

# 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 more stringent regulations of child care inputs significantly reduces the number of center-based child care establishments operating in local markets, especially for lower-income areas. At the same time, more stringent regulations on the labor intensiveness of child care centers increase the quality of services. As a result, there are winners and losers from more stringent 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 quality on 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.<sup>1</sup> 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.<sup>2</sup> In this scenario, even more consumers may be forced out of the market if price competition cannot offset the

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

<sup>2</sup> See Ronnen (1991), Crampes and Hollander (1995), and Garella and Petrakis (2008).

high cost of quality improvement.

In this study we investigate the impact of imposing minimum quality standards on inputs used in production of child care services. Child advocates and researchers argue that there is an under-provision of developmentally-enriching, high quality care,<sup>3</sup> 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.<sup>4</sup> In the U.S., states are in charge of regulating non-parental providers of child care services. The nature 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. For example, many states require licensed child care providers to limit the ratio of children to 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.<sup>5</sup> 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, in contrast to the above theory, 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. Furthermore, as we previously discussed these regulations may have “unintended” (to child care advocates) consequences that may affect access to these services.

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<sup>3</sup> 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, noting that these developmental inadequacies are particularly true for facilities serving infants and toddlers.

<sup>4</sup> 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).

<sup>5</sup> This point has been noted by Blau (2003, 2007) and Blau and Currie (2006).

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,<sup>6</sup> 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.<sup>7</sup>

To conduct our analysis of the effects of child care regulations on the supply side of the child care market, 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).<sup>8</sup> 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 production of child care services. The data allows us to consider a wider class of estimators than have been used in previous work and provide estimates for the U.S. as a whole.<sup>9</sup> More importantly, our data allows us to assess the differential impact of the regulations on different markets and determine which markets suffer more losses due to the regulation.

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<sup>6</sup> Blau (2007) considers evidence as to whether regulations are complied with.

<sup>7</sup> Using data on parental child care choices with data from the Survey of Income and Program Participation (SIPP), 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 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.

<sup>8</sup> NAEYC is an independent not-for-profit organization that provides accreditation services to child care centers.

<sup>9</sup> We note that most of the empirical work on the entry and exit of firms from markets has been limited to the manufacturing sector. See, for example, Dunne, Roberts, and Samuelson (1988, 1989a, 1989b) and Greenstone (2002). For a literature review on firm turnover in the manufacturing industries, see Caves (1998).

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 variation in regulations across states for identification.<sup>10</sup> 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 have four major findings. First, we find that more stringent regulations of child care services in the formal sector, i.e., day care centers, appear to drive firms out of business. Furthermore, we find no evidence that the day care centers that remain in local markets increase their size by hiring more workers in response to increases in the stringency of child care regulations. Taken together, these findings indicate that more stringent regulations reduce parents' access to services in the formal sector of the child care market. Moreover, we find that this reduction of access to day care centers is greater in poorer markets, so that less advantaged children are more likely to be crowded out of providers thought to provide more developmentally enriching services.

Second, we examine whether the loss of capacity in the formal day care sector attributable to more stringent regulations is made up for by increases in the size of the informal sector of child care. We find that more stringent regulations for day care centers have no effect on the *number* of family day care

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<sup>10</sup> 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. There are work by Gormley (1991), Lowenberg and Tinnin (1992) and Chipty (1995). Closest to ours in the literature are the studies by Chipty and Witte (1997) and Blau (2007) that 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. However, both of these studies rely on cross-sectional data from specialized samples of child care establishments which limits their ability to measure changes in the supply of child care in response to changes in regulations and limits the econometric strategies they can use for isolating the causal effects of regulations on child care availability or its quality.

homes. At the same time, we do find evidence that more stringent state staff-to-child ratio requirements do lead to family day care homes having higher revenues. 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 per family home (and per care provider).

In contrast to our findings on the negative effects of more stringent regulation on the capacity of child care services in local markets in the U.S., we do find that regulations that increase the labor intensiveness of child care services in day care centers significantly increase the share of centers in a market that are accredited. This finding supports the view that high-end firms respond strategically to more stringent regulation, even these regulations do not directly bind them. At the same time, there is evidence that these quality gains due to more stringent staff-to-child ratio requirements are not shared equally by all consumers. Most of these gains appear to accrue to markets with wealthier populations who are more able to afford the higher quality, but apparently more expensive care. However, more stringent educational requirements on all child care center staff *reduces* the likelihood of accreditation, although the effect of higher educational requirements for center directors on accreditation is not statistically significant.

Overall, the imposition of more stringent regulations on the child care sector produces winners and losers. For wealthier consumers (parents), well-chosen, more stringent regulations such as staff-child ratio requirements appear to increase the quality of care in child care centers and have minimal impact on the availability of such care, while for poorer parents, such regulations reduce both their access to center-based care and do not appear to substantially improve the quality of the centers in the markets where they live.

Finally, we also investigate the consequences of more stringent regulations on the workers and owners in day care centers. Here again, we find that more stringent regulations produce winners and losers. We find that these regulations do not improve – and may even reduce – the wages and salaries of the typical worker in this industry. As a result, it appears that workers do not benefit from more stringent regulations in the formal sector of the child care market. At the same time, we do find evidence that more

stringent regulations on the labor intensiveness of child care centers increases their revenue and profit per worker, suggesting that their owners capture most the benefits of any increased willingness of parents to pay for higher quality child care services.

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 that 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 costs of quality.

Consumer welfare, the profitability of firms and the distribution of quality in a market is also af-

ected by the market structure. For example, Ronnen (1991)<sup>11</sup> finds that imposing more stringent minimum quality standards can induce quality (and possibly price) competition among sellers in markets that 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

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<sup>11</sup> See also Crampes and Hollander (1995).

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.<sup>12</sup> 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.<sup>13</sup> Based on data from the Survey of Income and Program Participation

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<sup>12</sup> 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.

<sup>13</sup> 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%.

(SIPP) gathered in the Spring of 1997,<sup>14</sup> 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<sup>15</sup> and 7.3% in a family day care home arrangement. Among those preschool children with working mothers,<sup>16</sup> 54.0% were 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 a tax liability. 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.<sup>17</sup> 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-

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<sup>14</sup> See Smith (2002).

<sup>15</sup> Organized child care facilities include child care centers, nursery schools and Head Start programs. Note that this category does not include babysitting services provided in the child's home.

<sup>16</sup> In 1997, the SIPP estimated that 52.7% of children under the age of 5 had mothers who were working.

<sup>17</sup> The child care industry is classified under the category of social services (SIC code 8351) in the Census of Service Industries.

level for non-employer establishments.<sup>18</sup> 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 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,<sup>19</sup> which we used to match establishments over time and determine the chain-status of an establishment.<sup>20</sup> (b) Street address and business names for each establishment,<sup>21</sup> 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 daycare (Chipty, 1995; Hofferth et al., 1991). 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. We note that one can use alternative geographic entities to define child care markets, including zip-code bundles – i.e., the geographic areas encompassed by a zip code and all its neighboring zip codes within a certain radius of its population center – counties or metropolitan statis-

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<sup>18</sup> 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). At the time of our request, the Census Bureau was not prepared to request that the IRS grant our project access to establishment-level data on these establishments.

