

The Impact of Regulations on the Supply and Quality of Care in Child Care Markets*

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Abstract

We examine the impact of child care regulations on the supply side of the child care market, using a unique panel data set merged from the Census of Services Industries, state regulation data, and administrative accreditation records from the National Association of Education for Young Children. We exploit the presence of panel data on both individual establishments and local markets to control for state, time, and, where possible, establishment-specific fixed effects in order to mitigate the potential bias due to policy endogeneity. We find that the imposition of regulations that establish minimum standards on the inputs of child care centers reduces the number of center-based child care establishments operating in local markets, especially in lower income markets. At the same time, such regulations increase the quality of services provided, especially in higher income areas. As a result, there are winners and losers from the regulation of the child care market.

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1. Introduction

Imposing regulations on quality of inputs or directly on quality has an extensive history in a number of sectors of the economy. For example, the government subjects automobile manufacturers to fuel-economy standards, and older cars to smog checks to ensure that they meet certain emission standards. Health care professionals, and apropos of this study, child care providers, must pass detailed licensing requirements in order to practice their occupations. Several rationales are often used to justify such governmental regulations, including informational asymmetries between sellers and consumers (Akerlof, 1970) or negative externalities that the consumption of low-quality products or services may impose on society. The latter two situations can lead to market failure, i.e., insufficient quantities of higher quality products or services are produced and consumed relative to what is socially optimal.

At issue is whether regulating the quality of products or services necessarily improves social welfare. At a theoretical level, the existing literature indicates that whether such regulations improve welfare depends on consumers' information and preferences, market structure and the cost structure of producing quality. For example, in cases where market failure arises because consumers have less information about the quality of products than do providers, appropriately set minimum quality standards can *assure* consumers about the quality of products they will receive by eliminating the lower-quality products from the market place and, thereby, increasing consumers willingness to pay for such products.¹ At the same time, imposing regulations that eliminate the sale of lower quality products tends to harm those consumers with low tastes for quality, who are "priced out" of the regulated market. Moreover, imposing standards in industries characterized by high fixed costs of producing quality and by oligopolistic markets with differentiated products can stimulate price competition *and* investments in product quality by firms, even for those firms who would otherwise sell products with qualities well in excess of the minimum standard.² In this scenario, even more consumers may be forced out of the market if price competition cannot offset the

¹ See Leland (1979), Shapiro (1986), Klein and Leffler (1981) and Garella and Petrakis (2008).

² See Ronnen (1991), Crampes and Hollander (1995), and Garella and Petrakis (2008).

high cost of quality improvement.

We investigate the impact of imposing minimum quality standards on inputs used in production of child care services.³ Child advocates and researchers argue that there is an under-provision of developmentally-enriching, high quality care,⁴ either because parents are unable to evaluate and/or monitor the quality of services their children receive (Mocan, 2007) or they fail to take account of the full social benefits that exposing their pre-school children to developmentally-enriching child care.⁵ In the U.S., states are in charge of regulating non-parental providers of child care services. The presence and stringency of these regulations differ across states and over time. States do not regulate the quality of child care services directly. Rather, they impose standards for inputs to the production of child care services that are thought to improve the level of quality of these services. States require licensed child care providers to limit the number of children per staff in a given facility or classroom, to hire staff that meet certain educational and training requirements and to require facilities and staff to meet various safety standards. The fact that inputs, rather than quality, are regulated implies that the mapping between the quality of services and the stringency of regulations is not as direct as suggested by the theoretical literature on minimum quality standards.⁶ For example, a regulation that requires the directors of child care centers to have college degrees may not result in an increase in the quality of services if the imposition of this regulation induces child care centers to use less skilled teachers or aides. Thus, there is no guarantee that firms who remain in, or enter, the industry after the imposition of more stringent regulations will necessarily provide higher quality services, even if there is perfect compliance with all regulations. And these regulations can have

³ Ours is not the first study to seek to estimate the causal effects of child care regulations on the supply side of the child care market. Chipty and Witte (1997) and Blau (2007) examine the effects of state child care regulations on the input utilization, prices charged, wages paid and alternative measures of the quality of child care services. Other related studies include Gormley (1991), Lowenberg and Tinnin (1992) and Chipty (1995).

⁴ Studies by Whitebook, Howes, and Philips (1989) and the Cost, Quality and Outcomes Team (1995) estimate that only about 15% of all child care programs provide care that truly supports a child's physical, emotional and social and cognitive development.

⁵ For example, in making their child care decisions, parents may not take account of the externality that an ill-prepared child entering the first grade can impose on the learning of other children (Lazear, 2001) or on the likelihood of engaging in criminal behavior or being dependent on welfare later in life (Currie, 2001).

⁶ This point has been noted by Blau (2003, 2007) and Blau and Currie (2006).

“unintended” (to child care advocates) consequences that may affect access to these services.

A number of studies have investigated the effects of child care regulations on the child care market, with most focused on the demand side of the market, i.e., on the child care choices of parents. To the extent that child care regulations are enforced and complied with,⁷ more stringent regulations would be expected to increase the quality of care to which children are exposed, but costly higher quality services can cause a price increase to the extent that some children are crowded out of regulated quality care. Based on data on parental child care choices, there is evidence of both of these effects. For example, Currie and Hotz (2004) find that while more stringent child care regulations improve the safety of child care facilities – reducing the likelihood that children in such facilities experience an accident that requires medical treatment – they also find that such regulations reduce the likelihood that parents send their child to a regulated child care center.⁸

To conduct our analysis we use a unique panel data set obtained by merging child care sector data from the Census of Services Industries (1987, 1992, and 1997) with state regulation data and information on the accreditation of child care centers from the National Association of Education for Young Children (NAEYC). The resulting data set contains detailed information on establishments, including their legal form of organization, tax-exempt status, revenue, payroll, employment and accreditation, as well as the state-level child care regulations on various aspects of the provision of child care services. In addition to analyzing the impacts of regulations at the establishment level, we also use these data to analyze the impacts of regulations on the availability and quality of child care services on local markets and how these impacts differ by the characteristics of consumers (parents) who populate them.

In our empirical analysis, we pay particular attention to the identification of the causal effects of regulation on the choices made by child care providers. Most previous empirical investigations rely on the

⁷ Blau (2007) considers evidence as to whether regulations are complied with.

⁸ Blau (2003) also finds that more stringent regulations reduces the utilization of regulated types of child care, although he finds no impact on the amount that parents spend on such care or on the number of hours they use. See also Hotz and Kilburn (1997, 2000) and Hofferth and Chaplin (1998) for evidence on the effects of regulations on the utilization of non-parental child care.

variation in regulations across states for identification. While there is substantial variation in these regulations across states, state child care regulations may be correlated with various factors – such as other state policies, conditions in labor markets, or the preferences of consumers – that directly affect the behavior of child care establishments. Failure to adequately control for these confounding factors in estimation will tend to produce biased estimates of the causal effects of child care regulations. We attempt to mitigate the intrusion of such bias by controlling for a rich set of market-level variables and, more importantly, by including state, time, and establishment-specific fixed effects in the empirical models we estimate. We present estimates of two sets of effects of regulations: the marginal effect of changes in the stringency of a standard, evaluated at prevailing levels of stringency, and the average effect of imposing a standard relative to imposing none. As has been noted in the recent treatment effects literature, the two effects measure different things and need not have the same sign.⁹

We have four major findings. First, we find that the imposition and greater stringency of regulations on aspects of the provision of child care services in the formal sector, i.e., day care centers, appear to drive firms out of business, thereby reducing the availability of such services to parents. Furthermore, we find no evidence that the day care centers that remain increase their size by hiring more workers in response to child care regulations. Taken together, these findings indicate that the imposition and increased stringency of these regulations reduce the availability of services in the formal sector of the child care industry. Moreover, we find that this reduction of access to day care centers is greater in poorer markets, so that children from more disadvantaged backgrounds are less likely to be exposed to more developmentally enriching child care.

Second, we examine how regulating day care centers affects the informal sector of the child care industry. We have two findings. First, we find that more stringent regulations of day care centers neither leads to an expansion or reduction in the *number* of family day care homes in local markets. However, we do find that more stringent state staff-to-child ratio requirements lead to higher revenues in family day

⁹ See Heckman and Vytlacil (2005) and Blundell and Costa Das (2009) for more on the distinction between treatment effects in the presence of heterogeneity.

care homes. To the extent that the demand for child care is fairly price elastic and given that the only staff at a family day care home is the proprietor, this increase in revenues per establishment is consistent with more children being cared for in the same number of family homes.

In contrast to the negative effects of more stringent regulations on the availability child care services in local markets, we do find that such regulations do increase the fraction of centers that are of sufficient quality to be accredited by an independent educational organization. We find conclusive evidence that the imposition and increasing stringency of state standards that regulate the labor intensiveness of child care center services significantly increase the rate of accreditation. It also appears that the average effect of imposing minimum educational requirements on child care center staff on accreditation rates is positive. Finally, the improvements in quality of child care services due to state regulations appear to accrue disproportionately to higher income markets, although these differences by income are not always precisely estimated.

Overall, the imposition of more stringent regulations on the child care sector produces winners and losers among consumers. In wealthier markets (markets with higher median household income) we find that more stringent state regulations actually increase the availability of child care center services and appear to improve their quality (i.e., the share of centers that are accredited). In contrast, imposing such standards reduce the availability of such services in poorer markets with little evidence of any offsetting improvement in their quality. This reduction in the access to center-based and higher quality child care in these local markets, especially in poorer markets, can increase risks to these children, including exposing them to higher rates of accidents.

Finally, we investigate the impact of regulations on the labor costs and revenues of day care centers. Our findings here are less consistent and clear-cut than for the other dimensions of the supply and quality of child care services. For example, we do find that the average effect of imposing educational requirements on the directors of child care centers is to increase the average wages of center staff, but also increases the gross and net-of-payroll revenues per worker in such centers. This, it appears that the owners of child care centers, and possibly their workers, may gain from regulation. But, such effects are not

always estimated precisely and are sensitive to how one parameterizes state regulations.

The paper proceeds as follows. Section 2 briefly reviews the theoretical literature on the effects of regulations like minimum quality standards and licensing on product quality to help frame our empirical analyses. Section 3 discusses the child care market, state regulations, how we define local markets, and the data we use on child care establishments and accreditation. Section 4 describes our empirical methodology. Section 5 presents our findings. Section 6 offers some concluding observations.

2. Theoretical Issues in Regulating the Quality of Products

To help frame our empirical investigations and findings, we briefly review the existing theoretical literature on the effects of regulating the quality of products on the behavior of firms and indicate the key differences in the child care market from the settings considered in this literature.

