twenty-plus years. The Temporary Assistance for Needy Families (TANF) program, formally created through the Personal Responsibility and Work Opportunity Reconciliation Act of 1996, is a work-focused welfare program that led to an influx of female workers with little education into low-wage labor markets. The predecessor to TANF, Aid to Families with Dependent Children (AFDC), provided cash assistance to qualified low-income families largely headed by single mothers, without work requirements or time limits (Blau, Ferber, & Winkler, 2010). TANF eliminated AFDC and tied cash assistance to work requirements. Recipients must work in the labor market as a condition of receiving benefits, and are subject to a 60 month lifetime limit on receipt of benefits (Edin & Shaefer, 2015). TANF sent many thousands of single mothers with little education into the labor market, flooding low-wage, low-skill jobs, in occupations related to service and care work (Edin & Shaefer, 2015). These jobs are often part-time, have nonstandard hours with little flexibility, few benefits, and little (if any) paid time off. For the low-income single mothers who tend to work in these positions, a sick child or car trouble can

lead to job loss. For this reason, women in this type of work tend to lose jobs often and are frequently searching for new ones (Edin & Shaefer, 2015). As TANF reaches fewer and fewer families in need (Center on Budget and Policy Priorities, 2016), these women are left with no choice but to take whatever work is available, regardless of job conditions. It is possible that supply in highly feminized low-wage, service sector jobs has maxed out since the late 1990s to the point where, now, changes in supply in one low-wage occupation (child care workers) have little impact on already-low wages, since workers leaving other low-wage, low-skill labor markets (personal care aides, food service workers, etc.) are also cycling in and out of jobs and moving around to others.

There are additional explanations for the low wages received by child care workers. The cost of child care has very little room to increase, since families are already spending so much money on care services. Costs of care in the states range from a high of \$17,062 for full-time infant care in a Massachusetts-based center to a low of \$4,822 for similar services in Mississippi. Care for older children is slightly less expensive, ranging from a high of \$12,781 for center-based care in Massachusetts to a low of \$3,997 for similar services in Mississippi (Child Care Aware, 2015). Costs of care are significant for families. Nationwide, families can expect to spend more on infant care than on food. In nearly half of all states, the cost of care for a family with two children and a house exceeds the amount spent on mortgage payments (Child Care Aware, 2015). Limits on acceptable cost of care services place a ceiling on potential wages for workers in the industry. Therefore, increases in demand for services are not likely to lead to the wage increases that would be expected in a competitive labor market.

Even if child care workers did consider collective action for higher wages, the consequences of striking as a tactic for increasing wages may prevent them from taking this action. Nancy Folbre (2001) describes workers in care-related fields as “prisoners of love.” A unique aspect of purchasing care in the market is that the provider will often begin to develop feelings of attachment and affection for the client, and vice versa. This attachment can make it difficult for the caregiver to threaten to withhold services by, for example, going on strike to demand higher wages, because they know that their absence can harm the client – in this case, leaving a family without care for their child (Folbre, 2001). Further, the warm relationships that often arise in caregiving work may be used as justification for why financial remuneration for this work is so low. Folbre (2001) notes that the inherent fulfillment that comes from having caring relationships with clients may be used to justify paying workers lower wages. In other words, the value of the satisfaction received from these relationships is part of the worker’s overall compensation package.

Child care workers exist in an economic system that provides low wages for women, generally, and even lower wages for commodified jobs that were once routinely performed in the home. The next section will describe the wage ceiling created by the forces which place downward pressure on wages in the labor market for child care workers.

The wage ceiling in the labor market for child care workers

The combination of factors which collectively keep child care worker wages low include social norms and enduring customs that devalue women’s work, the belief that intrinsic satisfaction derived from care work is an effective substitute for a higher wage, the inability of employers to raise child care fees to improve worker compensation due to parents’ limited ability to pay, and “prisoner of love” pressures which prevent workers from making credible threats to withhold services in efforts to bargain for higher wages. These factors create an invisible wage ceiling that benefits employers and consumers of child care services (working parents), but disadvantages workers.

In a competitive market, it is assumed that a price ceiling (a price limit that artificially lowers the price below the market equilibrium) would lead to a supply shortage. If a price (wage) ceiling were put in place in a competitive labor market, workers would leave the market in search of better opportunities and

employers would be left short-staffed, driving the wage higher as employers competed for relatively few remaining workers. High turnover rates in child care work, with many workers leaving in search of better opportunities (Whitebook, 1999), suggest that the low wages have an impact on supply in this occupation to some extent. However, this is not a problem for employers due to TANF's creation of a large reserve of willing replacement workers and the inherent instability of low-wage work that keeps workers cycling through spells of employment and joblessness, and often searching for new jobs. Employers therefore have an easy time replacing former workers with new workers cycling in to the market. The wage ceiling creates artificially low employee costs, which allow employers to hire more workers and provide more child care services than would be possible if a competitive wage was paid to workers. Figure 5 demonstrates this concept.

In the context of a wage ceiling, neither supply changes nor changes in demand for child care workers are expected to significantly impact wages. Favorable wage changes in the overall economy, and wage policy benefiting low earners, may exert some upward pressure on the wage ceiling, though not enough to push wages up to the natural equilibrium point. The next section, Research Methods, describes the statistical methods that were used to assess changes in the supply of child care workers, and demand for care, during the study period.

Research methods

This study used descriptive statistics and multiple regression modeling with survey data from the U.S. Census and Bureau of Labor Statistics to examine the impact of changes in the supply of child care workers, and the demand for child care, on worker wages over a five-year period spanning 2002 to 2007. Data was collected at the state level for each of the fifty states and Washington, DC.