<sup>19</sup> The identifiers to which we had access were the Census File Number (CFN) and Establishment Identification Number (EIN).

<sup>20</sup> We define establishments sharing the same 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.

<sup>21</sup> This information comes from the Standard Statistical Establishment List (SSEL), an integrated part of the Census of Service Industries.

tical areas (MSAs). While we expect, *ex ante*, that zip-codes are likely to be the preferred geographic unit for child care markets, in the analysis presented below we also conducted all of our analyses using zip-code bundles and counties as our definition of local markets in order to assess the robustness of our findings based on our preferred zip-code market definition.

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, 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 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).<sup>22</sup> 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. Details of the construction of these variables, if not self-explanatory, are found in the Appendix. 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

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<sup>22</sup> 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.

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 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 display the pattern of entry and exit of child care center establishments over this same period. As can be seen from Table 2a, this industry is characterized by a high rate of turnover. In a given year, about 50% of the operating establishments have entered in the previous 5 years, while about 40% of them will exit in the next 5 years. A close look shows that the incidence of the high mortality rates mainly fall on the new entrants. As noted in Table 2b, 46% of new entrants in 1992 had exited by 1997, while only 30% of incumbents had exited.

In Table 3a, 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 1997. 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.

Finally, Table 3b describes 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.<sup>23</sup> 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. The applying program must submit extensive information about its program, referred to as a self-study, and undergo a site-visit to validate the accuracy of this study. Information that is compiled and validated includes assessments of the nature and extent of interactions among teachers and children, a center's curriculum, the 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 the program

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<sup>23</sup> The 1988 National Child Care Staffing Study (Whitebook, Howes, and Philips 1989) examined the quality of care in 227 child care centers representing 643 classrooms in five U.S. metropolitan areas and found that accredited centers provided higher-than-average-quality services to children, assessed with the Early Childhood Environment Rating Scale. They found that accredited centers had better-trained staff and lower staff turnover, and provide more developmentally appropriate activities and higher-quality care giving. The 1993 Cost, Quality and Child Outcomes Study examined 401 child care centers representing 749 classrooms in four states and confirmed the findings of the previous study. Parents were willing pay a premium for the accreditation status, especially for newly opened centers where parents had no provider reputation to rely on (Xiao, 2007).

is in compliance with NAEYC's criteria for a high quality child care program, placing great emphasis on the quality of interactions between staff and children and the developmental appropriateness of the program's curriculum. If the program is in compliance, the commission grants accreditation 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. The data contains information on the provider's exact address (street address, city, county, state, zip), some center characteristics (number of staff, number of children, number of groups, length of day, affiliation), and accreditation history (application date, initial accreditation date, expiration date, and accreditation status).<sup>24</sup> With these data, we are able to construct a measure of quality at the establishment level and thereby compensate for the lack of measures of quality in the Census of Services. We also constructed a measure of the fraction of child care center establishments that are accredited, or accreditation rates, for each of our local markets.

Measures of rates of accreditation at the establishment and market levels are provided at Table 4a. 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 accredited 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

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<sup>24</sup> However, as the application date is updated whenever the establishment submits a new application or a request for renewal, we are not able to determine the number and identity of applicants at a given time.

period.<sup>25</sup> 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. While we conduct our regression analysis below for both of these measures, we suspect that, of the two, the market-level measures are less subject to measurement/classification error. Focusing on the latter rates in Table 4a, 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 any response by child care centers to changes in the stringency of state regulations are mitigated by shifts of children into family day care homes. Ideally, we would prefer to have comparable data for these types of establishments as we had for day care centers. But, as noted above, we do not. Rather, we only have geographically-based aggregated 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.<sup>26</sup> We also were not able to develop comparable measures of the quality of their services as we have for child care centers as NAEYC does not accreditation family day care homes. Nonetheless, we are able to conduct some analyses of the spillover effects of child care center regulations on aspects of the operations in this more informal sector of the child care market.

We present, in Table 4b, some descriptive statistics for family day care home establishments by

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<sup>25</sup> 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.

<sup>26</sup> There are no child care non-employer data available for finer geographic levels for the years of data we use in our analysis.

state for the years 1987, 1992 and 1992. 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.<sup>27</sup> 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 nature of the regulation of the child care industry and the data we use to measure these regulations. The stringency and nature of regulations differ across types of child care providers, with one set of regulations applying to *center-based care* provided in day care centers, pre-school and/or nursery schools and Head Start programs, and a different set 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., minimum educational requirements and requiring criminal background checks for child care workers) of

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<sup>27</sup> See O'Neill and O'Connell (2001) for more on the non-employer establishment data for child care providers.

child care center services.<sup>28</sup> 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.<sup>29</sup> 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.<sup>30</sup> This strategy is used 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 over 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.<sup>31</sup> On the surface, there are no discernable trends in the various measures of regulation amongst those states that had regula-

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<sup>28</sup> Other requirements are on the necessity of developmental curriculum and liability insurance, health and safety standards such as immunization and fire-safety equipment, and general standards such as whether parents are allowed free visits. Some states even specify the frequency of government inspections on licensed child care centers.

<sup>29</sup> 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 the study by 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.

<sup>30</sup> 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.

<sup>31</sup> The information on state child care regulations was gathered by one of the authors (Hotz), in collaboration with Dr. Rebecca Kilburn of Rand for the period 1983-1997. These data are available from the author upon request.

tions. 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, 5 states started regulating staff-child ratios for infants and 4 changed its regulatory stringency and, from 1987 to 1997, 10 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).

As just noted, states can vary their regulation of various aspects of the production of child care services on both the “extensive margin,” by whether or not they impose any regulation, and on the “intensive margin,” by varying the stringency of a regulation. So that our results are comparable with those from previous studies, we focus primarily on the effects of changes in the stringency of regulations on the intensive margin. However, in all of the analyses we present, we also control for dummy variables indicating whether or not the state had imposed any regulation on a particular aspect of child care production.

#### **4. Econometric Methods**

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.<sup>32</sup> For example, some states may have a high proportion of parents who have strong preferences for providing their children with high quality child care and are willing to pay for such care. At the same time, these parents, as voters, are likely to support more stringent regulations that promote higher quality in the child care market. In contrast, the parents in other states may care less about the quality of child care and, as result, are less willing to pay for it and are less willing to support policies that promote it. Failure to control for such unobserved differences in tastes, economic conditions, etc. that vary across states and/or over time will result in biased estimates of the effects of policy on the outcomes of interest.