As noted above, the theoretical literature most relevant for our work is on the effects of minimum quality standards and/or licensing. Leland (1979), Shapiro (1986), and Klein and Leffler (1981) focus on the effects of minimum quality standards or licensing requirements in the presence of informational asymmetries between buyers and sellers. Assuming a competitive environment, they argue that imposing binding minimum quality standards that increase the marginal cost of (higher quality) products can lead to low-quality firms exiting the market and deterring their future entry. At the same time, the imposition of minimum quality standards increases, all else equal, the average quality available to consumers, thereby increasing their willingness to pay a higher price for these goods and services. Which of these two effects – the cost-of-quality effect and the quality-assurance effect – prevails depends on the availability of substitutes for the product, how price-sensitive consumers are with respect to the quality of products and the relative importance of the marginal to fixed costs of quality.

Consumer welfare, the profitability of firms and the distribution of quality in a market is also affected by the market structure. For example, Ronnen (1991)¹⁰ finds that imposing more stringent minimum quality standards can induce quality (and possibly price) competition among sellers in markets that

¹⁰ See also Crampes and Hollander (1995).

are less than perfectly competitive. That is, sellers may find it in their strategic interests to increase the quality of their products in response to the imposition of minimum quality standards, even though these standards are not binding on their pre-regulation quality levels. This is because high-quality sellers will want to produce even higher quality in order to differentiate themselves from firms selling lower-quality products to mitigate the degree of price competition with their regulated low-quality rivals. As a result, the quality of products of all firms in an industry, and not just those on whom the standards are binding, will increase, even if price competition between rivals may reduce the price of each firm's product. As a result, consumers are better off and their demand for all products will increase. More recently, Garella and Petrakis (2008) have shown that this strategic, quality-increasing and consumer welfare increasing response to imposing minimum quality standards is sensitive to the degree of substitutability of products among products, the share of consumers in the market with limited information and the presence of variable costs of producing quality.

There are two important features of the child care market and its regulation that are not adequately captured in the existing theoretical literature. First, as noted above, states do not regulate the quality of child care services directly. Rather, they regulate the production of these services by imposing restrictions on the inputs used such as imposing minimum staff-to-child ratios for children in different age groups. Complications immediately arise from regulating inputs rather than quality directly as regulating inputs may distort care providers' incentives concerning input use and substitution. For example, providers may hire employees who are lower in quality of other dimension to satisfy education requirement. With such distortion, the success of these regulations in increasing and maintaining the quality of care provided in the child care market becomes in question. In the empirical analysis below, we explicitly investigate what happens to the quality of child care provided in local markets subject to more stringent child care regulations on inputs used in the production of such services.

Second, the existing theoretical literature does not adequately characterize the alternative options facing parents when assessing the impact of more stringent regulations on their choice of child care services. As noted in the Introduction, the child care market consists of two types of providers, child care

centers and family day care homes that are subject to different regulations. Moreover, there are other options for the care of young children available to parents – *parental* care, i.e., parents caring for their own children, and/or *relative* care – that are not directly regulated at all.¹¹ These “outside options” for child care services make the evaluation of welfare effects of imposing more stringent regulations on a subset of the providers in the child care market more complicated. For example, one might expect that more stringent regulations of child care centers would induce parents to move their children into the family day care sector. To the extent that there is capacity to absorb these children, evidence of reductions in available supply in the child care center sector would not necessarily imply any reduction of access by parents to market-based child care services. Moreover, the presence of these alternative forms of care is likely to influence the strategic response of firms in the regulated (or more highly regulated) sector in ways that are not captured by the above simple models. A full exploration of how the imposition of regulations affects the behavior of firms and the well-being of consumers in the presence of segments of markets that are differentially regulated is beyond the scope of this paper. However, we do explore the extent to which regulations of child care centers affect the availability of child care in the more informal sector of the market, family day care homes.

3. The Child Care Industry

The child care market has grown substantially in the past three decades, fueled largely by the rise of female labor force participation.¹² Based on data from the Survey of Income and Program Participation (SIPP) gathered in the Spring of 1997,¹³ 35% of all children under the age of 5 were in some type of non-relative child care arrangement, with 17.1% of these children in an organized, or center-based, child care facility and 7.3% in a family day care home arrangement.¹⁴ Among those preschool children with work-

¹¹ Obviously, parents and relatives are always subject to laws other than child care regulations, such as ones covering the abuse, neglect and abandonment of children.

¹² According to the Bureau of Labor Statistics, in 1970 28.7% of mothers with children under age six worked; by 1990 this number had grown to 58.2%, and by 2000 64.4%.

¹³ See Smith (2002).

¹⁴ Organized child care facilities include child care centers, nursery schools and Head Start programs. Also note that

ing mothers,¹⁵ 54.0% where in some type of non-relative care, with 25.7% in organized child care facilities and another 13% in family day care homes.

The data we use on the child care industry is from the U.S. Census Bureau's Census of Service Industries. Every 5 years, the Census Bureau obtains data on all establishments in the service sector that filed federal income tax returns, regardless of whether they had tax liabilities. We are interested in those establishments listed as child care providers, preschools and Head-Start programs whose primary focus is the care of children under the age of five. Among these child care establishments, the Census Bureau distinguishes between those that are: (1) non-employer establishments, which are owned by an individual and hire no employees; and (2) establishments that have an employee payroll with one or more employee in addition to the owner of the establishments. Day child care centers fall within the second category of establishments, whereas family day care home providers – providers who care for pre-school age children in their homes – fall within the first category. Accordingly, throughout the remainder of this paper, we shall refer to the establishments with payrolls as child care centers and those non-employer establishments as family day care homes.

Under the Research Data Center program at the U.S. Bureau of the Census, we obtained access to establishment-level data for all child care establishments with an employee payroll for the Census of Service Industries conducted in 1987, 1992 and 1997. However, due to confidentiality concerns about non-employer data in the Census of Services, we were not able to obtain the corresponding establishment-level for non-employer establishments.¹⁶ Rather, as we describe below, we were only able to obtain data aggregated to the state level on this sector of the child care market.

3.1 Child Care Centers and Child Care Markets

As noted, our primary analysis is of establishment-level data for all child care establishments with

family day care does not include babysitting services provided in the child's home.

¹⁵ In 1997, the SIPP estimated that 52.7% of children under the age of 5 had mothers who were working.

¹⁶ In contrast to information obtained for establishments with an employee payroll, all of the information obtained on non-employer establishments comes from tax returns collected and "owned" by the U.S. Internal Revenue Services (IRS). We were not granted access to the establishment-level data for the latter type of establishments.

an employee payroll, i.e., child care centers, from the Census of Services in 1987, 1992 and 1997. For each of these establishments, we were given access in a secure site run by the Census Bureau to the following information: (a) Establishment identifiers, which we used to match establishments over time and determine the chain-status of an establishment.¹⁷ (b) Street address and business names for each establishment, which we used to organize our data into local geographic markets, link in data on various characteristics of these markets, and to link in a measure of the quality of the child care services described below from an external source. (c) Characteristics of these establishments and their operation, including the legal form of organization, tax-exempt status, operating receipts and revenues, operating expenses, number of employees, payroll, ownership, etc.

Child care markets are very localized markets geographically. Few parents will travel more than fifteen miles to send their children to day care (Chipty, 1995; Hofferth et al., 1991). For most of the results presented below, we use zip codes as our measure of local markets. Based on the 2000 population Census, a typical zip code covers a radius of 3 to 4 miles, roughly consistent with the area that a child care center could cover. In order to assess the robustness of our findings based on our preferred zip-code market definition, we conducted all of our analyses using other definitions of local markets, including zip-code bundles and counties.¹⁸ We discuss the findings from these robustness checks below.

Finally, in order to characterize differences in the populations residing in our local child care markets, especially families with younger children, we used data from the 1990 and 2000 Censuses of Population to construct market-level measures of the demographic characteristics, including ethnic mix, median income of the local population; the percentage of population living in rural areas; the number of children under age 5; indicators of the typical household composition (e.g., the average number of people in a household and whether it is female-headed), labor market conditions (e.g., the percentage of females

¹⁷ We define multiple establishments sharing the same IRS-generated establishment identification number (EIN) in the same Census year as affiliated with a chain. A chain has as few as 2 establishments to as many as around 1000 establishments in the data.

¹⁸ We form zip-code bundles as the geographic areas encompassed by a zip code and all its neighboring zip codes within a 5-mile (or 10-mile) radius of the zip-code's population centroid.

over 16 not working and the local unemployment rate), and indicators of commuting patterns (the percentage of the working population over 16 working at home and spending more than 40 minutes commuting).¹⁹ We include these variables as regressors in our establishment- and market-level analyses presented below.

After merging the data on child care centers across the three Censuses, we ended up with a panel dataset with approximately 150,000 establishment-year observations. We also organized our data into local markets under the alternative definitions noted above. Based on the zip-code definition, we had approximately 10,000 markets for each of the three years of the Censuses of Services. Using the data from these surveys, we constructed a number of different outcomes and characteristics of these centers at both the establishment and market levels. We provide summary statistics for the resulting establishment- and market-level data in Tables 1 through 4.

In Table 1 we summarize various characteristics of child care center establishment. There are several notable patterns. First, the number of child care establishments has dramatically increased over the decade we analyze, rising from 40,628 in 1987 to 51,299 in 1992 to 61,882 in 1997, which is a rise of 26% between 1987 and 1992 and 21% from 1992 to 1997. Second, with respect to the type of local organization, child care centers in 1987 were most likely to be organized as a corporation (49.2%), followed by an sole proprietorship (30.7%), a partnership (4.0%), and the remaining establishments having had some other legal structure, including being a government entity (16.1%). Over the period, there was a slight increase in the percentage of child care centers that were incorporated, largely at the expenses of partnerships. In 1987, a little over one-third of centers were tax-exempt, not-for-profit entities, although the incidence of this status declines over time. About 18% of centers were a part of a chain in 1987 and this rate grows slightly to 21.5% by 1997. Third, despite the rise in centers organized as corporations, it is clear that these establishments are small businesses as they have a relatively small number of employees as well as modest payrolls and revenue. A typical child care center hires 8 to 10 employees depending on

¹⁹ The 1990 Census of Population is merged into the 1987 and 1992 Census of Services, and the 2000 Census of Population is merged into the 1997 Census of Services.

the year, paying around \$10,000 salary per employee and generating less than \$25,000 revenue per employee. At the same time, all three of these dimensions of centers increased over the period we examine.

In Tables 2a and 2b, we provide summary statistics for child care markets, using zip-codes as the measure of local markets. In 1987, child care centers operated in roughly one third of all 30,000 U.S zip codes, and by 1997 in roughly half of these zip codes. On average, three to four child care establishments operate per zip code, about two of which have entered in the last five years, and one to two of which will exit in the next five years. For every 1000 children under 5 years of age, there are approximately 7 child care establishments in 1987, 8 in 1992 and 9 in 1992. Given the average numbers of employees an establishment hires (8 to 10) and the minimum staff-child ratio requirement (around 0.133, that is, 7 or 8 children every staff member) over the three Census years, it is straightforward to figure out that these establishments do have the capacity of accommodate a significant portion of children under 5. For example, in 1997 about 40 child care center employees in a typical zip code have the capacity of taking care of around 300 children, which account for about 25% of population under 5. In Table 2b we provide summary statistics for the demographics of the zip codes in which child care establishments operate from the 1990 and 2000 Census of Population. They tend to be more heavily populated, wealthier, better-educated, and less-rural zip codes than the average U.S. zip code.