The Census Bureau conducts a national Economic Census every five years to collect economic and business information. A series of datasets containing information collected from the Economic Census related to state-level demand for child care services and the distribution of child care facilities in each state has been published by the Census Bureau for the years spanning 1987-2007 (five datasets total, for the years 1987, 1992, 1997, 2002, and 2007). Each dataset contains state-level data for the following variables: total child care facilities - broken down into nonemployer (home-based) facilities, taxable (for-profit) centers, and tax exempt (nonprofit) centers - and total facilities per 1,000 children under age 5.³

The Bureau of Labor Statistics publishes Occupational Employment Statistics in May of each year. These include estimated total number of employed individuals and mean and median hourly wages for all occupations, major occupational groups (e.g., PCS occupations; production occupations; education, training, and library occupations), and more specific occupations (e.g., child care workers; personal care aides; hairdressers, hairstylists, and cosmetologists).⁴ For this study, state-level employment and wage data was collected for all occupations generally, and for child care workers specifically. National data was collected for these categories, as well as for PCS occupations generally, as well. State-level wage data for all occupations was not available for 1997 or prior years, leading to the selection of 2002-2007 for the study period. All 2002 wage data was converted to 2007 dollars⁵ for the purpose of comparing changes in real wage values.

Data from the above sources was used to create the variables listed below for each state and Washington, DC for the period spanning 2002 through 2007. Each is presented with a description of the

³ This data is publicly available at https://www.census.gov/library/working-papers/2013/econ/2013_child_care.html

⁴ This data is publicly available at <https://www.Bureau of Labor Statistics.gov/oes/tables.htm>

⁵ The inflation rate was found using the CPI Inflation Calculator, available at <https://data.Bureau of Labor Statistics.gov/cgi-bin/cpicalc.pl>

source data used to calculate the variable and a discussion of whether the variable relates to supply of, or demand for, child care workers, or to other factors that could impact wages for child care workers.

Dependent variable

Change in real median hourly child care worker wage was used as the dependent variable. For a robustness test, a model with change in real mean child care worker hourly wage as the dependent variable was used as well.

- **Change in real median child care worker hourly wage, in dollars** (variable name: chg_medwage_cc)
Source data used was real median child care worker hourly wage in 2002 and 2007.
- **Change in real mean child care worker hourly wage, in dollars** (chg_meanwage_cc)
Source data used was real mean child care worker hourly wage in 2002 and 2007.

Independent variables

Two variables were used to gauge changes in wage conditions for all workers and for low-income workers. A third variable was used to indicate changes in the supply of child care workers, and a fourth was used to indicate changes in the demand for child care workers.

- **Change in median hourly wage for all occupations** (chg_medwage_alloccs)
This is a general indicator of wage changes in the economy. Source data used was the median hourly wage in all occupations in 2002 and 2007.
- **Change in state minimum wage** (chg_minwage)
This is a general indicator of wage changes for low wage workers. Prior research finds that minimum wage increases tend to have a “ripple effect.” When the minimum wage in a state is increased, workers who earn up to 150 percent of the minimum wage tend to see wage increases as well (see for example Harris & Kearney, 2014). This analysis found that median hourly child care worker wages, on average, amounted to 153% of a state’s minimum wage in 2002 and 151% of a state’s minimum wage in 2007. Source data used was the minimum wage in each state in 2002 and 2007.⁶
- **Change in home-based facilities as a portion of total child care facilities** (chg_homecare)
This is considered an indicator of the supply of child care workers. The Economic Census records the total number of home-based (nonemployer) child care facilities along with for-profit and nonprofit child care centers that employ workers. Occupational Employment Statistics collected by the Bureau of Labor Statistics do not include self-employed workers like home-based care providers in employment and wage estimates (Bureau of Labor Statistics, 2017c). An increase in the ratio of self-employed home child care providers to employers indicates that potential child care workers are leaving the labor market to work for themselves. In a competitive market, the exit of significant numbers of workers from a labor market should shift the supply curve inward and lead to increased wages (Figure 3). Source data used was the number of home-based, for-profit, and nonprofit centers, in 2002 and 2007.
- **Change in the number of facilities per 1,000 children under age 5** (chg_fac_per_child)
This is an indicator of demand for child care services, and, by extension, demand for child care workers. A decreasing number of facilities per 1,000 children under age five would suggest more

⁶ This data was obtained from the U.S. Department of Labor Wage and Hour Division and is publicly available at <https://www.dol.gov/whd/state/stateMinWageHis.htm>. Twenty-one states did not change the minimum wage during the study time period, and had the same minimum wage in 2002 and 2007. These states showed a decrease in the real value of the minimum wage over the study period.

competition for child care services (i.e., more children potentially need care, thus care providers will need to hire more child care workers to meet this need, shifting the demand curve outward as shown in Figure 3). With more parents demanding care for their children, and more care facilities seeking workers to meet this demand, wages for child care workers should increase. Source data used was the number of children under age 5, in thousands, and total number of child care facilities (including home-based, for-profit, and nonprofit), in 2002 and 2007.

Descriptive statistics for each of the source variables and each of the model variables are presented in Tables 2 and 3 respectively. T tests were performed to determine whether changes in the mean value of similar source variables collected for both 2002 and 2007 were statistically significant. The results of these tests are presented in Table 4.

A multiple regression model was used to determine the extent to which the forces of supply and demand impacted child care worker wages between 2002 and 2007, while controlling for overall wage changes and minimum wage changes that could influence child care worker pay. The model is expressed as follows:

$$y_i = \beta_0 + \beta_1 \text{chg_medwage_alloccs} + \beta_2 \text{chg_minwage} + \beta_3 \text{chg_homecare} + \beta_4 \text{chg_fac_per_child} + \varepsilon$$

Four hypotheses describe the expected impact of general wage changes, minimum wages changes, worker supply, and demand for workers, on child care worker wages.

Hypothesis 1: Increases in overall wage levels will lead to less pronounced increases in child care worker wages.