One strategy for reducing the influence of policy endogeneity is to control for as rich a set of observable state and individual-level characteristics that might account for this source of bias. In the regression analysis presented below, we do so. But, the particularly rich structure of the data we have available in this study, especially for analyzing the effects of regulations on the formal sector of the child care market, allows us to control for the influences of a wide range of unobserved sources of heterogeneity. In particular, we can exploit the fact that we have panel data on establishments located in different states to control for state, time, and, in some cases, establishment fixed effects in our analyses. More precisely, for market level analyses we can estimate regressions of the following form:

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

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  $t$ ,  $X_{mst}$  is a vector of market-level population characteristics and economic conditions,  $\delta_t$ , and  $\gamma_s$ , are, respectively, year and state fixed effects, and  $\alpha_1$  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:

$$Y_{jmst} = \beta_0 + \beta_1 REG_{st} + \beta_2 X_{mst} + \beta_3 Z_{jmst} + \omega_t + \lambda_s + \kappa_j + v_{jmst}, \quad (2)$$

where  $Y_{jmst}$  are outcomes for establishment (child care center)  $j$  located at local market  $m$  within state  $s$  in

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<sup>32</sup> See Besley and Case (2000) for an explicit treatment of this source of bias.

year  $t$ ,  $Z_{jmt}$  denotes a vector of establishment characteristics,  $\omega_t$ ,  $\lambda_s$  and  $\kappa_j$  are, respectively, time, state and establishment fixed effects and  $\beta_1$  is the vector of the impacts of state child care regulations on  $Y_{jmt}$ . In the case of our market-level analyses, the inclusion of state and year fixed effects implies that our effects of regulations are identified off *within-state changes* in state regulations, holding constant any time-invariant *differences across markets*. As for establishment-level outcomes, our identification strategy uses this same within-state, over-time variation in regulations to identify the effects of regulations, holding constant any time-invariant *differences across establishments*. Note that the unobserved establishment-specific factors may also confound our assessment of the direct impact of regulations. For example, some child care providers may respond to local parents' high preferences for quality by adopting practices of hiring more part-time employees. Such providers may have more advantages in circumventing regulation as they have more flexible book keeping system or do not have to pay medical benefits for part-timers. Therefore without controlling establishment-specific fixed effects, the estimated impact of more stringent regulation on establishment outcomes is a mixture of regulation and such hiring practices. More importantly, as the incorporation of establish-specific fixed effects requires a panel data of establishments who have survived at least two Census years, the estimates will tell us whether incumbents respond to tougher regulation so that the effects of regulation is more than a result of entry of high quality firm and exit of low quality ones. To our knowledge, 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.<sup>33</sup>

In all sets of regressions, we estimate the variance matrix taking into account unobserved heterogeneity influencing seller behavior at the state-year level. 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

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<sup>33</sup> As noted above, the two empirical studies most relevant for our work are those by Chipty and Witte (1997) and Blau (2007). Both 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, but he does exploit variation within states across age groups of children and job titles of staff to help isolate the causal effects of child care regulations on the inputs used and quality of care provided.

structure but assume that errors are uncorrelated across groups (Moulton, 1986).<sup>34</sup>

## 5. Results

Tables 6 through 13 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 local income levels.<sup>35</sup> 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 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

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<sup>34</sup> If we cluster error terms by state instead of state-year pair, we lose significance in a few places but main results stay intact.

<sup>35</sup> The attributes of local markets that are controlled for in our regressions include: the area's racial composition, average household size and other characteristics of households, the levels of educational attainment of residents, work-related factors, percentages of rural population, and the size of population under 5. In all regressions, most of the above attributes are key determinants of the dependent variables with the exceptions of the size of population under 5, local income levels and the unemployment rates losing significance in some of the specifications. In the establishment-level analysis, all the firm-level attributes we include – organization structure, tax-exempt status, chain status, and whether the providers provide services for less than six months a year – have significant effects on the outcome variables.

other dimensions of the production of child care services or whether we control for indicators of whether a state actually imposed any regulatory restriction.<sup>36</sup> Finally, we find that the signs and statistical significance of regulations on the outcomes we exam 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 these robustness checks for all of the outcomes we analyzed. Detailed results for these analyses are available upon request.

### ***5.1 Do more stringent child care regulations drive child care centers out of the market?***

As we noted in Section 2, one cannot sign the effects of more stringent regulations 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 they will receive. 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 and on the likelihood that firms exit from these markets.

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 higher staff-child ratio requirements significantly reduce the number of establishments operating in a local market, although the effect of our average staff-child ratio is not statistically significant. To get a sense of how sizeable this effect is, consider the 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.<sup>37</sup>

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<sup>36</sup> 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.

<sup>37</sup> The average of the minimum staff-child ratio for infants is 0.226 (Table 5), which corresponds to a maximum

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, increasing the average required number of years of education of center directors by 1 would *reduce* 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, this is a non-trivial reduction 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. These results indicate that the negative effect of more stringent staff-child ratios on the number of child care centers in local markets is significantly greater in poorer markets. Based on these estimates, the impact of reducing the average maximum number of infants per center staff member by 1 would reduce the number of child care centers by between 11.2% to 13.8%, depending on the year analyzed, in a local market with median family income of \$16,399, which is equal the poverty threshold for a family of four in 1992 (measured in 1997\$).<sup>38</sup> Thus, the burden of imposing more stringent minimum staff-child ratios is disproportionately borne by the poorer markets.

As we noted above, we estimated a number of alternative specifications of our baseline model to determine the robustness of our findings concerning the effects of regulation stringency on all of our outcomes. Table 7 presents a few of these robustness checks for the number of establishments per market. Comparing the estimates in Table 7 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

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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 childcare centers in a zip code in 1997, and 10.8% ( $= 0.371/3.440$ ) in 1987. The following calculations all follow this procedure.

<sup>38</sup> The poverty thresholds were taken from U.S. Census Bureau's Historical Poverty Tables (<http://www.census.gov/hhes/www/poverty/histpov/hstpov1.html>) and then converted to 1997\$.

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 more stringent educational requirements for child care center staff, while the estimated effects are less consistently statistically significant, the estimated effects always have a negative sign.

Our findings from Table 6 (and Table 7) clearly indicate that more stringent regulations reduce the number of child care centers in local markets. It is of potential interest to know whether this is due to the forestalling of entry into the market or higher rates of established or “incumbent” centers leaving the market or both. In Tables 8a and 8b, we provide estimates of the impacts of our child care regulations on market entry and exit rates and the probability that child care centers exit their local markets, respectively.<sup>39</sup> With respect to entry rates into local markets (table 8a, columns 1 and 2) – using zip codes once again as our definition of markets – we find that more stringent staff-child ratio requirements significantly reduce the rate at which new child care centers enter local markets. However, we also find, somewhat unexpectedly, that higher educational requirements for center directors (Panel A) or all center staff (Panel B) appear to increase the rate of entry into markets. Finally, we find that that increasing the stringency of either the staff-child or educational requirements has different effects by the income levels of local markets. In particular, the forestalling effect of more stringent staff-child ratio requirements is greater in richer local markets while the forestalling effect of higher educational requirements tends to be greater in poorer markets. With respect to market exit rates (Table 8a, columns 3 and 4), the only statistically significant effect of child care regulations is for staff-child ratio requirements, where we find that the more stringent are these regulations, the higher the rate of child care centers exiting from local markets.