3.2 Measuring the Quality of Child Care Services: NAEYC Accreditation

A key feature of our study is to examine the effects of regulation on the quality of child care services available to parents. There is a growing consensus among child developmental specialists that a good measure of whether a child care center provides high-quality services is whether it is accredited.²⁰ The National Association of Education for Young Children (NAEYC) has administered a national accreditation system for almost two decades. Any early childhood program—child care center, preschool, kindergarten, or before- and/or after-school program—can voluntarily apply for NAEYC accreditation.

²⁰ The 1988 National Child Care Staffing Study (Whitebook, Howes, and Philips 1989) found that accredited child care centers provided higher-than-average-quality services to children and Xiao (2009) found that parents were willing to pay a premium for the accredited centers, especially newly opened centers that had not yet established a reputation about the quality of their services among parents.

The applying program must submit extensive information about its program and undergo a site-visit to validate the accuracy of this information. This includes assessments of the nature and extent of interactions among teachers and children, a center's curriculum, relationships between teachers and families, staff qualifications and professional development, the quality of a center's administration, center staffing and the extent of staff turnover, a center's physical environment, whether a center meets various health and safety standards, and the quality of the nutrition and food services it provides. As a final step, this information is reviewed by a national commission of recognized experts in child care and early childhood education to determine whether a center meets NAEYC's criteria for a high quality child care program. If so, the commission accredits the center for a three-year period. In 1997, the last year in our data, around 6,500 programs were accredited. As we shall see below, this is a fairly small fraction of all child care centers, reflecting the fact that only very high quality programs are able to comply with the NAEYC's standards.

We obtained administrative accreditation records from the NAEYC, which contain information on the accreditation status of individual child care providers over the period 1987-97. These records included information on the provider's exact address (street address, city, county, state, zip) and information on their accreditation history (application date, initial accreditation date, expiration date, and accreditation status). We used this address information to determine the accreditation status of establishments in the Census of Services data in 1987, 1992 and 1997. We also used the NAEYC data to measure the fraction of child care center establishments that are accredited, or accreditation rates, by year for each of our local markets.

Measures of rates of accreditation at the establishment and market levels are provided at Table 3. There is a substantial discrepancy in these rates, with accreditation rates based on establishment data substantially lower than those measured at the zip-code/market level. This discrepancy is a result of the lower rates of matching at the establishment level between the establishments in the Census of Services data and the NAEYC accreditation database. The latter was done using the addresses and names of establishments in the two data sets. In all three Census years, we can only match approximately 60% of the NAEYC ac-

credited establishments with Census establishments. If there is no match, we assume that the Census establishment was not accredited, which may be incorrect. The main reason for this low match rate, we suspect, is that many child care centers have changed their addresses and business names during our sample period.²¹ In contrast, the market-level accreditation rates were obtained by dividing the number of accredited establishments in the NAEYC data located in the geographical market, i.e., within a particular zip-code, by the number of child care center establishments from the Census data in that market. While also potentially subject to misclassification error, this latter set of rates only required matching on the geographical unit of the market, e.g., zip codes and, we suspect, are less subject to measurement/classification error. Focusing on the latter rates in Table 3, we find a sizeable increase in accreditation rates over time. While only 0.8% of child care establishments were NAEYC accredited in 1987, 3.8% were accredited in 1992 and 9.4% in 1997. Still, only a small proportion of establishments have received accreditation, which partially reflects the fact that the accreditation status serves as an indicator of high-end child care services.

3.3 Data on Family Day Care Homes

Given the structure of the child care industry, it is important to assess whether regulation of the formal sector of the child care industry leads to changes in the number of children cared for family day care homes that comprise the informal sector of this industry. As noted earlier, we have more limited data for family day care homes – which the Census of Services classifies as non-employer establishments – than we have for day care centers. In particular, we only have state-level data on these providers, including number of providers in a state in a given year and the total revenues these providers received for their services as claimed on their tax returns. We also do not have comparable measures of the quality of their services as we have for child care centers as NAEYC does not accredit family day care homes. Nonetheless, we are able to analyze the spillover effects of child care center regulations on several aspects of the operations in this more informal sector of the child care market.

²¹ The Censuses of Services records the addresses and the business names in 1987, 1992, and 1997 respectively, while the NAEYC only keeps the most recent addresses and business names.

We present, in Table 4, some descriptive statistics for family day care home establishments by state for the years 1987, 1992 and 1997. As one can see, there are a large number of these establishments. In 1997, there were 9,583 family day care homes per state or 488,734 in the nation as a whole, with family day care homes making up 89% of *all* child care establishments in our data. We note that there appears to have been a large increase in the number of family day care homes between 1987 and 1992. While there may have been a dramatic growth of family day care homes between these two years, it is more likely that the 1987 number is the result of an undercount in these establishments. It turns out that 1987 was the first year in which non-employer establishments were included in the Census of Services. Data from these establishments are obtained solely from federal tax returns and a substantial number of family day care homes were misclassified in terms of their industrial code in this initial year.²² We deal with this potential undercount in our empirical analyses of the effects of child care regulations by dropping 1987 non-employer data for robustness check in our non-employer regressions. Finally, we note that compared to child care centers, the average annual revenues of a family day care home is relatively low (\$9,382 in 1997), indicative of the fact that these establishments are truly small businesses.

3.4 State Child Care Regulations

In this section, we briefly describe the regulation of the child care industry and the data we use to measure these regulations. Which aspects of a center's operation are regulated, and the stringency of those of regulations, differs by types of child care provider. One set of regulations apply to *center-based care* provided in day care centers, pre-school and/or nursery schools and Head Start programs. A different set applies to *family day care*, i.e., care provided by a provider, typically in their own home. Given that the primary focus of this paper is on the provision of center-based care, we limit our discussion to the regulation of this more formal sector of the child care market.

In the analysis presented below, we focus on the effects of state regulations of the labor intensiveness (e.g., maximum child-to-staff ratios and group sizes by age group) and staff qualifications (e.g.,

²² See O'Neill and O'Connell (2001) for more on the non-employer establishment data for child care providers.

minimum educational requirements and requiring criminal background checks for child care workers) of child care center services.²³ Previous studies have found that these two aspects of the production of child care services appear to be associated with objective measures of child care quality, such as the cognitive, emotional and social development of young children.²⁴ However, even within these categories of regulations, states tend to impose different standards for the care of children of different ages. Furthermore, as Blau (2003) points out and Currie and Hotz (2004) confirm, many of these regulations are highly correlated with one other. For example, states which impose stringent requirements on child-staff ratios also tend to restrict group sizes, i.e., the total number of children in a particular child care setting. This correlation makes it difficult to identify separate effects of individual regulations. Accordingly, we use two alternative strategies to characterize state regulations. Under one strategy, we make use of sets of representative standards for labor intensity and staff qualifications, such as staff-child ratio requirements for infants and the education requirement for directors since most states regulate these dimensions and they differ across states.²⁵ This strategy is used by Chipty and Witte (1997), Blau (2007) and Currie and Hotz (2004). Following Blau (2003), we also construct summary indices of the stringency of state standards for labor intensiveness and staff educational qualifications. In particular, for staff-child ratio requirements, we average the requirements for the six age groupings and, for staff qualifications, we use the average of the number of years of schooling required for center directors and teachers.

Table 5 presents summary statistics for the minimum staff-to-child ratios for child care centers and educational requirements for center directors and teachers in 1987, 1992, and 1997.²⁶ On the surface,

²³ Other requirements include requiring use of a developmental curriculum, carrying liability insurance, and meeting certain health and safety standards such as immunization and fire-safety equipment. Some states even specify the frequency of government inspections on licensed child care centers.

²⁴ Ruopp, et al. (1979) and Mocan, et al. (1995) find evidence that more labor intensive and better qualified child care staff improve the development of young children. (Also see Hayes, et al. (1990) and Blau and Currie (2006) for summaries of these and other studies.) An important exception to these findings is Blau (2000). He finds, using the same data as in the Mocan, et al. (1995) study, that only educational qualifications have an effect on measures of children's development once one controls for center-specific fixed effects.

²⁵ The staff-child ratio requirements for toddlers and pre-schoolers have comparable variation in data, but labor intensiveness matter the most for the infant group.

²⁶ The information on state child care regulations was gathered by one of the authors (Hotz), in collaboration with

there are no discernable trends in the various measures of regulation amongst those states that had regulations. However, one does see an increase in the number of states that began to regulate certain aspects of the production of child care services over this period. For example, between 1987 and 1997 five states started regulating staff-child ratios for infants and 4 states changed its regulatory stringency and ten states went from no regulation on directors' education levels to having a regulation. More generally, as shown in the last column of Table 5, a sizeable number of states changed their individual regulations over this period. This variation – i.e., where states changed particular regulations over our sample period – will turn out to be essential for our ability to identify the causal effects of these regulations on the availability and quality of child care services. We also note that there is considerable variation in the stringency of regulations across states. Some states (e.g. Maryland, Kansas, and California) require one staff member to take care of no more than 3 or 4 toddlers, while other states (e.g. South Carolina, Idaho) allow one staff member to take care of as many as 8 to 12 toddlers. As for the education requirements, states range from imposing no educational requirements on any child care center employees (e.g., Florida, Idaho) to requiring that directors have high-school diplomas (e.g., Connecticut, Michigan), to requiring that child care center directors and teachers have some college education(e.g. South Dakota, New Jersey).

4. Econometric Methods

In this section, we briefly outline our estimation strategy and describe the alternative measures of the effects of regulation.

As we noted in the introduction, there is a potential for bias in the estimation of the causal effects of regulation stringency on the child care market. The most challenging source of such bias is “policy endogeneity,” i.e., the possibility that state policies are influenced by (or correlated with) unobserved state-level factors or conditions that influence the behavioral outcomes under investigation.²⁷ For example, suppose some states may have a high proportion of parents who prefer to provide their children with high

Dr. Rebecca Kilburn of Rand for the period 1983-1997. These data are available from the author upon request.

²⁷ See Besley and Case (2000) for an explicit treatment of this source of bias.

quality child care – and are willing to pay it – while the parents in other states do not. Furthermore, suppose that parents vote their preferences and either support or oppose the imposition and stringency of regulations as a way to promote higher quality child care. Then failure to control for the potentially unobserved differences in the distribution of tastes across states – as well as other differences across states and over time – will result in biased estimates of the effects of policy on the outcomes of interest.