Real wages for most American workers have been stagnant over the past several decades. Lower income workers have experienced declining real wages since 2000, while the highest earners have seen gains (Desilver, 2014). The wage ceiling is expected to move upward to some extent when general wage conditions become more favorable. However, the collective downward pressures on child care worker wages are anticipated to persist, leading to a smaller increase for child care workers than seen in other occupations.

Hypothesis 2: Increases in minimum wage levels will lead to more pronounced increases in child care worker wages, relative to overall wage level increases.

Child care worker wages, which generally hover around 150% of a state's minimum wage, are expected to be more significantly impacted by the ripple effect of wage changes that specifically target low-income workers than by changes in overall wage conditions. Since high earners are more likely to benefit from changes in overall economic conditions, positive wage policy for low earners may exert more upward pressure on the wage ceiling for child care workers than an overall wage increase. An increase in the real value of a state's minimum wage is therefore predicted to have some effect on child care worker wages, and that effect is predicted to be larger than the effect of an overall wage increase.

Hypothesis 3: Changes in the supply of child care workers will not significantly impact child care worker wages.

Due to the large supply of workers cycling through low-wage labor markets and providing an oversupply of potential child care workers at any given time (Figure 5), changes in the supply of child care workers are hypothesized to have no effect on worker wages.

Hypothesis 4: Changes in the demand for child care workers will not significantly impact child care worker wages.

Due to the existence of the wage ceiling, which artificially constrains wages and leads to a greater demand for child care workers than would be the expected in a competitive market (Figure 5), changes in the demand for child care workers are hypothesized to have no effect on worker wages.

Correlation between each of the model variables is displayed in Table 5. The results of the regression model are displayed in Table 6. As a robustness test, a similar model with change in the real mean child care worker wage from 2002 to 2007 as the dependent variable was also used. The results of this model are displayed in Table 7.

Findings

General trends shown in Table 1 reflect an overall decline in the real value of wages that is consistent with broad economic trends. Wages for all occupations decreased by 1.1 percent between 2002 and 2007 and wages for lower-paid PCS occupations decreased more significantly, by 1.7 percent. The real value of child care worker wages deteriorated even more significantly during the study period, by 2.1 percent.

At the state level, the real median child care worker hourly wage decreased by \$0.20, on average, during the study period, and this change was statistically significant ($p=0.008$). The average value of the median hourly wage for all occupations in each state declined less significantly, by \$0.05, and this change was not statistically significant. Twenty-nine states and Washington, DC increased their minimum wage, while twenty-one states did not, resulting in an average decline in the real value of the minimum wage of \$0.03 that was not statistically significant.

The substantial decline in the real value of child care worker wages occurred despite indicators showing essentially no change in the supply of workers and a slightly increased demand for workers - a sign that wages would increase or, if nothing else, stay the same, in a competitive market. Home-based facilities as a portion of total child care facilities, on average, barely changed during the study period, moving from 0.883 to 0.882 over the study period. This change was not statistically significant. Demand for services increased slightly during this period, with the average number of facilities per 1,000 children under age 5 falling from 39.3 to 39.0, though this change was also not statistically significant.

In the face of declining real wages, employment increased. Employment in all occupations increased by 5.4 percent between 2002 and 2007 and the number of child care workers increased by 26.4 percent.⁷ Labor force participation by mothers of young children, which has increased significantly over the past forty-plus years (fueling the need for child care services) stayed nearly even during the study period. Between 2002 and 2007, labor force participation by mothers whose youngest child was under 6 years old decreased by 0.6 percentage points, from 64.1 to 63.5 percent.⁸

Correlation was greatest between the wage variables. Change in median hourly child care worker wage had a weak to moderate positive association with change in median hourly wage for all occupations ($r=0.37$) and change in state minimum wage ($r=0.32$). A weak to moderate negative association was found between change in median hourly child care worker wage and change in home-based facilities as a percent of total child care facilities ($r=-0.29$). This indicates that as supply decreased (signified by the ratio of home to employer facilities going up, which suggests potential employees are leaving the labor market to become self-employed), wages decreased, which is the opposite of what would be expected in a competitive market. A weaker negative association was found between change in median child care

⁷ Calculated using publicly available data from <https://www.Bureau of Labor Statistics.gov/oes/tables.htm>

⁸ Longer-term trends show participation of mothers in this group increasing by 24.9 percentage points, from 39.0 to 63.9 percent, over the forty-year period spanning 1975 through 2015 (Department of Labor, n.d.).

hourly worker wage and change in number of facilities per 1,000 children under age 5 ($r=-0.17$). In a competitive market, a decrease in demand for workers (signified by the ratio of facilities to 1,000 children under age 5 going up, suggesting that the number of children needing care is going down relative to available facilities) would cause wages to decrease. This is consistent with the negative association that was found.

The regression model allowed for an analysis of changes in supply and demand in the context of overall wage changes and changes to the minimum wage. Controlling for other variables in the model, neither the supply nor the demand variables had a statistically significant impact on child care worker wages. Wage conditions for all workers, and for low wage workers, were the only factors significantly associated with child care worker wages.⁹

This evidence supports Hypothesis 1 and, partially, Hypothesis 2. Increases in overall wages and minimum wages were associated with child care worker wages. However, changes in the state minimum wage were expected to have a relatively larger effect on child care worker wages than changes in wages for all occupations, and this was not the case. The model predicted that a dollar increase in the median hourly wage for all occupations would yield a \$0.65 increase in median child care worker hourly wages ($p=0.001$). Changes in the state minimum wage were projected to have a smaller impact, with a dollar increase expected to produce a \$0.29 increase in median child care worker hourly wages ($p=0.002$). Hypotheses 3 and 4 were supported by the model: changes in supply and demand indicators were not found to be associated with child care worker wages.