The inaccurate and somewhat inconsistent results in table 8a, which report the impact of more stringent regulations on individual establishment outcomes at an aggregate market level, suggest the ne-

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<sup>39</sup> Recall from Table 3a how entry and exit rates are calculated. (See also the Appendix for further detail on the construction of these measures.) The market-level “entry rate” we use as the dependent variable for the results presented in columns 1 and 2 of table 8 is equal to the number of new entrants in year  $t$  divided by the number of establishments in year  $t-5$ . Strictly speaking it does not measure the rate at which “potential” establishments enter a market, as we have no way of measuring the number of potential entrants to a market. Nonetheless, this measure, first proposed by Dunne, Roberts and Samuelson (1989), is commonly used in the empirical IO literature to characterize market-level rates of entry.

cessity of establishment level data. In Table 8b, we present estimates of the marginal effects of a change in child care regulations on the exit probabilities for individual child care establishments. Unlike the previous analyses, we can better measure the exit propensity at the establishment level and are able to include year, state *and* establishment fixed effects to better control for endogeneity bias when estimating the effects of regulations on firm behavior. The estimated effects in Table 8b, by and large, are quite consistent with those in Table 6 and, more notably, more accurate than those in columns 3 and 4 of Table 8a. Focusing on the estimates in columns 3 and 4 of Table 8b that control for establishment fixed effects, we find that both more stringent staff-child ratio and education requirements significantly *increase* the rate of child care centers exiting from local markets. Moreover, we find that the stringency of these regulations lead to even higher rates of exit from poorer local market and, in contrast to the corresponding estimates for market-level exit rate in Table 8a, these differential effects by income are statistically significant. Based on column 4, the impact of reducing the average maximum number of infants per center staff member by 1 would increase the probability of a child care center exiting by approximately 5.6% in a local market with median family income at the poverty threshold for a family of four in 1992 (compared to an insignificant 4.7% in an average zip code according to column 3). Meanwhile, the impact of increasing the average required number of years of education of center directors by 1 would increase the probability of a child care center exiting by approximately 4.6% in a local market with median family income at the poverty threshold for a family of four in 1992 (compared to 3.4% in an average zip code according to column 3). Again, the negative impacts of imposing more stringent regulation appear to be disproportionately borne by the poorer markets.

## ***5.2 Do more stringent regulations cause child care centers to increase their use of labor?***

The previous section clearly establishes that more stringent child care regulations reduce the number of child care centers. However, providers may change their size in response to different levels of regulatory stringency. For example, they may hire more employees to comply with higher staff-child ratio requirements. More generally as noted by Blau (2007), child care centers may adjust their labor inputs in

response to the regulations, although it is unclear whether this re-optimization will increase or decrease the amount of labor used in 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.<sup>40</sup> These results are presented in Table 9. While we do find some evidence that the stringency of these regulations affect the number of employees in a child care center when we do not control for establishment fixed effects (columns 1 and 2), the resulting estimates of regulatory stringency are all statistically insignificant once these fixed effects are included in the regressions (columns 3 and 4). We note that one would expect a positive effect of a more stringent staff-child ratio requirement on the number of employees per child care center if, in response to the increased stringency, these centers both complied with these regulations *and* did not reduce the number of children cared for in child care centers. Thus, our results clearly indicate that this mechanical effect of more stringent regulations does not characterize our data. Moreover, our findings are consistent with either firms being less likely to comply with regulations *and/or* that centers reduced the number of children it cared for in response to more stringent staff-child ratio requirements. We cannot shed more light on the latter possibilities, given that we have no information on the number of children enrolled in a child care center, but these results, taken together with our evidence that the number of establishments decline as a result of more stringent regulations, point to the conclusion that more stringent regulations reduce the supply of center-based child care services in local markets.

### ***5.3 Do more stringent child care regulations increase the supply of services in the informal sector?***

As we have noted above, more stringent regulations in the formal sector of the child care market may increase the demand for services in the informal sector to the extent that such regulations increase the price of center-based child care services and reduce the options parents face. And, given what are perceived to be low costs of entry, such increased demand and reduced option might be expected to increase

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<sup>40</sup> Previous studies (Gormley, 1991; Lowenberg and Tinnin, 1992) use the number of child care slots available per child in licensed programs as a measure of the supply in that child care market. We have neither data on the capacity nor the number of enrolled children necessary to perform such analyses.

the supply of child care services in the informal sector. We now examine whether the increased stringency of child care centers has any effect on the availability of services in family day care homes. Recall that we have more limited data on family day care homes. In particular for the years we are considering (1987, 1992 and 1997), we only have information on the total number of establishments and the total revenue for these establishments aggregated to the state level. Thus, our analysis of the cross-sector effect of child care center regulations is more limited than our analysis we conduct for child care centers. Nonetheless, we think they are informative.

We present in Table 10 estimates of the effects of the same measures of state child care regulations as used throughout our analysis. We examine two outcomes using our state-level data. First, we examine the number of establishments per 1000 children under age 5 to determine how child care center regulations affect the supply of family day care homes.<sup>41</sup> We also analyze the effects of these regulations on the average annual revenue per family day care home establishment. In addition to being of direct interest, this latter measure provides a rough indicator of the number of children (or child hours) in a family day care home, since these establishments, by definition, must be operated in a proprietor's home and does not have any employees. We note the estimates presented in Table 10 are from regressions that control for measures of states' regulations of labor intensiveness and educational qualifications that apply to family day care homes in order to avoid any confounding of the cross-sector effects of states' center-based regulations.<sup>42</sup> Finally, we also include time fixed effects in all of these regressions to account, in part, for the potential undercount of family day care homes in 1987 that we noted in Section 3.2.<sup>43</sup>

With respect to the effects of the stringency of center-based regulations on the number of family day care homes per 1000 children under the age of 5 (columns 1 in Table 10), we find no evidence of any

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<sup>41</sup> We use this ratio of family day care homes to the number of children of child care age in our state analyses to account for the fact that states differ in their population size. We did not use this "scaling" of the number of establishments in our zip-code level regressions since zip-codes are designed to contain roughly similar number of "postal drops" (mail boxes) which is closely related to population size in these geographical areas. The results are robust to whether we use the ratio of family day care homes to the number of children of child care age or the number of family day care homes.

<sup>42</sup> The results are robust to whether we include these measures of regulations on family day care homes.

<sup>43</sup> Our results are also robust to whether or not we drop 1987 data from our analysis.

cross-regulation effect. Put differently, we find no evidence that more stringent center-based regulations increase or decrease the density of family day care homes in a state. However, we do find evidence that more stringent staff-child ratio regulations, on average, increase the annual revenue per family day care home (column 3). We note that this effect of more stringent center-based child-staff ratio requirements on annual revenue per establishment is consistent with an increase in the number of children cared for per family home establishment, given that the informal sector is highly competitive and parents are price elastic. Since the only labor input into the operation of family day care homes, by definition, is provided by the home's proprietor, this would imply an increase in the number of children cared for per staff in these family day care homes. Finally, we also find that increased educational requirements for child care center directors decrease the annual revenues per family day care home providers and that this effect is statistically significant. However, the corresponding effect of the average educational requirements of center-based staff is not significant. Moreover, we have little evidence that these cross-regulation effects for either number of family home establishments per number of young children or annual revenues per establishment vary by whether the state is, on average, poor or wealthy (columns 2 and 4).

#### ***5.4 Do more stringent regulations increase the quality of child care centers?***

We next turn to the evidence on whether child care regulations achieve their goal of increasing the quality of child care services. As we noted in earlier, whether more stringent regulations will increase quality is an empirical issue, given the competing influences that such regulations can have on the behavior of establishments and their actions. We use whether a child care center is accredited by NAEYC as an indicator of high quality of the child care service. Presumably, none of the state requirements are likely to be binding on the criteria used by NAEYC in their accreditation evaluation. Thus, any evidence that more stringent regulations increase the rate of NAEYC accreditation is likely to come through the sort of quality competition considered in the work of Ronnen (1991). Thus, our estimates of the effects of regulation on the likelihood of NAEYC accreditation can be viewed as a test of Ronnen's prediction about the strategic response by a limited number of high-quality firms in local markets to the elimination of low-quality

firms by the imposition of more stringent regulations.