To mitigate the influence of this type of policy endogeneity, we exploit two features of our data. First, we control for as rich a set of observable establishment- and market-level characteristics that might account for this source of bias in the regression analyses presented below. Second, we exploit our panel data on establishments and local markets to control for state, time, and, where possible, establishment fixed effects in these regression models. Including establishment fixed effects in these models not only controls for time-invariant state-specific sources of unobserved heterogeneity – none of the child care establishments in our data are observed to relocate across state lines – but also controls for time-invariant establishment level factors that could cause bias in our estimates of the effects of regulations. More precisely, for market level analyses we can estimate regressions of the following form:

$$Y_{mst} = \alpha_0 + \alpha_1 REG_{st} + \alpha_2 NoREG_{st} + \alpha_5 X_{mst} + \delta_t + \gamma_s + \varepsilon_{mst}, \quad (1)$$

where Y_{mst} are outcomes of interest for market m in state s in year t , REG_{st} is a vector of the child care regulations in that state as of year t , $NoREG_{st}$ is a vector of dummy variables that equal 1 if the state did not mandate a particular regulation in year t and equal to 0 otherwise, X_{mst} is a vector of market-level population characteristics and economic conditions, δ_t , and γ_s , are, respectively, year and state fixed effects, and α_1 is the vector of the impacts of state child care regulations on Y_{mst} . And, for establishment level analyses, we can estimate the following regression models:

$$Y_{jmst} = \beta_0 + \beta_1 REG_{st} + \beta_2 NoREG_{st} + \beta_5 X_{mst} + \beta_6 Z_{jmst} + \omega_t + \lambda_s + \kappa_j + v_{jmst}, \quad (2)$$

where Y_{jmst} are outcomes for establishment (child care center) j located at local market m within state s in year t , Z_{jmst} denotes a vector of establishment characteristics, ω_t , λ_s and κ_j are, respectively, time, state and

establishment fixed effects and β_1 is the vector of the impacts of state child care regulations on Y_{jmst} .²⁸ In order to examine how the effects of regulations differ across the population of consumers (parents), we also estimate the following variants of (1) and (2):

$$Y_{mst} = \alpha_0^* + \alpha_1^* REG_{st} + \alpha_2^* NoREG_{st} + \alpha_3^* REG_{st} \cdot C_{mst} + \alpha_4^* NoREG_{st} \cdot C_{mst} + \alpha_5^* X_{mst} + \delta_t^* + \gamma_s^* + \varepsilon_{mst}^*, \quad (1')$$

$$Y_{jmst} = \beta_0^* + \beta_1^* REG_{st} + \beta_2^* NoREG_{st} + \beta_3^* REG_{st} \cdot C_{mst} + \beta_4^* NoREG_{st} \cdot C_{mst} + \beta_5^* X_{mst} + \beta_6^* Z_{jmst} + \omega_t^* + \lambda_s^* + \kappa_j^* + \nu_{jmst}^*, \quad (2')$$

where C_{mst} denotes characteristics of the populations of local markets and we use median household income as such a characteristic in this study.

The inclusion of state and establishment fixed effects implies that our effects of regulations are identified holding constant any time-invariant *differences across markets* in (1) and any time-invariant *differences across establishments* in (2).²⁹ The inclusion of year fixed effects implies that we also hold constant any shocks which hit all the states in the same year. Our data allow us to support a richer set of strategies to mitigate policy endogeneity bias than any previous attempts to estimate the effects of regulations on the availability or quality of child care services.³⁰

The specifications in the above regression models allow us to estimate two alternative and distinct effects of regulations on Y_{mst} and Y_{jmst} . The coefficients α_1 and β_1 in (1) and (2), respectively, measure the *marginal effect* of a change in the stringency of an *existing* standard, REG , given that this dimension of child care is regulated.³¹ This causal effect considered in previous studies of child care services. But, as

²⁸ Replacing establishment effects with firm fixed effects – multiple establishments can belong to the same firm – produced results that were similar to those reported below.

²⁹ Clearly, this approach does not control for unobserved market-level factors that are time-varying and to the extent that such factors are also correlated with our regulation variables, our results still may be biased.

³⁰ Both Chipty and Witte (1997) and Blau (2007) use cross-sectional data to identify the effects of regulations on the supply and quality of child care services. For example, Blau (2007) uses a detailed cross-sectional sample of child care centers surveyed in four states and uses within state variation in differences in regulations by age groups of children and by types of center staff to estimate causal effects of these regulations.

³¹ The corresponding measures of marginal effects for alternative values of $C_{mst} = \tilde{C}$ are given by $\alpha_1^* + \alpha_3^* \tilde{C}_{mst}$ and $\beta_1^* + \beta_3^* \tilde{C}$, respectively.

suggested by the theoretical work on the effects of regulations discussed in Section 2, one is often interested in the effect of imposing some standard relative to *no standard at all*. This latter effect corresponds to average treatment effects considered in the evaluation literature. In particular, let Y_1 denote the potential outcome when a state regulates a particular dimension of child care centers and Y_0 denote the potential outcome when it does not. Then, the *average effect of regulation* is defined to be

$$E\left(Y_1 - Y_0 \mid REG = \tilde{R}\right) = \begin{cases} \theta_1 \tilde{R} - \theta_2 & \text{in (1) and (2)} \\ \theta_1^* \tilde{R} + \theta_3^* \tilde{R} \cdot \tilde{C} - \theta_2^* - \theta_4^* \tilde{C} & \text{in (1') in (2')} \end{cases} \quad (3)$$

where $\theta_i = \alpha_i$ in (1) and β_i in (2) and $\theta_i^* = \alpha_i^*$ in (1') and β_i^* in (2'). Below, we present estimates of the average effect of a regulation at its *sample mean*, i.e., $\tilde{R} = \bar{R}$.

It is important to note that the marginal effect and average effect of regulation characterize two different effects of regulation and, in general, they need not be of the same sign. The regression specifications above allow for this possibility. For example, it follows from (3) that the average effect of imposing any regulation, evaluated at certain level of regulation, \tilde{R} , is positive, even though the marginal effect of a change in that level is negative.

Finally, we estimate the variance matrix taking into account unobserved heterogeneity influencing seller behavior at the state-year level in all sets of regressions. Specifically, we allow the error terms to cluster by state-year group, that is, we allow each state-year group to have a different and unrestricted covariance structure but assume that errors are uncorrelated across groups (Moulton, 1986).³²

5. Results

Tables 7 through 14 present results on the effects of state child care regulations on the supply and quality of child care services. To keep the size of these tables manageable, we only report the coefficients on our regulation variables and their interactions with the median household income in the local mar-

³² If we cluster error terms by state instead of state-year pair, we lose significance in a few places but our inferences about the effects of regulations remain largely intact.

kets.³³ For every table, we include two panels: the upper panel (Panel A) presents estimates of the effects of specific regulations, i.e., those for the minimum staff-child ratio requirement for infants in day care centers and educational requirements for center directors. The bottom panel (Panel B) presents estimated effects of the stringency indices on minimum staff-child ratio and educational requirements that we described in Section 3.

We begin by making some general observations about our empirical findings. First, we consistently find that the estimated effects of regulations (marginal effects and average treatment effects) that control for time, state and/or establishment fixed effects are markedly different from those that do not. For example, we find that estimated effects results often switch signs – including from negative and significant to positive and significant – when we control for fixed effects. Furthermore, we do not find, as in Blau (2007), that controlling for fixed effects systematically render the estimated effects of regulations to be statistically insignificant. Rather, we find that for many outcomes, regulations do significantly affect firm behavior, even after we control for various sets of these fixed effects. Second, we find that the signs and statistical significance of the effects of regulations on firm and market-level outcomes are not very sensitive to whether we use direct measures of regulations or the stringency indices we constructed. Nor are our results on the effects of minimum staff-child ratios or staff educational requirements sensitive to whether we hold constant measures of regulations on other dimensions of the production of child care services or whether we control for indicators of whether a state actually imposed any regulatory restriction.³⁴ Finally, we find that the signs and statistical significance of regulations on the outcomes we examine are robust to the particular way we define local markets, i.e., whether they are defined local markets as zip codes, zip code bundles, or counties. To conserve on space, we do not report on all of the robustness checks we performed. Detailed results for these analyses are available upon request.

³³ In all of our regressions, we control for the variables listed in the top part of Table 1 and in Table 2b. Versions of Table 6 and Tables 8-11 with a complete set of coefficient estimates and their robust standard errors are available at www.econ.duke.edu/~vjh3/working_papers/Hotz-Xiao-Tables.pdf.

³⁴ In alternative specifications where we do not dummy out no regulation, our results are robust to whether we treat no education requirements as 0 or 8 years of education.

5.1 *Does the imposition of child care regulations and/or increases in their stringency drive child care centers out of the market?*

As we noted in Section 2, one cannot sign the effects of the imposition of regulatory standards or of increasing their stringency on the production of child care services. They depend on the balance between the increased costs that firms may face to comply with such regulations and the increased willingness of consumers to pay higher prices for care because of their increased assurance of the quality of services. Moreover, the fact that inputs, rather than quality, are regulated implies that the mapping between the quality of services and the stringency of regulations is not as direct as suggested by the theoretical literature on minimum quality standards. In this section, we examine estimates of the net effect of these forces on the supply of child care services as measured by the number of establishments per local market.

Table 6 presents results on the effects of state child care regulations on the number of child care centers in a local market, using zip codes to define these markets. The regressions both without and with state and time fixed effects (column 4) show that the average effect of imposing minimum staff-child ratio requirements, where the regulation is evaluated at its sample mean (estimates in “Ave. Effect of Regulation” rows) and the marginal effect of increasing the stringency of this standard significantly reduce the number of establishments operating in a local market, although the average effect of the minimum staff-child ratio regulation is not statistically significant. To get a sense of how sizeable this effect is, consider the marginal effect of increasing the minimum staff-child ratio from its mean of 0.226 (see Table 5) to 0.292, which amounts to *reducing* the average maximum number of infants per staff member in a child care center by 1 infant.³⁵ Based on the estimates from Panel A, column 4 of Table 6, such an increase in the stringency of the staff-child ratio for infants would *reduce* the number of child care centers in the average market by between 9.2% and 10.8% depending on the year analyzed. Meanwhile, the marginal effect of increasing the average required number of years of education of center directors by 1 would *re-*

³⁵ The average of the minimum staff-child ratio for infants is 0.226 (Table 6), which corresponds to a maximum child-staff ratio of 4.425. Thus, reducing the number of infants per staff member by one implies that the associated minimum staff-child ratio would be 0.292 ($= 1/[4.425 - 1]$). Thus, the minimum staff-child ratio would *increase* by 0.066 ($= 0.292 - 0.226$). Then the estimated reduction in the number of centers in an average local market would be -0.371 ($= -5.617 \times 0.066$), corresponding to 9.2% ($= 0.371/4.023$) of average number of child care centers in a zip code in 1997, and 10.8% ($= 0.371/3.440$) in 1987. The following calculations all follow this procedure.

duce the number of child care centers in the average market by between 3.2% and 3.8% depending on the year analyzed. While not huge, the marginal effects are not trivial reductions in the availability of child care centers.