There are three significant limitations associated with this research. First, it is inherently difficult to conceptualize and measure states' supply of, and demand for, child care employees. On the supply side, this difficulty stems from the nature of child care work, which is performed in nonprofit and for-profit centers as well as private home-based facilities (all included in this study) and by nannies and baby-sitters. Reliable, complete data on the prevalence of nannies and baby-sitters is not presently available, as some work for formal agencies and others work under-the-table in the informal economy. Unlicensed home-based daycare centers, operating in the informal economy, are missing from this analysis as well. In terms of demand, it is difficult to capture the true demand for child care workers without an understanding of parents' access to unpaid child care from family members or friends, and access to possible local resources like free pre-kindergarten programs. This paper represents an initial attempt at measuring state-level supply and demand for child care workers; future research may develop additional methods for measurement. Second, while several years' worth of Economic Census data (dating back to 1987) was available, correlating Bureau of Labor Statistics employment and wage data was not available for Economic Census years prior to 2002. Therefore, this research was limited to the five-year period spanning 2002 through 2007. In the future, I plan to manually assemble Economic Census data from 2012 and revise this study to include another five-year period. A third limitation is the lack of one or more comparison groups. It would be useful to obtain data for similar occupations and use a model with comparable variables to measure the extent to which supply and demand have an impact on wages in other jobs. This would help to test the efficacy of the measures used in this model.

Discussion and conclusion

The real value of child care worker wages declined more quickly than overall wages during the study time period, and child care wages are predicted to grow relatively slowly as a result of increases in overall wage conditions and the minimum wage. A wage ceiling prevents supply or demand from impacting the price commanded by workers in the market for child care labor. Therefore, the child care labor market appears to be undergoing market failure, resulting in an inefficient outcome: loss of wages, borne by child

⁹ The robustness test using mean hourly child care worker wages (Table 7) had similar results.

care workers, to the benefit of employers and the working parents who are able to purchase child care services at artificially low rates.

When market failure occurs, government intervention is necessary to create an efficient outcome. To this end, policy change is needed. A number of think tanks and research institutes have put forth ideas for enhancing wages and general working conditions for child care workers (see Loewenberg, 2015 for an overview of recent ideas from multiple sources). It is beyond the scope of this study to recommend a particular policy proposal to increase wages. However, this research underscores the importance of understanding the complex forces which create the wage ceiling when attempting to solve the problem with policy. For example, increasing education requirements for child care workers may work against traditional ideas that this work is “natural” for women and therefore unskilled, deserving low wages. Yet the effects of more worker education on wages could be diminished by the inability of employers to increase child care fees beyond current levels. Policies must consider all of the forces which contribute to the formation of the wage ceiling in order to effectively dismantle this barrier.

Policymakers must also consider the impact of dismantling the wage ceiling on the market for child care services. If the wage ceiling is eliminated and wages are allowed to rise to a competitive equilibrium, we would expect demand for workers to decrease from its artificial high point as the cost of employing workers goes up. What will happen to families in need of care if services are diminished by this change? A shortage of child care is already a reality in some parts of the United States (Malik, Hamm, Adamu, & Morrissey, 2016). Action must be taken to address this issue as well.

Wage ceilings likely exist in labor markets for other female-dominated care jobs, such as personal and home care aides. Future research is needed to explore the extent to which wage ceilings constrain worker wages in these types of occupations and to inform policy change to dismantle these ceilings.

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Tables

Table 1. U.S. Median hourly wage data, 2002, 2007, and 2016

Occupation category	2002		2007		Percent change in real wage, 2002-2007	2016		Percent change in real wage, 2002-2016
	Median hourly wage (\$)	Percent of median wage for all occupations	Median hourly wage (\$)	Percent of median wage for all occupations		Median hourly wage (\$)	Percent of median wage for all occupations	
All occupations	17.70	-	17.52	-	-1.1%	17.81	-	0.6%
All personal care & service occupations	11.21	63%	11.02	62%	-1.7%	10.92	62%	-2.6%
Hairdressers, hairstylists, & cosmetologists	12.13	69%	12.39	70%	2.1%	11.66	66%	-3.9%
Personal and home care aides	10.39	59%	10.31	58%	-0.7%	10.54	60%	1.5%
Child care workers	10.45	59%	10.23	58%	-2.1%	10.18	58%	-2.6%

Notes:

All wage data is presented in 2016 dollars. Wages retrieved from the Bureau of Labor Statistics Occupational Employment Statistics for May 2002, 2007, and 2016, available at <https://www.Bureau of Labor Statistics.gov/oes/tables.htm>. Inflation rates calculated using the CPI Inflation Calculator, available at <https://data.Bureau of Labor Statistics.gov/cgi-bin/cpicalc.pl>

Table 2. Descriptive statistics: Source variables

2002 data	Estimated total employment, child care workers	Mean hourly wage (\$), child care workers^a	Median hourly wage (\$), child care workers^a	Number of children under 5 (in 1,000s)	Total number of child care facilities^b	Total number of for-profit child care centers
Mean	8,947	9.23	8.83	383	13,492	880
Standard deviation	10,195	1.02	0.97	451	17,693	907
Range	49,630	3.80	3.77	2,482	103,472	4,757
Minimum	820	7.73	7.41	31	1,116	33
Quartile 1	2,230	8.39	8.09	101	3,940	261
Median	6,010	9.20	8.73	267	8,973	679
Quartile 3	9,515	9.91	9.43	426	14,317	1,096
Maximum	50,450	11.52	11.18	2,513	104,588	4,790