Table 11 presents the estimated marginal effects of child care regulations on an establishment's probability of receiving NAEYC accreditation. Again, we focus on the estimates in columns 3 and 4, which are from regressions that control for year, state, and establishment fixed effects. On average, we find that more stringent staff-child ratio requirements significantly *increase* the probability that a child care center is accredited (column 3). This result is consistent with more stringent regulations helping to stimulate quality competition amongst child care centers as suggested by Ronnen's (1991) model of the strategic benefits of the regulation on quality. In contrast, we find that more stringent educational requirements on all child care center staff (column 3 of Panel B) *reduces* the likelihood of accreditation, although the effect of higher educational requirements for center directors on accreditation is not statistically significant (column 3 of Panel A). We also find evidence that the improvement in quality associated with more stringent staff-child ratio requirements occurs disproportionately in wealthier areas, with poorer local markets benefiting less (column 4 of Panels A and B). We find less consistency in the evidence concerning whether the impacts of higher educational requirements on the likelihood that a child care center is accredited varies by the income levels of local markets.

As we noted in Section 3.1, the lower rates of matching between NAEYC accreditation database and the Census data at the establishment level, may compromise the validity of the estimates of the effects of regulations on accreditation at the establishment level. Therefore, we also present estimates of the effects of child care regulations on rates of accreditation in local markets in columns 5 and 6 of Table 11, where local markets are defined to be zip codes. We again find that more stringent staff-child ratio requirements for child care centers do significantly increase the incidence of accreditation in local markets and less consistent evidence that higher educational requirements for center staff reduces the incidence of accreditation. Finally, based on our market-level estimates, we do not find strong evidence that the impacts of staff-child ratio requirements vary by the wealth in local markets but we again see that the quality-detering effects of more stringent educational requirements for all center-based staff (column 6 of Panel B) fall disproportionately on poorer local markets.

Overall, these results indicate that more restrictive staff-child ratio requirements do appear to promote the quality of child care services and this result is found using both establishment level and market level data. But, there is evidence that these “gains in quality” from regulating the labor intensiveness of child care centers accrues primarily to higher income markets at the expense of poorer ones. Moreover, our results on the effects of higher education requirements suggest that more stringent regulation of an input – in this case the educational qualifications of labor used in production process – may not increase the quality of services produced. To know which link is broken in the mapping from higher education levels to higher quality requires more detailed establishment level data and is beyond the scope of this study. Finally, our findings here suggest that properly-chosen regulations may spark quality competition among local child care centers, especially in higher income markets, resulting in increases in the quality of child care services even among higher quality firms on whom state regulations are not likely to be binding.

### ***5.5 Do child care workers and/or owners benefit from more stringent child care regulations?***

Finally, we examine whether workers in child care centers and/or center owners benefit from more stringent child care regulations. 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 and profits 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.<sup>44</sup> 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). With respect to

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<sup>44</sup> 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.

center profits, more stringent regulations may lead to greater profitability, consistent with our evidence that potential competitors are less likely to enter markets as regulatory stringency increases. On the other hand, more stringent standards may raise operating costs, thereby reducing the profitability of child care centers.

Estimates of the effects of state child regulations on the wages, revenues, and profits per worker in child care centers are presented in Table 12.<sup>45</sup> We again focus on the estimates from regressions that control for state, time and establishment fixed effects (columns 2, 4 and 6). The evidence of the effects of regulatory stringency on the three outcomes is somewhat mixed. In particular, based on the effects of specific measures of child care regulations in Panel A, we find that higher educational requirements for child care center directors reduces payroll, revenues and profits per worker, while we find no effect of the stringency of staff-child ratio requirements for infants. Based on these results, it appears that neither child care center workers nor owners benefit from more stringent child care regulations. However, examining the effect of regulation stringency indexes in Panel B, we find that the more stringent are the average measure of staff-child ratio requirements, the higher are revenues and profits of child care centers although neither staff-child ratio requirements nor average educational requirements affect the wage and salary income of child care workers. So based on the estimates in Panel B, it would appear that owners do benefit from more stringent child care center regulations, while workers do not. Given that the regulations being considered in Panel A versus Panel B are different, it could be each of these somewhat contradictory findings across the two Panels is true. A more cautious interpretation of these results is that it is not clear cut as to whether owners benefit when child care centers are more stringently regulated on labor intensiveness. However, we find relatively clear-cut evidence that child care workers do not benefit from more stringent regulations and that neither workers nor owners benefit from requiring staff members to have more education. The latter evidence is consistent with our results in Table 11, which indicates that more stringent education requirements have adverse effects on quality.

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<sup>45</sup> Results are robust to alternative definition of workers, 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.

## 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.<sup>46</sup> In the face of these alternative responses, policy makers need to be fully informed of the consequences – intended or unintended – of such regulations. 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. As the standards do not seem to crowd out providers into informal sector and the remaining providers do not hire more employees to respond to the regulation, the standards lead to a real loss in the access to child care. Furthermore, more stringent standards on the labor intensiveness of child care center services appear to be more effective at increasing accreditation in local markets than to requiring more educated staff members in child care centers. If anything, requiring more highly educated staff in child care centers appear to reduce the likelihood that centers are accredited, suggesting broken link in the mapping between higher education requirements and higher quality of child care services. Finally, we find that child care workers do not gain from more stringency regulations while owners are potential winners from regulations on labor intensiveness of child care services.

While more evidence has accumulated on the demand-side effects of the stringency of input regulations, there is much less evidence as to the supply-side effects, largely due to data limitations. As Kleiner (2000) points out, “the empirical evidence (of occupational licensing) on the increase in quality, greater level of training, or avoidance of catastrophes is often thin or nonexistent ... The largest barrier standing in the way of analysis of occupational licensing is that there is no well-organized national data set waiting to be explored.” Using a rich set of panel data at the national level, our study represents an important step in filling the void on the effects of minimum input standards – of which licensing is one form – on the supply and quality of services for an important set of services, namely those provided by child care cen-

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<sup>46</sup> For example, another regulatory response could be to requirement sellers to disclose the quality of their products or services (Jin and Leslie, 2003).