The estimates in Table 6 also indicate that the effects of child care regulations on the availability of child care centers are not uniform across different markets. In column 5 of Table 6, we provide estimates of the interaction of the various regulations with the median household income in the local markets. As one can see, the interactions of the staff-child ratios in both Panels A and B are statistically significant. Furthermore, the positive coefficient on the interactions of these ratios with the median income of households in the local markets are positive, indicating that the marginal effects of increases in the stringency of minimum staff-child ratios are higher in wealthier markets and lower in poorer markets. At the same time, the interactions of median income with minimum educational requirements in either Panel A or B are not statistically significant and tend to be small, indicating that there is little evidence that the effects of this latter set of regulations vary by the income of households in local markets.

To provide a better sense of how the impacts of the marginal and average effects of regulations vary by the median household income of local markets, we present, in column 1 of Table 7, the implied estimates of both the marginal and average effect of regulations for local markets with higher median income markets (evaluated at 2 standard deviations above the sample median) and for lower income markets (evaluated at 2 standard deviations below the sample median). With respect to these effects, we find that the negative impact of the imposition of minimum staff-child ratios (“Ave. Eff.” column) and increases in their stringency (“Marg. Eff.” column) is concentrated in poorer markets. In fact, based on our points of evaluation, the imposition of minimum staff-ratios or increasing their stringency actually increase the number of child care centers (establishments) in higher income markets. One possible explanation for this difference is that wealthier households may respond to tighter standards by increasing their demand for child care center services consistent with the dominance of the quality-assurance effect suggested by some of the theoretical models discussed in Section 2. In contrast, markets with poorer households may be more affected by the increase costs that result from such regulations, i.e., the cost-of-quality

effects dominate any quality-assurance effects of the imposition or tightening of minimum staff-child ratios in this sector. We will provide more evidence below on the plausibility of this explanation when we look at the differential effects of regulation by household income on our measure of quality (accreditation) and on the costs (labor costs) of center-based care.

As we noted above, we estimated a number of alternative specifications of our baseline model to determine the robustness of our findings concerning the marginal and average effects of regulations on all of our outcomes. In Table 8 we present a few of these robustness checks for the number of establishments per market. Comparing the estimates of the marginal and average effects of regulation in Table 8 with those in Table 6, we see that across changes in our measures of regulations, whether or not we control for other state regulations and using alternative definitions of local markets, we consistently find negative and statistically significant effects of more stringent staff-child ratios on the number of child care centers per market. With respect to imposing minimum educational requirements for child care center staff or increasing their stringency, while the estimated effects are less consistently statistically significant, the estimated effects are almost always negative in sign.

Overall, we find consistent evidence that the imposition of and tightening of minimum staff-child ratios lead to a reduction in the availability of child care centers in local markets. Our findings with respect to the effects of minimum educational requirements on the supply of centers to local markets are somewhat less consistent in that statistical significance varies by which type of effect one considers and somewhat by household income. Nonetheless, we do find rather consistent evidence that, *on average*, imposing minimum requirements on the educational qualifications of center staff reduces the availability of centers in local markets.³⁶

³⁶ We also examined the effects of state child care regulations on the market rates of entry and exit to determine whether the negative effects of such regulations on the number of establishments per market is the result of regulations forestalling entry or increasing the rate at which incumbent centers leave the market. We find evidence that imposing and increasing the stringency of these regulations do both. These results can be found in www.econ.duke.edu/~vjh3/working_papers/Hotz-Xiao-Tables.pdf.

5.2 *Does the imposition of child care regulations and/or increases in their stringency cause child care centers to increase their use of labor?*

The previous section established that the imposition and increased stringency of child care regulations reduce the number of child care centers available in local markets. However, these findings do not imply that the capacity of center services in these markets is necessarily reduced, since the remaining providers could increase the labor they use, and thus the size of their operations, in response to changing regulations and possibly completely offset the loss of centers. More generally as noted by Blau (2007), child care centers may adjust their labor inputs in response to changes in these regulations, regardless of whether such responses increase or decrease the production of child care services. Accordingly, we directly examine the effects of the stringency of state child regulations on the number of employees per child care establishment using establishment-level data. The results of this analysis are presented in Table 9. While we do find significant effects of regulations when we do not control for establishment fixed effects (columns 1 and 2), none of these effects are statistically insignificant once these fixed effects are included in the regressions (columns 3 and 4). The latter findings suggest that the centers that remain in business do not fully comply with states' minimum staff-child ratios *or* that these centers end up reducing the number of children they cared for. Our data do not allow us to sort out these alternatives, since we do not have information on the number of children enrolled in a child care center. But, our findings, taken together with our evidence that the number of establishments decline as a result of the imposition of and increased stringency of state regulations, do point to the conclusion that such changes in regulations reduce the supply of center-based child care services in local markets.

5.3 *Does the imposition of child care regulations and/or increases in their stringency increase the supply of child care services in the informal sector?*

As we noted in the Introduction, the imposition and increased stringency of regulation of the formal sector of the child care industry may increase the demand for services in the informal sector to the extent that such regulations either increase the price of center-based child care services and/or otherwise reduce their availability. And, given what are perceived to be low costs of entry, these regulatory changes might be expected to increase the supply of child care services provided in the informal sector as children

are crowded out of the formal sector. We now examine the evidence on whether this “crowding in” to family day care homes occurs. Recall that we have more limited data on family day care homes than we do for day care centers. In particular, we only have information on the total number of establishments and the total revenue for these establishments at the state level for the years 1987, 1992, and 1997. Thus, our analysis of the cross-sector effect of child care center regulations is more limited than the analysis we conduct for child care centers. Nonetheless, we think they are informative.

In Table 10 and column 2 of Table 7, we present estimates of the marginal and average effects of the same measures of state child care regulations as used throughout our analysis.³⁷ We examine two outcomes using our state-level data. First, we examine the effects of child care center regulations on the number of family day care homes (non-employer establishments) per 1000 children under age 5 to determine how child care center regulations affect the supply of family day care homes.³⁸ Second, we analyze the effects of these regulations on the average annual revenue per family day care home establishment. In addition to being of direct interest, we argue below that family day care home revenues are likely to closely track the number of children (or child hours) in these homes, given that such homes, by definition, have a staff of one (the proprietor), that the informal sector is highly competitive and that parental demand for this form of care is likely to be fairly price elastic. We note that while the results in Table 10 are based on data that include the 1987 data, the year for which there appears to be an undercount of family day care homes, our findings and inferences about the effects of regulations for either family day care home outcomes are little affected by excluding the 1987 data.

With respect to the effects of the regulations of child care centers on the number of family day care homes per 1000 children under the age of 5 (columns 1 and 2 in Table 10), we find little evidence of

³⁷ We also estimated versions of the regression models that also included measures of states’ regulations of labor intensiveness and educational qualifications that apply to family day care homes as Currie and Hotz (2001) find that this latter set of state regulations are correlated with those for child care centers. Regressions that control for state family day care home regulations produce estimates has little impact on the estimates and significance of the effects of state child care center regulations.

³⁸ To account for the fact that states differ in the sizes of their populations, we scaled the number of establishments by the number of children of child care age in our state analyses. Our results and inferences were qualitatively unchanged if we used the number of family day care homes in a state as our dependent variable.

any cross-regulation effects on the number of family day care homes, almost none of the coefficients are statistically significant. Moreover, the implied average effects of regulation for the state minimum staff-child ratios and educational requirements for child care centers are negative, implying, if anything, that the imposition of these regulations in the formal sector may have reduced the number of family day care homes in states. (Given this lack of statistical significance, we do not present, in Table 7, how the estimated regulation effects differ by household income.)

However, we do find that both the average effects of regulating center-based staff-child ratios (evaluated at the sample mean) and the marginal effects of these regulations on the annual revenue per family day care homes are positive and statistically significant (Table 10, columns 3 and 4). Furthermore, while the marginal effect of increasing the stringency of the educational requirements of center directors is negative, the average effect of this regulation is positive, consistent with the average effects of center-based minimum staff-child ratios. As noted above, changes in annual revenues of family homes are likely to primarily reflect changes in the number of children in such facilities. Thus, these findings suggest that more stringent regulation of center-based care leads to an increase in the number of children per family day care home, which may have deleterious effects on the development and safety of the children in these homes.

Finally, we find that the average effect of regulating the center-based staff-child ratios vary by household income (Table 10, column 4), with such regulations resulting in higher revenues per establishment in higher income markets relative to poorer ones. In fact, our estimates imply that revenues actually fall in very poor markets as a result of tighter regulation of center-based care. While somewhat surprising, we note that Currie and Hotz (2004) find that more stringent regulation of child care centers leads to an increase in the utilization of the children of higher socioeconomic status parents and a decline for the children of black and less educated parents.

5.4 Does the imposition of child care regulations and/or increases in their stringency increase the quality of child care centers?

We next examine whether child care regulations achieve their goal of increasing the quality of

child care services. Existing theories of regulation suggest that whether regulation promotes the quality of child care services depends on whether the quality-assurance effects of such regulations outweigh the greater costs of producing higher quality services. Furthermore, as noted by Blau (2003), the fact that child care regulations affect the *inputs* used in the production of quality, and not quality itself, implies that imposing or tightening regulations could induce the substitution of other inputs and have little or no effect on quality. Finally, the models of Ronnen (1991) and others suggest that imposing or tightening minimum standards on quality can induce quality competition in markets that are less than perfectly competitive. In the analysis that follows, we are unable to explicitly test the validity of these alternative avenues through which child care regulations affect the quality of center-based care. Rather, we focus on the average and marginal effects of regulation on the quality of center-based care in local markets.

We present, in Table 11, estimates of the average and marginal effects of child care regulations on the percentage of child care centers in local markets that are accredited by NAEYC, i.e., market accreditation rates. As we noted in Section 3.2, it appears that the rates of accreditation based on establishment-level data are understated due to the difficulties of matching child care centers in the NAEYC accreditation database with establishments in the Census of Services data. We argued that market-based accreditation rates were less susceptible to this understatement, given that such matches only required matching on zip codes and not full addresses. While not reported here, we also estimated the effects of regulation on the probability of child care centers accredited using establishment-level data. In most cases, the signs and statistical significance of the average and marginal effects were the same as those presented in Table 11.³⁹

We find that the imposition of and increased stringency of minimum staff-child ratio requirements significantly *increase* the rates of accreditation in local markets. We also find that the marginal effects for both of our measures of minimum educational requirements for child care center staff in Panels

³⁹ Results on the probability of accreditation using establishment-level data can be found in www.econ.duke.edu/~vjh3/working_papers/Hotz-Xiao-Tables.pdf. The only notable differences between the latter results and those reported in Table 11 are for the coefficients on the minimum educational requirements variables, where there were differences in levels of statistical significance although virtually no differences in the signs and magnitudes of the estimates themselves.