2002 data	Total number of nonprofit child care centers	Total number of home-based child care facilities	Home-based facilities as a portion of total child care facilities	Total child care facilities per 1,000 children under age 5	State minimum wage (\$)^a	Median hourly wage (\$), all occupations^a
Mean	475	12,136	0.883	39.3	6.00	15.04
Standard deviation	496	16,456	0.046	17.1	1.04	2.10
Range	2,751	96,048	0.159	70.7	5.64	11.36
Minimum	60	939	0.785	16.5	2.30	12.20
Quartile 1	135	3,383	0.847	25.1	5.92	13.69
Median	332	7,974	0.889	35.0	5.92	14.56
Quartile 3	615	12,621	0.927	50.7	5.92	16.00
Maximum	2,811	96,987	0.944	87.2	7.94	23.56

2007 data	Estimated total employment, child care workers	Mean hourly wage (\$), child care workers	Median hourly wage (\$), child care workers	Number of children under 5 (in 1,000s)	Total number of child care facilities^b	Total number of for-profit child care centers
Mean	11,307	9.09	8.63	405	15,027	1,051
Standard deviation	12,986	1.17	1.09	482	20,378	1,065
Range	64,390	4.53	4.43	2,629	117,291	5,349
Minimum	850	7.22	7.00	32	1,020	30
Quartile 1	2,710	8.16	7.62	110	3,719	331
Median	7,460	8.92	8.42	278	9,698	781

Quartile 3	13,350	10.05	9.42	470	15,053	1,399
Maximum	65,240	11.75	11.43	2,662	118,311	5,379

2007 data	Total number of nonprofit child care centers	Total number of home-based child care facilities	Home-based facilities as a portion of total child care facilities	Total child care facilities per 1,000 children under age 5	State minimum wage (\$)	Median hourly wage (\$), all occupations
Mean	422	13,555	0.882	39.0	5.97	14.99
Standard deviation	437	19,034	0.040	15.7	1.23	2.25
Range	2,363	109,697	0.146	64.5	5.93	13.06
Minimum	59	813	0.797	15.6	2.00	12.13
Quartile 1	149	3,253	0.852	28.2	5.15	13.62
Median	295	8,536	0.886	34.0	6.15	14.28
Quartile 3	537	13,727	0.919	50.1	6.90	16.08
Maximum	2,422	110,510	0.943	80.1	7.93	25.19

^a In 2007 dollars

^b Home-based facilities, for-profit centers, and nonprofit centers

Table 3. Descriptive statistics: Model variables

	Change in real mean child care worker hourly wage (\$)	Change in real median child care worker hourly wage (\$)	Change in real median hourly wage (\$) for all occupations
Mean	-0.13	-0.20	-0.05
Standard deviation	0.53	0.52	0.36
Range	2.55	2.57	2.14
Minimum	-0.98	-0.96	-0.51
Quartile 1	-0.49	-0.56	-0.26
Median	-0.19	-0.30	-0.10
Quartile 3	0.04	-0.07	0.07
Maximum	1.57	1.61	1.63

	Change in real value of state minimum wage (\$)	Change in home-based facilities as a portion of total child care facilities	Change in number of facilities per 1,000 children under age 5
Mean	-0.03	-0.001	-0.4
Standard deviation	0.82	0.022	4.9
Range	4.40	0.120	19.7
Minimum	-0.77	-0.050	-9.7
Quartile 1	-0.77	-0.012	-3.6
Median	-0.07	-0.005	-0.6
Quartile 3	0.34	0.006	2.2
Maximum	3.63	0.070	10.0

Table 4. Change in mean value and t test results for source variables, 2002 and 2007

	Estimated total employment, child care workers	Mean hourly wage (\$), child care workers	Median hourly wage (\$), child care workers
Mean, 2002	8,947	9.23	8.83
Mean, 2007	11,307	9.09	8.63
Change in mean	2,361	-0.13	-0.20
t test p value	0.000 ***	0.086 *	0.008 ***
	Number of children under 5 (in 1,000s)	Total number of child care facilities	Total number of for-profit child care centers
Mean, 2002	383	13,492	880
Mean, 2007	405	15,027	1,051
Change in mean	22	1,536	171
t test p value	0.001 ***	0.002 ***	0.000 ***
	Total number of nonprofit child care centers	Total number of home-based child care facilities	Home-based facilities as a portion of total child care facilities
Mean, 2002	475	12,136	0.883
Mean, 2007	422	13,555	0.882
Change in mean	-53	1,418	-0.001
t test p value	0.000 ***	0.003 ***	0.763
	Total child care facilities per 1,000 children under age 5	State minimum wage (\$)	Median hourly wage (\$), all occupations
Mean, 2002	39.3	6.00	15.04
Mean, 2007	39.0	5.97	14.99
Change in mean	(0.4)	-0.03	-0.05
t test p value	0.575	0.816	0.320

* Significant at the 10% level, *** significant at the 1% level

Notes:

All 2002 dollar values are presented in 2007 dollars. Paired t tests were used with a two-sided distribution.

Table 5. Correlation between model variables

	Change in real median child care hourly worker wage	Change in real mean child care hourly worker wage	Change in median hourly wage for all occupations	Change in state minimum wage	Change in home- based facilities as a portion of total child care facilities	Change in number of facilities per 1,000 children under age 5
Change in real median child care hourly worker wage	1.000					
Change in real mean child care hourly worker wage	0.931	1.000				
Change in median hourly wage for all occupations	0.372	0.256	1.000			
Change in state minimum wage	0.323	0.396	-0.209	1.000		
Change in home-based facilities as a portion of total child care facilities	-0.294	-0.308	-0.258	-0.181	1.000	
Change in number of facilities per 1,000 children under age 5	-0.174	-0.133	-0.143	0.115	0.776	1.000

Table 6. Regression model output: Predicting change in median child care worker hourly wage

$n=51, r^2=0.334$

Independent variable	β	p	95% Confidence interval
Change in median hourly wage for all occupations	0.652	0.001 ***	0.27, 1.03
Change in state minimum wage	0.289	0.002 ***	0.11, 0.47
Change in home-based facilities as a portion of total child care facilities	1.921	0.721	-8.82, 12.66
Change in number of facilities per 1,000 children under age 5	-0.024	0.301	-0.07, 0.02