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## References

- Akerlof, George, 1970, "The Market for Lemons: Quality Uncertainty and the Market Mechanism," *The Quarterly Journal of Economics*, 84(3): 488-500.
- Besley, Timothy & Case, Anne, 2000, "Unnatural Experiments? Estimating the Incidence of Endogenous Policies," *Economic Journal*, vol. 110(467), pages F672-94.
- Blau, David, 2000, "The Production of Quality in Child Care Centers: Another Look," *Applied Developmental Science*, 4(3): 136-148.
- Blau, David, 2003, "Do Child Care Regulations Affect the Child Care and Labor Markets?" *Journal of Policy Analysis and Management*, 22(3): 443-465.
- Blau, David, 2007. "Unintended Consequences of Child Care Regulations," *Labour Economics*, 14(3): 513-38.
- Blau, David and Janet Currie, 2006. "Preschool, Day Care and After-School Care: Who's Minding the Kids," in *Handbook of the Economics of Education*, Vol. 2, Eric A. Hanushek and Finis Welch, eds., New York: Elsevier, 1163-1278.
- Blau, David and Alison P. Hagy, 1998, "The Demand for Quality in Child Care," *Journal of Political Economy*, 106(1): 104-46.
- Blau, David and Naci Mocan, 2002, "The Supply of Quality in Child Care Centers," *Review of Economics and Statistics*, 84(3): 483-496.
- Caves, Richard E., 1998, "Industrial Organization and the New Findings on the Turnover and Mobility of the Firms," *Journal of Economic Literature*, 36(4): 1947-1982.
- Chipty, Tasheem and Anne Witte, 1997, "An Empirical Investigation of Firms' Responses to Minimum Quality Standards Regulation," NBER working paper No. 6104.
- Chipty, Tasheem, 1995, "Economic Effects of Quality Regulations in the Daycare Industry," *American Economic Review*, 85(3): 419-424.
- Cost, Quality and Outcomes Team, 1995, "Cost, Quality, and Child Outcomes in Child Care Centers, Executive Summary," Denver: Economics Department, University of Colorado at Denver.
- Crampes, Claude and Abraham Hollander, 1995, "Duopoly and Quality Standards," *European Economic Review*, 39(1): 91-82.
- Currie, Janet, 2001, "Early Childhood Education Programs," *Journal of Economic Perspectives* 15(2), 213-238.
- Currie, Janet and V. Joseph Hotz, 2004, "Accidents Will Happen? Unintentional Childhood Injuries and the Effects of Child Care Regulations", *Journal of Health Economics*, 23(1): 25-59.
- Dunne, Timothy, Mark J. Roberts, and Larry Samuelson, 1988, "Patterns of Firm Entry and Exit in U.S. Manufacturing Industries," *The RAND Journal of Economics*, 19(4): 495-515.
- Dunne, Timothy, Mark J. Roberts, and Larry Samuelson, 1989a, "The Growth and Failure of U.S. Manu-

- facturing Plans,” *The Quarterly Journal of Economics*, Vol. 104 (4), 671-698.
- Dunne, Timothy, Mark J. Roberts, and Larry Samuelson, 1989b, “Plant Turnover and Gross Employment Flows in the U.S. Manufacturing Sector,” *Journal of Labor Economics*, Vol. 7 (1), 48-71.
- Garella, Paolo and Emmanuel Petrakis, 2008, “Minimum Quality Standards and Consumers’ Information,” *Economic Theory*, 36(20): 283-302.
- Gormley, William, 1991, “State Regulations and the Availability of Child Care Services,” *Journal of Policy Analysis and Management*, 10(1): 78-95.
- Greenstone, Michael, 2002, “The Impacts of Environmental Regulations on Industrial Activity: Evidence from the 1970 and 1977 Clean Air Act Amendments and the Census of Manufacturers,” *Journal of Political Economy*, 110(6): 1175-1221.
- Hayes, Cheryl, John Palmer and Martha Zaslow, 1990, *Who Cares for America’s Children? Child Care Policy for the 1990s*, Washington, DC: National Academy Press.
- Hofferth, Sandra L., A. Brayfield, S. Deich, and P. Holcomb, 1991, National Childcare Survey, 1990, the Urban Institute Press, Washington, D.C.
- Hofferth Sandra L. and D. Chaplin, 1998. “State Regulations and Child Care Choice,” *Population Research and Policy Review*, 17(2):111-140. Hotz, V. Joseph and M. Rebecca Kilburn, 1997, “Regulating Child Care: The Effects of State Regulations on Child Care Demand and Its Cost,” *mimeo*, UCLA.
- Hotz, V. Joseph and M. Rebecca Kilburn, 2000, “The Effects of State Regulations on Child Care Prices and Choices,” *mimeo*, UCLA.
- Jin, G. and P. Leslie, 2003, “The Effects of Information on Product Quality: Evidence from Restaurant Hygiene Grade Cards, the *Quarterly Journal of Economics*, 118(2), 409-51.
- Klein, Benjamin and Keith Leffer, 1981, “The Role of Market Forces in Assuring Contractual Performance,” *Journal of Political Economy* 89( ): 615-641.
- Kleiner, Morris M., 2000, “Occupational Licensing,” *Journal of Economic Perspectives*, 14(3): 189-202.
- Lazear, Edward 2001. “Educational Production,” *Quarterly Journal of Economics*, 116(2): 777-803.
- Leland, Hayne, 1979, “Quacks, Lemons, and Licensing: A Theory of Minimum Standards,” *Journal of Political Economy*, 87(6): 1328-1346.
- Lowenberg, A. and T. Tinnin, 1992, “Professional versus Consumer Interests in Regulation: the Case of the U.S. Child Care Industry,” *Applied Economics*, 24(6): 571-580.
- Mocan, Naci, 2007, “Can Consumers Detect Lemons? An Empirical Analysis of Information Asymmetry in the Market for Child Care,” *Journal of Population Economics*, 20(4): 507-31.
- Mocan, Naci, M. Burchinal, J.R. Morris, and S. Helburn, 1995, “Models of Quality in Center Child Care,” in *Cost, Quality and Child Outcomes*, S. Helburn, ed., Center for Research on Economic and Social Policy, University of Colorado at Denver.

- Moulton, Brent R., 1986, "Random Group Effects and the Precision of Regression Estimates," *Journal of Econometrics*, 32(3): 385-397.
- O'Neill, Grace E. and Martin O'Connell, 2001, "State Estimates of Child Care Establishments: 1977-1997," Working Paper Series No. 55, Population Division, U. S. Bureau of the Census.
- Ronnen, Uri, 1991, "Minimum Quality Standards, Fixed Costs, and Competition," *Rand Journal of Economics*, 22(4): 490-504.
- Ruopp, R., J. Travers, F. Glantz and C. Coelen, 1979, *Children at the Center: Summary Findings and their Implications*, Cambridge, MA: Abt Books.
- Shapiro, Carl, 1986, "Investment, Moral Hazard, and Occupational Licensing," *Review of Economic Studies*, 53(5): 843-862.
- Whitebook, M., D. Howes, and C. Philips, 1989, "Who Cares? Child Care Teachers and the Quality of Care in America: Final Report of the National Child Care Staffing Study, Executive Summary", Oakland, CA: Child Care Employee Project.
- Xiao, Mo, 2007, "Is Quality Certification Effective? Evidence from the Childcare Market," *mimeo*, University of Arizona.