A and B are negative, although the marginal effect of our average measure of these requirements (Panel B) are not statistically significant. Furthermore, our estimates of the average effects of these regulations are either positive or negative but are not statistically significant. Thus, our evidence indicates that the imposition of either type of regulation increases the quality of center-based care available in local markets. This is consistent with the quality-assurance effect dominating the cost-of-quality effect among typical consumers and with the regulation of these inputs actually improving the quality of child care. It is also consistent with Ronnen's prediction the imposing minimum quality standards will not only reduce the provision of low-quality services but also generate strategic increases in quality by already high quality centers. Recall that attaining NAEYC accreditation requires a center to meet a set of minimum standards for its operation that are well above the minimum standards imposed by any state.

Finally, based on the estimates of coefficients on the interactions of the regulations with the median household income in Table 11, we find that any increases in the quality of center-based care that result from the imposition of these regulations only accrue to high income markets (Table 7, column 3), although the interactions with income are only statistically significant for the average minimum educational requirements measure in Panel B of Table 11. In fact, the effect of imposing these standards on quality is consistently negative in very poor local markets. The latter findings suggest that any quality-assurance effects of imposing regulations are swamped by the effects of the higher costs of quality among the poor.

5.5 Do child care workers and/or owners benefit from the imposition of and/or increasing stringency of child care regulations?

Finally, we examine the effects of child care regulations on an important component of child care center costs, namely wage and salary of center staff, center revenues and revenues per worker net of payroll costs. In particular, we look at the effects of more stringent child care regulations on the wage and salary income of child care workers (measured by payroll per worker) and on revenues per worker in child care centers. With respect to the earnings of child care workers, more stringent child care regulations may drive up wage and salary income levels as profitability in the industry rises or more skilled workers end up staffing child care centers. However, the wage and salary incomes of child care workers

may suffer if employers are successful in making them bear the cost of more stringent regulations (Blau, 2007). With respect to center revenues, we have noted that more stringent standards can drive up the revenues of child care centers as parents become willing to pay more for services about whose quality they are more confident.⁴⁰ However, center revenues may decline to the extent that consumers view the quality and quantity of child care as substitutes and respond to the higher price of more regulated services by reducing their consumption (Blau and Hagy, 1998). Finally, with respect to the profitability of day care centers, the imposition and stringency of regulations may lead to higher profits, consistent with the evidence we have found that there are fewer competitors as regulations tighten (see Table 6). On the other hand, to the extent that regulations raise the cost of operating centers and these costs are not completely compensated by parents willingness to pay for higher quality services, center profits may fall.

In Table 12, we present estimates of the average and marginal effects of state child regulations on the wages and revenues per worker in child care centers.⁴¹ Since the Census of Services does not provide reliable data on costs that child care centers incur other than the total wage bill, we cannot directly analyze the effects of regulations on accounting, let alone economic, profits.⁴² However, we do present estimates of the effects of regulations on revenues *net* of payroll costs to provide a sense of whether the owners of centers gain or lose as a result of the imposition or stringency of regulations.

The evidence of the effects of regulations on wages, revenues and net revenues per worker are less consistent across the various regulation measures compared with what we have found for the other outcomes. First, while we do not find any evidence that either the imposition or marginal increase in the stringency of minimum staff-child requirements on infants in Panel A affect payroll, revenue or net reve-

⁴⁰ Blau and Mocan (2002) find that revenue is positively (though weakly) associated with quality of child care centers, where quality in their study is measured by instruments defined by developmental psychologists.

⁴¹ We note that our results are robust to alternative definition of the number of workers in centers, which defines the number of workers as the number of employees plus 1 (owner) if the establishment is owned individually or 2 if it is co-owned by partnerships.

⁴² In the Census more than half of the establishments report zero expenses, which include payroll as defined in the Census form, but positive payroll in a separate entry. Lack of documentation on the Census of Services prevents us from finding out the reasons they report these values. Using definitions of profitability with or without expenses deducted produces similar results.

nue per worker, we do find that the imposition and stringency of the average minimum staff-child ratio measure in Panel B have statistically significant effects on each of these outcomes, although only weakly so for wages per worker. Second, while we find that minimum educational requirements for day care center directors have significant effects on wage costs and both measures of revenues per worker in Panel A, with the exception of the model with median household income interactions, we do not find significant effects of the average minimum educational requirements for center staff in Panel B. Third, we find no evidence that the effects of any of the regulations differ by income across local markets. (Accordingly, we do not include entries for either of these outcomes in Table 7.)

With respect to the statistically significant effects of regulation, it does appear that both gross and net revenues per worker rise with the imposition of and increasing stringency of the average measure of minimum staff-child ratios on centers, suggesting that owners of centers benefit from such regulations. However, while the imposition of minimum educational requirements on child care center directors *increases* the payroll, revenues and net revenues per worker in child care centers, at the margin, increasing the stringency of this regulation *decreases* all three of these outcomes. Put differently, while we find that imposition of minimum educational requirements for directors has resulted, on average, in higher earnings for center staff and higher gross and net revenues per worker for owners of these centers, both of these effects are declining as these educational requirements increase. Based on these results, it appears as if owners of child care centers benefit from the imposition of state regulations while, it is less clear cut whether the same is true for the workers in these centers. However, a more cautious characterization of our findings seems to suggest that it is hard to tell whether either party has gained or lost from the regulation of the child care industry.

6. Conclusions

The imposition of minimum quality standards on inputs used in production of services is only one of many regulatory responses in markets where high-quality products or services are under-produced and

under-consumed.⁴³ In the face of these alternative responses, policy makers need to be fully informed of the consequences – intended or unintended – of such regulations. Based on our findings, these consequences for the well-being of children and their parents appear to be both positive and negative. On the negative side, we find that the imposition of input regulations in the formal sector of the child care market significantly reduces the number of operating child care establishments, especially in lower-income markets. Furthermore, this loss of capacity in the formal sector due to regulation is not offset by child care centers hiring more workers or by expanding the number of home day care providers in the informal sector of this market. Rather, our evidence suggests that regulating child care centers leads to more children going into the same number of family day care homes or being cared for by parents or relatives, where these latter arrangements are thought to be less developmentally enriching. But, on the positive side, the imposition and increased stringency of such standards, especially on the labor intensiveness of child care centers, do increase the quality services available in the centers that remain. Unfortunately, this increased quality is not shared equally by all children and parents, since the gains appear to accrue primarily to those living in higher income areas. In short, our results suggest that a simple characterization of whether the well-being of children is improved or reduced by regulations is not possible and would be misleading. Rather, there are positive and negative consequences of regulating the child care market and, with some children and parents being better off and some being worse off. Finally, our evidence is less than clear about whether child care workers or owners gain from the imposition or stringency of regulations.

⁴³ For example, another regulatory response could be to require sellers to disclose the quality of their products or services (Jin and Leslie, 2003).

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Table 1: Characteristics of Child Care Center Establishments

Variable	Definition	1987 Mean	1992 Mean	1997 Mean	% Change, 1987-97
Corporation	Whether the establishment is owned by a corporation: = 1 if yes; = 0 otherwise.	0.492 (0.500)	0.514 (0.500)	0.536 (0.499)	8.9%
Individual	Whether the establishment is owned as a sole proprietorship: = 1 if yes; = 0 otherwise.	0.307 (0.461)	0.317 (0.465)	0.310 (0.463)	1.0%
Partnership	Whether the establishment is owned by a partnership: = 1 if yes; = 0 otherwise.	0.040 (0.197)	0.028 (0.165)	0.034 (0.181)	-15.0%
Tax Exempt	Whether all or part of the income of the establishment is exempt from federal income taxes: = 1 if yes; = 0 otherwise	0.340 (0.474)	0.311 (0.463)	0.292 (0.455)	-16.4%
Chain	Whether the establishment belongs to a chain: = 1 if yes; = 0 otherwise.	0.185 (0.389)	0.209 (0.406)	0.215 (0.411)	14.1%
Part Year	Whether the establishment operates less than 6 months in a year: = 1 if yes; = 0 otherwise.	0.040 (0.197)	0.044 (0.206)	0.029 (0.454)	-27.5%
# Employees	Number of employees	8.739 (11.942)	9.122 (13.362)	10.143 (15.353)	16.1%
Revenue	Total annual revenue (in 1000s of 1997 \$)	\$180.040 (323.764)	\$199.851 (448.398)	\$228.799 (463.063)	27.1%
Payroll	Total annual payroll (in 1000s of 1997 \$)	\$88.547 (153.647)	\$96.535 (195.269)	\$112.417 (205.117)	27.0%
Payroll per Employee	Payroll / # Employees	8.935 (4.480) [37,743]	9.538 (6.222) [47,150]	10.011 (6.189) [56,478]	12.0%
Revenue per Employee	Revenue / # Employees	\$19.531 (11.632) [37,743]	\$22.819 (21.499) [47,150]	\$23.315 (18.332) [56,478]	19.3%
<i>N</i>	Number of Establishments	40,628	51,299	61,882	52.3%

Notes: Unless otherwise noted, in Tables 2 through 5, standard deviations are reported in parentheses and sample sizes are reported in brackets for variables with missing values.

Table 2a: Market-Level Characteristics of Center-based Child Care
(Markets Defined as Zip Codes)

Variable	Definition	1987 Mean	1992 Mean	1997 Mean
No. of Establishments	Number of child care establishments in a zip code	3.440 (3.320)	3.734 (3.522)	4.023 (3.864)
Establishment Density	No. of Establishments / No. of Children under 5	0.007 (0.049)	0.008 (0.075)	0.009 (0.047)
No. of Child Care Employees	Number of child care employees in a zip code	30.152 (40.914)	34.207 (46.062)	40.705 (55.873)
No. of Entrants	Number of establishments which do not exist at $t - 5$	n.a.	1.942 (2.108)	1.942 (2.144)
Entry Rate ¹	No. of Entrants at t / No. of Establishments at $t - 5$	n.a.	0.691 (0.802)	0.661 (0.744)
No. of Exits	Number of establishments which do not exist at $t + 5$	1.330 (1.617)	1.423 (1.695)	n.a.
Exit Rate ¹	No. of Entrants at t / No. of Establishments at t	0.383 (0.364)	0.378 (0.356)	n.a.
<i>N</i>	Number of Zip Codes	11,404	13,304	14,966

¹We follow Dunne, Roberts, and Samuelson (1988) to construct aggregate measures of entry and exit rates.