*** Significant at the 1% level

Table 7. Regression model output: Predicting change in mean child care worker hourly wage

n=51, r²=0.299

Independent variable	β	p	95% Confidence interval
Change in median hourly wage for all occupations	0.467	0.024 **	0.06, 0.87
Change in state minimum wage	0.295	0.003 ***	0.10, 0.49
Change in home-based facilities as a portion of total child care facilities	-2.163	0.703	-13.52, 9.19
Change in number of facilities per 1,000 children under age 5	-0.008	0.752	-0.06, 0.04

** Significant at the 5% level, *** significant at the 1% level

Figures

Figure 1. A model of supply and demand in a competitive market

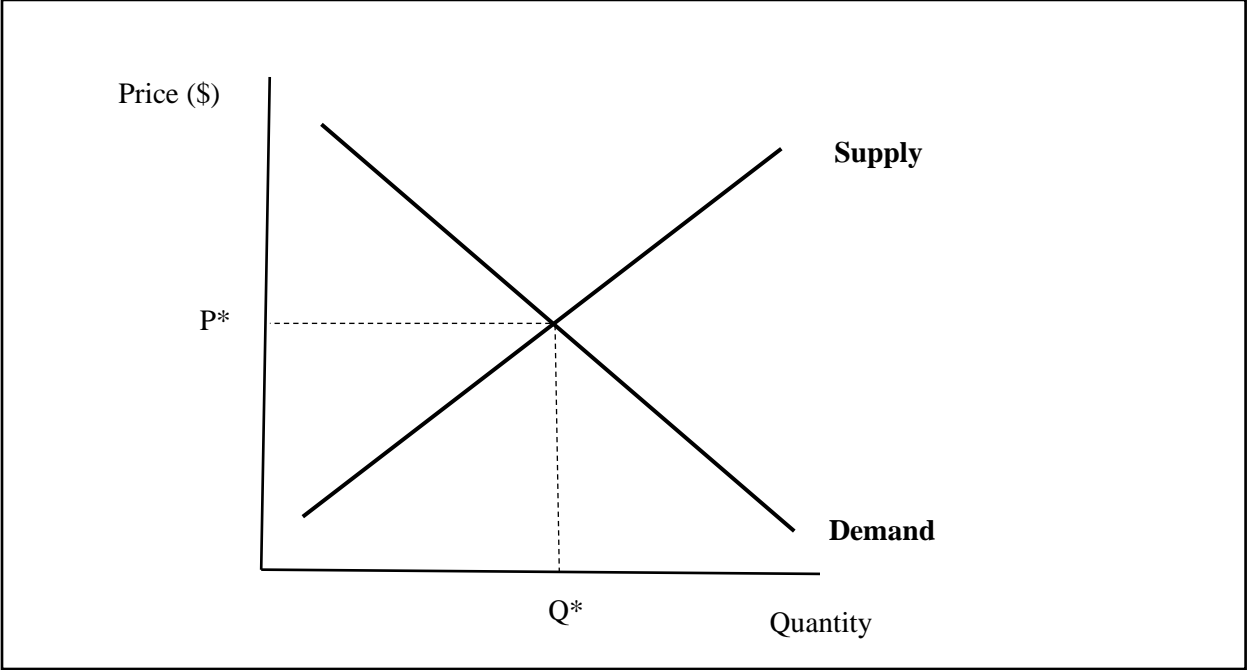


Figure 2. Supply and demand in a labor market

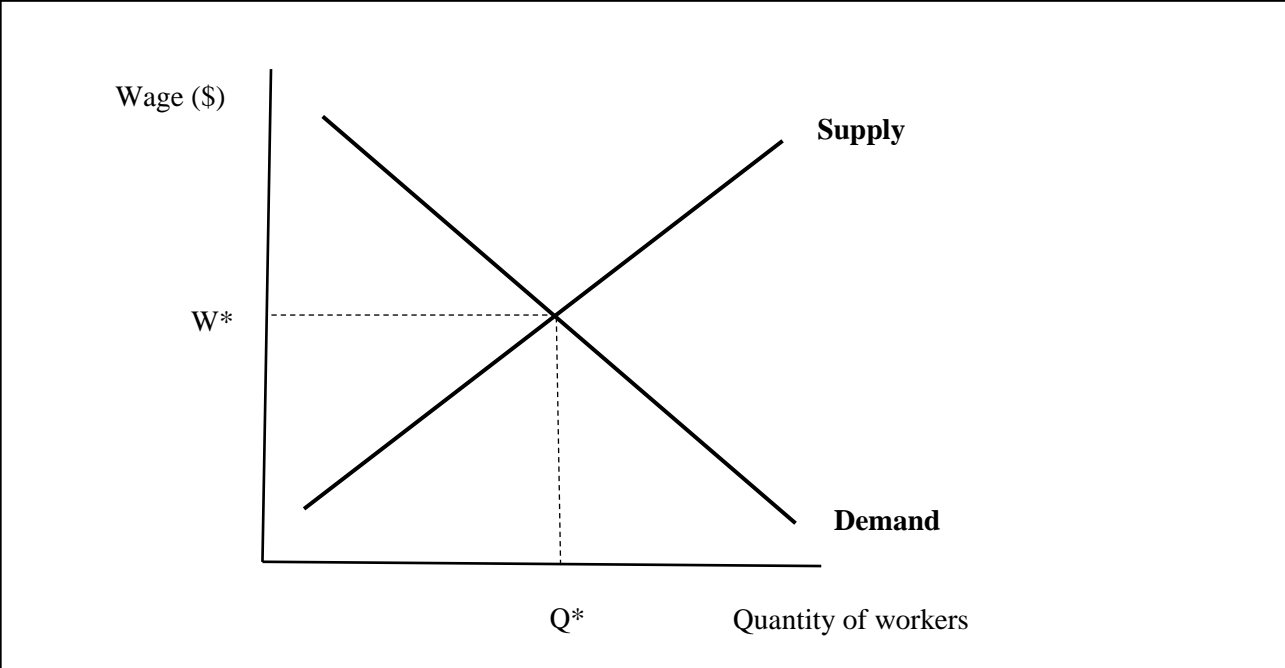
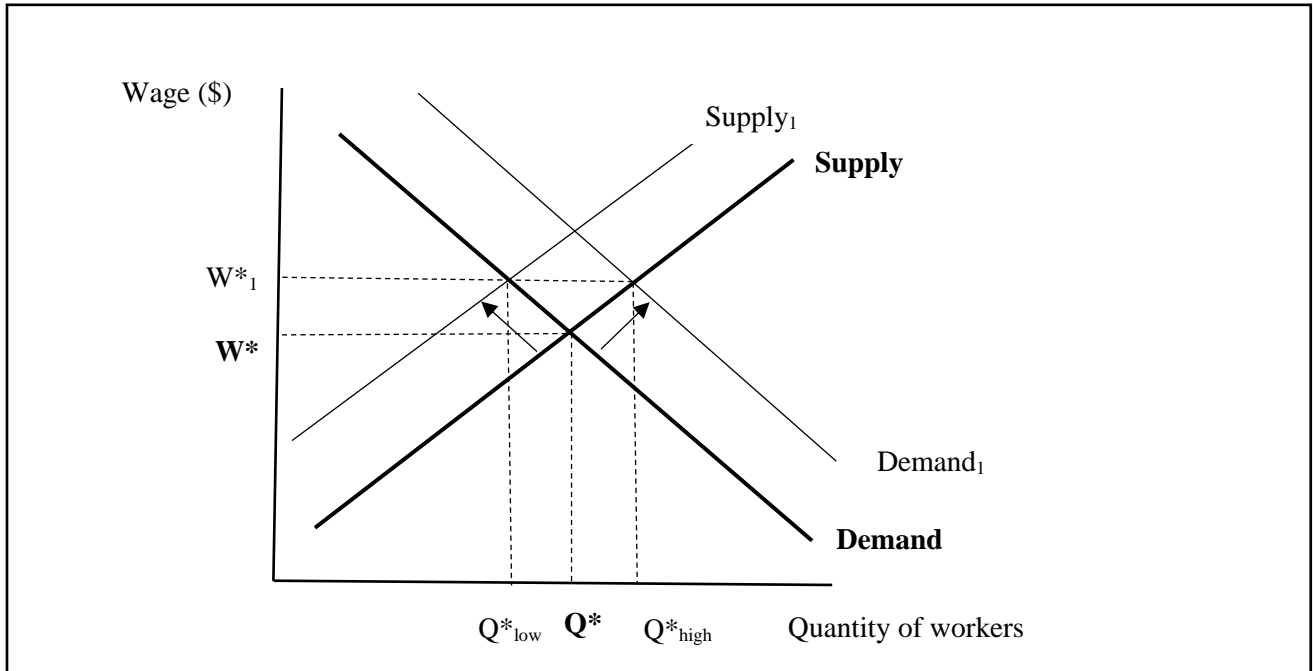


Figure 3. Shifts in labor market supply and demand



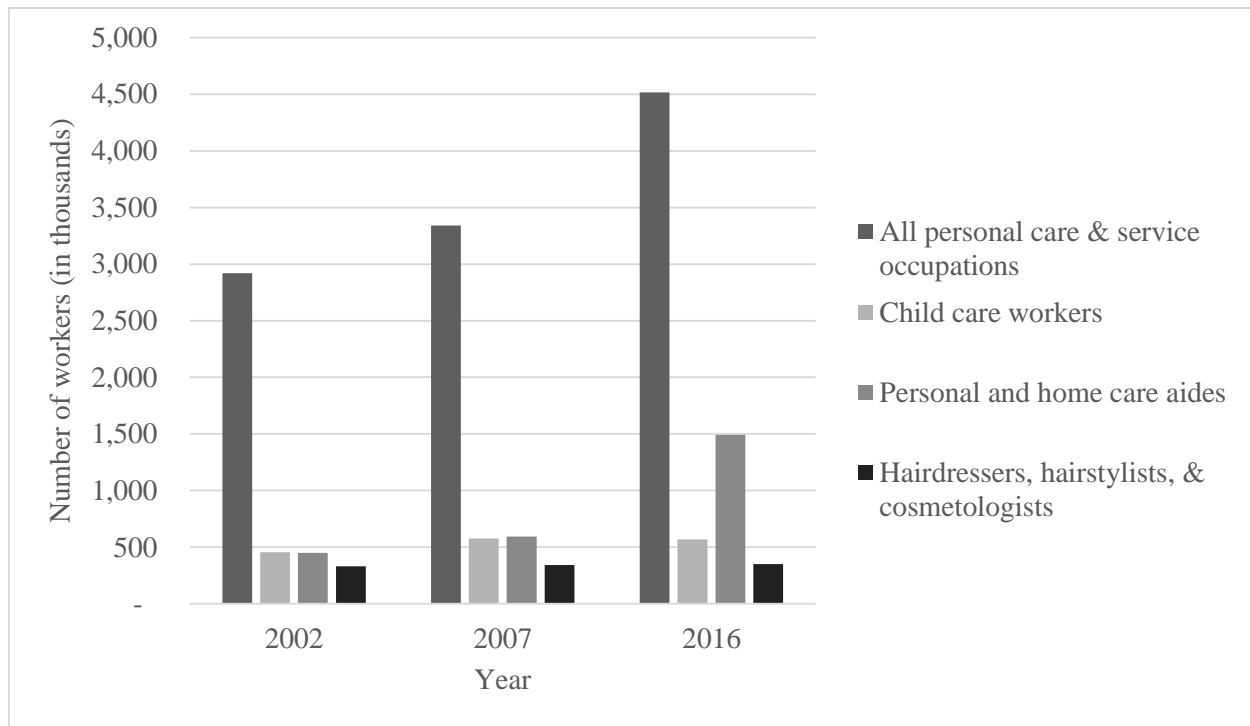
Notes:

The initial market equilibrium occurs where the Supply and Demand curves intersect, at W^* and Q^* .