**Table 1: Characteristics of Child Care Center Establishments**

<b>Variable</b>	<b>Definition</b>	<b>1987 Mean</b>	<b>1992 Mean</b>	<b>1997 Mean</b>	<b>% Change, 1987-97</b>
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 revenue (in 1000s of 1997 \$)	\$180.040 (323.764)	\$199.851 (448.398)	\$228.799 (463.063)	27.1%
Payroll	Total payroll (in 1000s of 1997 \$)	\$88.547 (153.647)	\$96.535 (195.269)	\$112.417 (205.117)	27.0%
Expense	Total operating expense (in 1000s of 1997 \$)	\$253.139 (1536.181) [15,800]	\$261.810 (1079.995) [19,286]	\$335.691 (1382.111) [22,431]	32.6%
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 (in 1000s of 1997\$)	\$19.531 (11.632) [37,743]	\$22.819 (21.499) [47,150]	\$23.315 (18.332) [56,478]	19.3%
Expense per Employee	Expense / # Employees (in 1000s of 1997 \$)	\$26.562 (378.821) [15,450]	\$22.964 (135.117) [18,711]	\$31.241 (426.676) [21,809]	17.6%
<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: Entry and Exit of Child Care Center Establishments**

<b>Variable</b>	<b>Definition</b>	<b>1987 Mean</b>	<b>1992 Mean</b>	<b>1997 Mean</b>
Entry	Whether the establishment exists at $t - 5$ : = 0 if yes; = 1 otherwise.	n.a.	0.519 (0.500)	0.483 (0.500)
Exit	Whether the establishment exists at $t + 5$ : = 1 if yes; = 0 otherwise.	0.387 (0.487)	0.381 (0.486)	n.a.
<i>N</i>	Number of Establishments	40,628	51,299	61,882

**Table 2b: Entry and Exit of Child Care Center Establishments in 1992**

	<b>Exit = 0</b>	<b>Exit = 1</b>	<b>Total</b>
Entry = 0	17,284 (70.09%)	7,374 (29.91%)	24,658 (100%)
Entry = 1	14,458 (54.27%)	12,183 (45.73%)	26,641 (100%)
<i>Total</i>	31,742 (61.88%)	19,577 (38.12%)	51,299 (100%)

Note: Row percentages are reported in the parentheses.

**Table 3a: Characteristics of Center-based Child Care at the Market Level**  
(Markets Defined as Zip Codes)

<b>Variable</b>	<b>Definition</b>	<b>1987 Mean</b>	<b>1992 Mean</b>	<b>1997 Mean</b>
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	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. [12,504]
Exit Rate	No. of Entrants at $t$ / No. of Establishments at $t$	0.383 (0.364)	0.378 (0.356)	n.a.
$N$	Number of Zip Codes	11,404	13,304	14,966

**Table 3b: Demographic Characteristics of Child Care Markets**

<b>Variables</b>	<b>Definition</b>	<b>1990 Mean</b>	<b>2000 Mean</b>
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 4a: Accreditation of Child Care Center Establishments**

<b>Variable</b>	<b>Definition</b>	<b>1987 Mean</b>	<b>1992 Mean</b>	<b>1997 Mean</b>
Accredit*	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
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

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

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

<b>Definition</b>	<b>1987 Mean</b>	<b>1992 Mean</b>	<b>1997 Mean</b>
Number of Family Home Establishments (1000s) in State	4.351 (4.281)	9.589 (8.956)	9.583 (9.354)
Number of Family Home Establishments per 1,000 Children under Age5	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**

Minimum Quality Standards	Mean	St. Dev.	Min	Max	1987		1992		1997		No. of states which changed Regulations.
					Mean	No. of States with No Regulation	Mean	No. of States with No Regulation	Mean	No. of States with No Regulation	
<b>Regulations on Labor Intensiveness: Staff-child Ratio</b>											
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
<b>Regulations on Staff Qualifications: Education Requirement (in years of schooling)</b>											
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	15	11.681	4	19

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

**Table 6: Estimated Effects of State Regulations on the Number of Child Care Center Establishments per Market**

	(1)	(2)	(3)	(4)	(5)
<b>Panel A: The Effects of Single Measures of Child Care Center Regulations</b>					
Staff-Child Ratio for Infants	-3.519 (1.095)***	-3.297 (1.035)***	-1.898 (1.582)	-5.617 (2.144)***	-11.693 (2.668)***
Staff-Child Ratio for Infants × Median Income					0.276 (0.057)***
Educ. Requirement for Directors	-0.055 (0.041)	-0.051 (0.028)*	-0.210 (0.061)***	-0.129 (0.049)***	0.062 (0.085)
Educ. Requirement for Directors × Median Income					-0.002 (0.002)
R <sup>2</sup>	0.44	0.44	0.45	0.46	0.46
<b>Panel B: The Effects of Averaged Measures of Child Care Center Regulations</b>					
Average Staff-Child Ratio	-8.017 (1.829)***	-7.059 (1.615)***	-5.226 (5.397)	-6.771 (7.046)	-19.992 (5.570)***
Average Staff-Child Ratio × Median Income					0.501 (0.082)***
Average Education Requirement	-0.051 (0.022)**	-0.044 (0.019)**	-0.010 (0.026)	-0.019 (0.027)	-0.015 (0.038)
Average Education Requirement × Median Income					-0.0004 (0.001)
R <sup>2</sup>	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		

Notes: For table 6 to 12, state-year clustered robust standard errors are reported in parentheses for all tables.

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

**Table 7: 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)
<b>Panel A: The Effects of Single Measures of Child Care Center Regulations</b>							
Staff-Child Ratio for Infants	-6.216 (2.009)***		-5.998 (1.885)***	-37.945 (6.766)***	-44.980 (10.308)***	-41.984 (17.617)**	-153.375 (51.822)***
Staff-Child Ratio for Infants × Median Income					0.388 (0.216)*		3.717 (1.207)***
Educ. Requirement for Directors		-0.128 (0.039)***	-0.193 (0.075)**	-0.464 (0.329)	-0.566 (0.356)	-1.447 (0.714)**	1.12 (2.451)
Educ. Requirement for Directors × Median Income					0.006 (0.005)		-0.063 (0.076)
R <sup>2</sup>	0.46	0.46	0.46	0.68	0.68	0.87	0.87
<b>Panel B: The Effects of Averaged Measures of Child Care Center Regulations</b>							
Average Staff-Child Ratio	-8.750 (5.194)*		-12.120 (6.400)*	-39.198 (32.459)	-41.049 (26.695)	-16.978 (37.027)	-146.223 (53.542)***
Average Staff-Child Ratio × Median Income					0.332 (0.320)		5.198 (1.835)***
Average Education Requirement		-0.033 (0.020)	-0.044 (0.034)	-0.338 (0.178)*	-0.438 (0.201)**	-0.337 (0.212)	-0.056 (0.594)
Average Education Requirement × Median Income					0.002 (0.003)		-0.008 (0.023)
R <sup>2</sup>	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 8a: Estimated Effects of State Regulations on Exit and Entry Rates of Child Care Centers in Local Markets**

Dependent Variables:	Market Entry Rate		Market Exit Rate	
	(1)	(2)	(3)	(4)
<b>Panel A: The Effects of Single Measures of Child Care Center Regulations</b>				
Staff-Child Ratio for Infants	-2.107 (0.192)***	-1.451 (0.321)***	2.239 (0.555)***	1.743 (0.526)***
Staff-Child Ratio for Infants × Median Income		-0.024 (0.007)***		-0.001 (0.004)
Educ. Requirement for Directors	0.013 (0.004)***	0.011 (0.007)*	0.013 (0.011)	0.014 (0.013)
Educ. Requirement for Directors × Median Income		-0.0002 (0.0002)		-0.00002 (0.0001)
R <sup>2</sup>	0.03	0.03	0.04	0.04
<b>Panel B: The Effects of Averaged Measures of Child Care Center Regulations</b>				
Average Staff-Child Ratio	-8.185 (0.618)***	-7.744 (1.200)***	1.688 (0.697)**	1.529 (0.724)**
Average Staff-Child Ratio × Median Income		-0.031 (0.012)**		0.001 (0.008)
Average Education Requirement	0.016 (0.001)***	0.024 (0.005)***	-0.006 (0.004)	-0.006 (0.005)
Average Education Requirement × Median Income		-0.0003 (0.0002)**		-0.000004 (0.00007)
R <sup>2</sup>	0.03	0.03	0.04	0.04
Year Fixed Effects	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Unit of Observations	Zip Code		Zip Code	
Number of Observations	22,890		24,541	