Table 2b: Demographic Characteristics of Child Care Markets

Variables	Definition	1990 Mean	2000 Mean
Population under 5	Population under age 5 (in thousands)	1.191 (1.199)	1.136 (1.197)
% Black	% Population that are African American	0.096 (0.176)	0.101 (0.180)
% Hispanic	% Population that are Hispanics	0.059 (0.126)	0.082 (0.147)
Household Size	Average household size	2.731 (0.406)	2.585 (0.345)
Median Income	Household median income (in 1000s of 1997\$)	31.060 (12.656)	43.674 (17.259)
% College	% Population over age 25 with some college education	0.307 (0.109)	0.352 (0.104)
% Female Head with Child	% Female-headed households with children.	0.058 (0.037)	0.066 (0.036)
% Female Not Working	% Female over age 16 not working	0.379 (0.092)	0.370 (0.085)
% Unemployed	% Labor force that are unemployed	0.062 (0.037)	0.057 (0.042)
% Work at Home	% Working population over age 16 working at home	0.036 (0.035)	0.037 (0.027)
% Long Commute	% Working population over age 16 spending more than 40 minutes commuting	0.282 (0.138)	0.322 (0.141)
% Rural	% Population living in rural areas	0.405 (0.414)	0.381 (0.403)
<i>N</i>	Number of Zip Codes	13,304	14,966

Table 3: Accreditation of Child Care Center Establishments

Variable	Definition	1987 Mean	1992 Mean	1997 Mean
<u>Establishments:</u>				
Accredit ¹	Whether the establishment is NAEYC accredited: = 1 if yes; = 0 otherwise	0.003 (0.057)	0.017 (0.128)	0.038 (0.191)
<i>N</i>	Number of Establishments	40,628	51,299	61,882
<u>Zip Code Markets:</u>				
No. of Accredited	Number of establishments which are NAEYC accredited in the market	0.028 (0.186)	0.151 (0.506)	0.375 (0.911)
Accreditation Rate	No. of Accredited / No. of Establishments	0.008 (0.071)	0.038 (0.162)	0.094 (0.275)
<i>N</i>	Number of Zip Codes	11,404	13,304	14,966

¹The low accreditation averages reported in this table reflect imperfect matching. We set unmatched establishments' accreditation status to zero.

Table 4: Characteristics of Family Day Care Home (Non-Employer) Establishments at the State Level

Definition	1987 Mean	1992 Mean	1997 Mean
Number of Family Home Establishments (1000s) per State	4.351 (4.281)	9.589 (8.956)	9.583 (9.354)
Number of Family Home Establishments per 1,000 Children under Age 5	16.595 (12.011)	34.927 (19.811)	33.259 (18.759)
Annual Revenue (in 1000s of 1997\$) per Family Home Establishment	\$8.240 (1.567)	\$7.753 (1.689)	\$9.382 (1.921)
<i>N</i> (States plus District of Columbia)	51	51	51

Table 5: Summary Statistics for State Child Care Center Regulations by Year

	<u>All Years</u>				<u>1987</u>	<u>1992</u>	<u>1997</u>	No. of states which changed Regulations			
	Mean	St. Dev.	Min	Max	Mean	No. of States with No Regulation	Mean		No. of States with No Regulation		
Regulations on Labor Intensiveness: Minimum Staff-child Ratio by Age of Children											
0 - 11 months	0.226	0.047	0.125	0.333	0.225	5	0.226	0	0.229	0	9
11 - 23 months	0.192	0.052	0.083	0.333	0.192	5	0.190	0	0.192	0	10
24 - 35 months	0.137	0.047	0.083	0.250	0.138	4	0.137	0	0.138	0	11
36 - 47 months	0.095	0.018	0.067	0.143	0.096	4	0.095	0	0.095	0	8
48 - 59 months	0.082	0.018	0.050	0.125	0.082	4	0.081	0	0.082	0	6
60+months	0.069	0.022	0.040	0.200	0.072	4	0.068	0	0.068	0	9
Average	0.133	0.028	0.082	0.196	0.133	4	0.133	0	0.134	0	18
Regulations on Staff Qualifications: Minimum Educational Requirement (in years of schooling) by Type of Staff											
For Directors	13.673	1.350	12	16	13.625	15	13.644	6	13.739	5	15
For Teachers	12.560	1.057	9	16	12.464	23	12.600	16	12.595	14	12
Average	11.599	3.019	6	16	11.660	15	11.467	5	11.681	4	19

Note: Descriptive statistics are calculated over observations with non-missing values of variables.

Table 6: Estimated Marginal and Average Effects of State Regulations on the Number of Child Care Center Establishments per Market¹

	(1)	(2)	(3)	(4)	(5)
Panel A: The Effects of Single Measures of Child Care Center Regulations					
Min. Staff-Child Ratio, Infants	-3.519***	-3.297***	-1.898	-5.617***	-11.693***
No Standard Imposed ³	-1.024**	-0.690*	-0.629*	-1.202**	-2.306***
Min. Staff-Child Ratio, Infants × Median Income					0.276***
No Standard Imposed × Interaction					0.047**
<i>Ave. Effect of Regulation, Min. Staff-Child Ratio¹</i>	<i>0.229</i>	<i>-0.055</i>	<i>0.200</i>	<i>-0.067</i>	<i>-0.139</i>
Min. Educ. Requirement, Directors	-0.055	-0.051	-0.210***	-0.129***	0.062
No Standard Imposed ³	-0.113	0.044	-3.069***	-1.501**	1.859
Min. Educ. Require., Directors × Median Income					-0.002
No Standard Imposed × Interaction					-0.052**
<i>Ave. Effect of Regulation, Min. Educ. Requirement¹</i>	<i>-0.639</i>	<i>-0.741</i>	<i>0.198</i>	<i>-0.263</i>	<i>-0.248</i>
R ²	0.44	0.44	0.45	0.46	0.46
Panel B: The Effects of Averaged Measures of Child Care Center Regulations					
Ave. Min. Staff-Child Ratio	-8.017***	-7.059***	-5.226	-6.771	-19.992***
No Standards Imposed ³	-0.764**	-0.433	-0.301	-0.424	-2.217***
Ave. Min. Staff-Child Ratio × Median Income					0.501***
No Standards Imposed × Interaction					0.053**
<i>Ave. Effect of Regulation, Min. Staff-Child Ratio¹</i>	<i>-0.302</i>	<i>-0.506</i>	<i>-0.394</i>	<i>-0.477</i>	<i>-0.020</i>
Ave. Min. Educ. Requirement	-0.051**	-0.044**	-0.010	-0.019	-0.015
No Standards Imposed ³	-0.348	-0.099	-0.515**	-0.119	0.835
Ave. Min. Educ. Requirement × Median Income					-0.0004
No Standards Imposed × Interaction					-0.030*
<i>Ave. Effect of Regulation, Min. Educ. Requirement¹</i>	<i>-0.244</i>	<i>-0.411</i>	<i>0.399</i>	<i>-0.101</i>	<i>-0.230</i>
R ²	0.44	0.44	0.45	0.46	0.46
Year Fixed Effects	No	Yes	No	Yes	Yes
State Fixed Effects	No	No	Yes	Yes	Yes
Number of Observations			39,674		
Unit of Observations			Zip code		

¹ The *Ave. Effect of Regulation* is the effect of imposing a regulation, at the mean value of the standard (see corresponding values in the “Mean” column for “All Years”) relative to no standard at all. See Section 4 for a description of how these effects were calculated. Estimates in *italics* are statistically significant, based on significance of coefficients on regulation × median household income interactions.

² The dummy variable is equal to 1 if a state imposed no standard for any of the regulations used to form the average measure and equal to 0 otherwise.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Differences in Estimated Marginal and Average Effects of State Regulations by Median Income of Local Market

	(1)		(2)		(3)	
	Number of Establishments per Market		Ann. Revenue per Non-Employer Establishments		Market Accreditation Rate	
	<i>Marg. Effect</i>	<i>Ave. Eff.</i>	<i>Marg. Effect</i>	<i>Ave. Eff.</i>	<i>Marg. Effect</i>	<i>Ave. Eff.</i>
Panel A: The Effects of Single Measures of Child Care Center Regulations						
Min. Staff-Child Ratio, Infants						
2 Std. Dev. above Median	<i>3.829</i>	<i>0.528</i>	<i>29.356</i>	<i>5.672</i>	0.610	0.018
2 Std. Dev. below Median	<i>-10.135</i>	<i>-0.250</i>	<i>2.374</i>	<i>-4.274</i>	0.712	-0.009
Min. Educ. Require., Directors						
2 Std. Dev. above Median	<i>-0.050</i>	<i>0.375</i>	<i>-0.203</i>	<i>-0.059</i>	-0.018	0.041
2 Std. Dev. below Median	<i>0.051</i>	<i>-0.872</i>	<i>-0.456</i>	<i>0.125</i>	-0.013	-0.0001
Panel B: The Effects of Averaged Measures of Child Care Center Regulations						
Ave. Min. Staff-Child Ratio						
2 Std. Dev. above Median	<i>8.185</i>	<i>0.325</i>	<i>47.266</i>	<i>9.653</i>	1.698	0.058
2 Std. Dev. below Median	<i>-17.163</i>	<i>-0.365</i>	<i>-5.180</i>	<i>-6.789</i>	1.800	-0.021
Ave. Min. Educ. Requirement						
2 Std. Dev. above Median	<i>-0.038</i>	<i>0.407</i>	<i>0.052</i>	<i>0.286</i>	<i>-0.0003</i>	<i>0.001</i>
2 Std. Dev. below Median	<i>-0.017</i>	<i>-0.867</i>	<i>-0.050</i>	<i>-0.078</i>	<i>-0.005</i>	<i>-0.009</i>
Based on Estimates in:	Table 6, Col. (5)		Table 10, Col. (4)		Table 11, Col. (2)	

Note: Estimates in *italics* are statistically significant, based on significance of coefficients on regulation × median household income interactions.