An inward shift in the supply curve (to $Supply_1$) will decrease the equilibrium quantity of workers from Q^* to Q^*_{low} . Due to increased competition for available workers, the equilibrium wage will increase from W^* to W^*_1 . In this scenario, there will be fewer workers available at any given wage level. The opposite effect would occur if the supply curve were to shift outward: there would be more workers available to work at any given wage level, and competition among workers, for jobs, would drive the equilibrium wage lower.

An outward shift in the demand curve (to $Demand_1$) will increase the equilibrium quantity of workers from Q^* to Q^*_{high} . Due to increased competition for available workers, the equilibrium wage would increase from W^* to W^*_1 . In this scenario, there would be more workers demanded at any given wage level. The opposite effect would occur if the demand curve were to shift inward: there would be fewer workers needed to work at any given wage level, and increased competition among workers for jobs would drive the equilibrium wage lower.

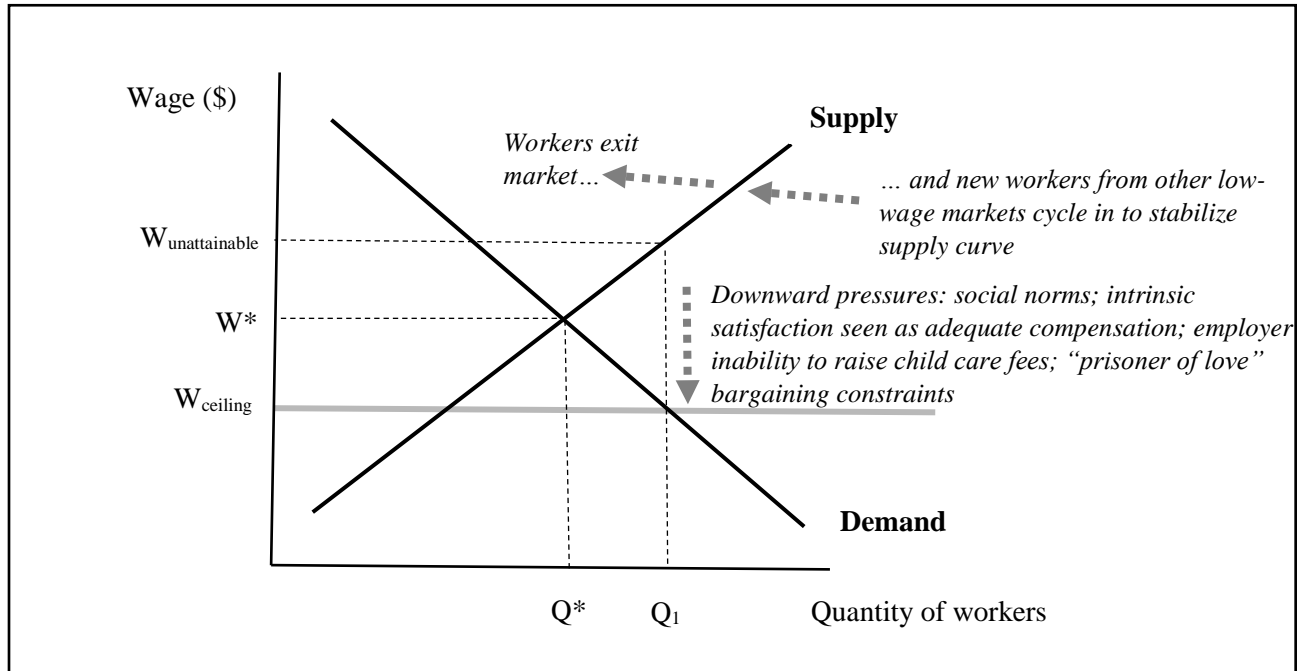
Figure 4. U.S. Employment in the most common personal care and service occupations, 2002, 2007, and 2016



Note:

Employment data retrieved from the Bureau of Labor Statistics Occupational Employment Statistics for May 2002, 2007, and 2016, available at <https://www.Bureau of Labor Statistics.gov/oes/tables.htm>.

Figure 5. The invisible wage ceiling in the market for child care workers



Notes:

The equilibrium wage (W^*) is the point at which an optimal quantity of workers (Q^*) are employed. In the market for child care workers, the combination of factors that place downward pressure on wages collectively keep wages at W_{ceiling} , below the equilibrium wage.

In a competitive labor market, a price ceiling (W_{ceiling}) should cause workers to exit the market for better opportunities, resulting in a shortage of workers that would drive the price (wage) upward. The steady stream of low-wage female workers entering and exiting labor markets for other low wage jobs, due to a combination of welfare reform and the inherent instability of low wage work, allows the supply of potential child care workers to remain high, despite high turnover rates. At the same time, artificially low employee costs allow employers to provide more child care services than would be available if a competitive wage was paid for these workers (Q_1) and ensures that there are always excess workers available to fill vacant jobs. The artificial “equilibrium” point exists at the intersection of W_{ceiling} and Q_1 . Despite low wages, workers who would normally command a higher wage ($W_{\text{unattainable}}$) to meet the quantity demanded at Q_1 are still willing to meet that demand. Employers and purchasers of child care services benefit from low wages, while workers experience a net loss.