Table 8: Estimated Effects of State Regulations on the Number of Child Care Center Establishments per Market: Robustness Checks

	Alternative Variable Specifications			Alternative Market Definitions			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: The Effects of Single Measures of Child Care Center Regulations							
Min. Staff-Child Ratio, Infants	-6.216***		-5.998***	-37.945***	-44.980***	-41.984**	-153.375***
No Standard Imposed	-0.921*		-1.102**	-6.221***	-9.435***	-7.887**	-14.943*
Min. Staff-Child Ratio, Infants × Median Income					0.388*		1.120
No Standard Imposed × Interaction					0.148		9.761
<i>Ave. Effect of Regulation, Min. Staff-Child Ratio</i>	-0.484		-0.254	-2.355	-2.597	-1.601	-2.746
Min. Educ. Requirement, Directors		-0.128***	-0.193**	-0.464	-0.566	-1.447**	3.717***
No Standard Imposed		-1.485***	-2.123**	-6.403	-6.972	-18.521*	0.114
Min. Educ. Require., Directors × Median Income					0.006		-0.063
No Standard Imposed × Interaction					0.057		-0.614
<i>Ave. Effect of Regulation, Min. Educ. Requirement</i>		-0.265	-0.516	0.059	0.008	-1.264	-2.103
R ²	0.46	0.46	0.46	0.68	0.68	0.87	0.87
Panel B: The Effects of Averaged Measures of Child Care Center Regulations							
Ave. Min. Staff-Child Ratio	-8.750*		-12.120*	-39.198	-41.049	-16.978	-146.223***
No Standards Imposed	-0.561		-0.626	-1.803	-7.728**	0.660	-14.390**
Ave. Min. Staff-Child Ratio × Median Income					0.332		-0.056
No Standards Imposed × Interaction					0.247***		6.503
<i>Ave. Effect of Regulation, Min. Staff-Child Ratio</i>	-0.603		-0.986	-3.410	-4.008	-2.918	-0.932
Ave. Min. Educ. Requirement		-0.033	-0.044	-0.338*	-0.438**	-0.337	5.198***
No Standards Imposed		-0.123	-0.249	-3.636*	-1.706	-2.488	0.558*
Ave. Min. Educ. Requirement × Median Income					0.002		-0.008
No Standards Imposed × Interaction					-0.071		-0.350
<i>Ave. Effect of Regulation, Min. Educ. Requirement</i>		-0.260	-0.261	-0.284	-0.460	-1.421	-0.806
R ²	0.46	0.46	0.46	0.68	0.68	0.87	0.87
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Including Additional Regulations	No	No	Yes	No	No	No	No
Unit of Observations		Zip code		Zip code bundle		County	
Number of Observations		39,674		38,286		8,225	

Table 9: Estimated Effects of State Regulations on Number of Employees per Child Care Center

	(1)	(2)	(3)	(4)
Panel A: The Effects of Single Measures of Child Care Center Regulations				
Min. Staff-Child Ratio, Infants	-2.725	10.992***	1.842	5.552
No Standard Imposed	1.074	4.106**	0.069	-0.680
Min. Staff-Child Ratio, Infants × Median Income		-0.395***		-0.054
No Standard Imposed × Interaction		-0.103**		0.038
<i>Ave. Effect of Regulation, Min. Staff-Child Ratio</i>	-1.690	-1.183	0.347	0.329
Min. Educ. Requirement, Directors	0.219**	0.280*	0.172	-0.064
No Standard Imposed	2.308*	4.032*	2.737	0.117
Min. Educ. Require., Directors × Median Income		-0.003		0.006
No Standard Imposed × Interaction		-0.073*		0.064
<i>Ave. Effect of Regulation, Min. Educ. Requirement</i>	0.686	0.819	-0.385	-0.415
R ²	0.10	0.10	0.05	0.05
Panel B: The Effects of Averaged Measures of Child Care Center Regulations				
Ave. Min. Staff-Child Ratio	-5.791	19.386**	-9.161	-5.068
No Standards Imposed	0.290	3.891*	-1.506	-0.882
Ave. Min. Staff-Child Ratio × Median Income		-0.736***		-0.136
No Standards Imposed × Interaction		-0.126**		-0.020
<i>Ave. Effect of Regulation, Min. Staff-Child Ratio</i>	-1.060	-0.414	0.288	0.269
Ave. Min. Educ. Requirement	0.022	0.037	-0.026	-0.075
No Standards Imposed	-0.156	1.073	0.004	-0.615
Ave. Min. Educ. Requirement × Median Income		-0.001		0.001
No Standards Imposed × Interaction		-0.046*		0.018
<i>Ave. Effect of Regulation, Min. Educ. Requirement</i>	0.411	0.456	-0.306	-0.460
R ²	0.10	0.10	0.05	0.05
Year Fixed Effects	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Establishment Fixed Effects	No	No	Yes	Yes
Unit of Observations		Establishment		
Number of Observations	149,102	149,102	93,063	93,063

Table 10: Estimated Effects of State Regulations on the Family Home Day Care (Non-Employer) Sector

Dependent Variables	Number of Non-Employer Establishments per 1,000 Children under Age 5		Annual Revenue (in millions of 1997\$) per Non-Employer Establishment	
	(1)	(2)	(3)	(4)
Panel A: The Effects of Single Measures of Child Care Center Regulations				
Min. Staff-Child Ratio, Infants	40.76	-36.717	27.028***	-0.690
No Standard Imposed	13.293	-10.940	5.894***	5.247**
Min. Staff-Child Ratio, Infants × Median Income		2.891*		0.533**
No Standard Imposed × Interaction		0.887		-0.076
<i>Ave. Effect of Regulation, Min. Staff-Child Ratio</i>	-4.081	-4.615	0.214	0.699
Min. Educ. Requirement, Directors	-1.976*	-4.144	-0.445***	-0.485
No Standard Imposed	-27.476	-53.699	-6.006***	-6.777
Min. Educ. Require., Directors × Median Income		0.072		0.005
No Standard Imposed × Interaction		0.894		0.072
<i>Ave. Effect of Regulation, Min. Educ. Requirement</i>	0.458	-0.152	0.078	0.033
R ²	0.96	0.96	0.93	0.94
Panel B: The Effects of Averaged Measures of Child Care Center Regulations				
Ave. Min. Staff-Child Ratio	38.847	-156.298	23.838***	-11.135
No Standards Imposed	5.842	14.897	3.637**	7.175***
Ave. Min. Staff-Child Ratio × Median Income		6.242**		1.036**
No Standards Imposed × Interaction		-0.519		-0.187***
<i>Ave. Effect of Regulation, Min. Staff-Child Ratio</i>	-0.675	6.221	0.467	1.432
Ave. Min. Educ. Requirement	-0.224	-0.903	0.056	-0.061
No Standards Imposed	0.327	-14.060	0.595	-0.588
Ave. Min. Educ. Requirement × Median Income		0.017		0.002
No Standards Imposed × Interaction		0.423		0.016
<i>Ave. Effect of Regulation, Min. Educ. Requirement</i>	-2.925	-3.428	0.055	0.104
R ²	0.96	0.96	0.92	0.94
Year Fixed Effects	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Unit of Observations	State		State	
Number of Observations	153		153	

Table 11: Estimated Effects of State Regulations on the Accreditation of Child Care Centers

Dependent Variables	Market Accreditation Rate	
	(1)	(2)
Panel A: The Effects of Single Measures of Child Care Center Regulations		
Min. Staff-Child Ratio, Infants	0.639***	0.723***
No Standard Imposed	0.139***	0.176***
Min. Staff-Child Ratio, Infants × Median Income		-0.002
No Standard Imposed × Interaction		-0.001
<i>Ave. Effect of Regulation, Min. Staff-Child Ratio</i>	<i>0.005</i>	<i>0.004</i>
Min. Educ. Requirement, Directors	-0.017**	-0.013
No Standard Imposed	-0.244***	-0.173
Min. Educ. Require., Directors × Median Income		-0.0001
No Standard Imposed × Interaction		-0.002
<i>Ave. Effect of Regulation, Min. Educ. Requirement</i>	<i>0.012</i>	<i>0.020</i>
R ²	0.09	0.09
Panel B: The Effects of Averaged Measures of Child Care Center Regulations		
Ave. Min. Staff-Child Ratio	1.735***	1.811***
No Standards Imposed	0.208***	0.224***
Ave. Min. Staff-Child Ratio × Median Income		-0.002
No Standards Imposed × Interaction		-0.001
<i>Ave. Effect of Regulation, Min. Staff-Child Ratio</i>	<i>0.023</i>	<i>0.040</i>
Ave. Min. Educ. Requirement	-0.003	-0.006***
No Standards Imposed	-0.029	-0.060**
Ave. Min. Educ. Requirement × Median Income		0.0001***
No Standards Imposed × Interaction		0.001*
<i>Ave. Effect of Regulation, Min. Educ. Requirement</i>	<i>-0.006</i>	<i>0.004</i>
R ²	0.09	0.09
Year Fixed Effects	Yes	Yes
State Fixed Effects	Yes	Yes
Unit of Observations	Zip Code	
Number of Observations	39,674	39,674

Table 12: Estimated Effects of State Regulations on Child Care Center Payroll, Revenue, and Profit per Worker

Dependent Variables:	Payroll per Worker		Revenue per Worker		Net (of Payroll) Revenues per Worker	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: The Effects of Single Measures of Child Care Center Regulations						
Min. Staff-Child Ratio, Infants	-0.206	-1.640	8.431	0.073	8.637	1.713
No Standard Imposed	0.024	0.318	0.671	-2.670	0.647	-2.989
Min. Staff-Child Ratio, Infants × Median Income		0.089		0.310		0.221
No Standard Imposed × Interaction		-0.009		0.130		0.139
<i>Ave. Effect of Regulation, Min. Staff-Child Ratio</i>	-0.071	0.242	1.234	0.770	1.178	0.400
Min. Educ. Requirement, Directors	-0.285***	-0.253*	-0.975***	-0.882**	-0.691***	-0.628**
No Standard Imposed	-4.070***	-3.063	-13.385***	-12.095**	-9.316***	-9.032**
Min. Educ. Require., Directors × Median Income		0.0004		-0.001		-0.001
No Standard Imposed × Interaction		-0.011		-0.013		-0.002
<i>Ave. Effect of Regulation, Min. Educ. Requirement</i>	0.173	0.138	0.054	0.014	2.091	2.195
R ²	0.20	0.02	0.01	0.01	0.01	0.01
Panel B: The Effects of Averaged Measures of Child Care Center Regulations						
Ave. Min. Staff-Child Ratio	9.082	6.257	43.366**	28.119	34.283**	21.862
No Standards Imposed	1.713**	1.210	5.585**	0.083	3.872*	-1.127
Ave. Min. Staff-Child Ratio × Median Income		0.164		0.571		0.406
No Standards Imposed × Interaction		0.015		0.211*		0.196*
<i>Ave. Effect of Regulation, Min. Staff-Child Ratio</i>	-0.505	-0.160	0.183	0.660	0.348	0.850
Ave. Min. Educ. Requirement	-0.027	-0.100**	-0.218	-0.229	-0.191	-0.129
No Standards Imposed	-0.523	-0.503	-2.417	-1.968	-1.894	-1.465
Ave. Min. Educ. Requirement × Median Income		0.002*		0.0004		-0.001
No Standards Imposed × Interaction		-0.003		-0.010		-0.007
<i>Ave. Effect of Regulation, Min. Educ. Requirement</i>	0.210	0.181	-0.112	-0.235	0.127	0.199
R ²	0.02	0.02	0.08	0.01	0.01	0.01
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Establishment Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Unit of Observations	Establishment		Establishment		Establishment	
Number of Observations	89,466	89,466	89,466	89,466	89,466	89,466