**Table 8b: Estimated Effects of State Regulations on Probability of a Child Care Center Establishment Exiting from Local Market**

	(1)	(2)	(3)	(4)
<b>Panel A: The Effects of Single Measures of Child Care Center Regulations</b>				
Staff-Child Ratio for Infants	0.934 (0.439)**	0.739 (0.390)*	0.706 (0.507)	1.226 (0.487)**
Staff-Child Ratio for Infants × Median Income		-0.006 (0.004)		-0.023 (0.009)**
Educ. Requirement for Directors	0.021 (0.007)***	0.019 (0.008)**	0.034 (0.009)***	0.062 (0.013)***
Educ. Requirement for Directors × Median Income		-0.00002 (0.00007)		-0.001 (0.0002)***
R <sup>2</sup>	0.09	0.09	0.31	0.32
<b>Panel B: The Effects of Averaged Measures of Child Care Center Regulations</b>				
Average Staff-Child Ratio	0.836 (0.608)	1.204 (0.599)**	-0.583 (1.014)	1.655 (0.923)*
Average Staff-Child Ratio × Median Income		-0.010 (0.006)		-0.047 (0.011)***
Average Education Requirement	-0.006 (0.003)*	-0.006 (0.004)	0.002 (0.005)	0.013 (0.007)*
Average Education Requirement × Median Income		-0.000001 (0.000060)		-0.0003 (0.0001)**
R <sup>2</sup>	0.09	0.09	0.31	0.32
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	88,103	88,103	47,249	47,249

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

	(1)	(2)	(3)	(4)
<b>Panel A: The Effects of Single Measures of Child Care Center Regulations</b>				
Staff-Child Ratio for Infants	-2.725 (2.596)	10.992 (3.632)***	1.842 (2.687)	5.552 (5.320)
Staff-Child Ratio for Infants × Median Income		-0.395 (0.077)***		-0.054 (0.176)
Educ. Requirement for Directors	0.219 (0.098)**	0.280 (0.155)*	0.172 (0.133)	-0.064 (0.262)
Educ. Requirement for Directors × Median Income		-0.003 (0.003)		0.006 (0.005)
R <sup>2</sup>	0.10	0.10	0.05	0.05
<b>Panel B: The Effects of Averaged Measures of Child Care Center Regulations</b>				
Average Staff-Child Ratio	-5.791 (8.365)	19.386 (8.357)**	-9.161 (10.077)	-5.068 (11.934)
Average Staff-Child Ratio × Median Income		-0.736 (0.127)***		-0.136 (0.231)
Average Education Requirement	0.022 (0.055)	0.037 (0.065)	-0.026 (0.066)	-0.075 (0.081)
Average Education Requirement × Median Income		-0.001 (0.002)		0.001 (0.002)
R <sup>2</sup>	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)
<b>Panel A: The Effects of Single Measures of Child Care Center Regulations</b>				
Staff-Child Ratio for Infants	32.825 (53.634)	-29.655 (85.335)	24.692 (7.080)***	-1.120 (12.043)
Staff-Child Ratio for Infants × Median Income		2.642 (1.639)		-0.078 (0.069)
Educ. Requirement for Directors	-1.972 (1.241)	-4.946 (2.600)*	-0.444 (0.131)***	-0.526 (0.325)
Educ. Requirement for Directors × Median Income		0.094 (0.062)		0.006 (0.008)
R <sup>2</sup>	0.96	0.96	0.93	0.94
<b>Panel B: The Effects of Averaged Measures of Child Care Center Regulations</b>				
Average Staff-Child Ratio	29.301 (113.979)	-136.108 (160.070)	20.460 (9.014)**	-11.832 (17.546)
Average Staff-Child Ratio × Median Income		5.437 (2.998)*		1.037 (0.513)**
Average Education Requirement	-0.145 (0.818)	-0.564 (1.257)	0.085 (0.095)	-0.054 (0.133)
Average Education Requirement × Median Income		0.011 (0.029)		0.002 (0.004)
R <sup>2</sup>	0.96	0.96	0.92	0.94
Year Fixed Effects	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
Control for state regulations for family day care homes	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	Accreditation Status of the Establishment				Accreditation Rate in the Market	
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Panel A: The Effects of Single Measures of Child Care Center Regulations</b>						
Staff-Child Ratio for Infants	0.135 (0.058)**	0.123 (0.076)	0.232 (0.086)***	0.007 (0.184)	0.639 (0.117)***	0.723 (0.152)***
Staff-Child Ratio for Infants × Median Income		0.001 (0.001)		0.008 (0.005)*		-0.002 (0.003)
Educ. Requirement for Directors	-0.011 (0.004)***	-0.009 (0.004)**	-0.010 (0.007)	-0.001 (0.006)	-0.017 (0.007)**	-0.013 (0.008)
Educ. Requirement for Directors × Median Income		-0.00003 (0.00004)		-0.0002 (0.0001)		-0.0001 (0.0001)
R <sup>2</sup>	0.04	0.04	0.05	0.05	0.09	0.09
<b>Panel B: The Effects of Averaged Measures of Child Care Center Regulations</b>						
Average Staff-Child Ratio	0.679 (0.213)***	0.629 (0.235)***	0.847 (0.234)***	0.258 (0.353)	1.735 (0.572)***	1.811 (0.620)***
Average Staff-Child Ratio × Median Income		0.003 (0.002)		0.018 (0.008)**		-0.002 (0.004)
Average Education Requirement	-0.002 (0.001)**	-0.005 (0.001)***	-0.003 (0.001)**	-0.008 (0.002)***	-0.003 (0.002)	-0.006 (0.002)***
Average Education Requirement × Median Income		0.00007 (0.00001)***		0.0001 (0.00005)***		0.0001 (0.00004)***
R <sup>2</sup>	0.04	0.04	0.05	0.05	0.09	0.09
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Establishment Fixed Effects	No	No	Yes	Yes	n.a.	n.a.
Unit of Observations		Establishment			Zip Code	
Number of Observations	149,102	149,102	93,063	93,063	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		Profit per Worker	
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Panel A: The Effects of Single Measures of Child Care Center Regulations</b>						
Staff-Child Ratio for Infants	-0.473 (1.482)	-0.206 (1.538)	-1.238 (4.840)	8.431 (6.712)	-0.765 (3.813)	8.637 (5.932)
Educ. Requirement for Directors	-0.159 (0.082)*	-0.285 (0.088)***	-0.581 (0.237)**	-0.975 (0.260)***	-0.422 (0.188)**	-0.691 (0.208)***
R <sup>2</sup>	0.20	0.02	0.08	0.01	0.06	0.01
<b>Panel B: The Effects of Averaged Measures of Child Care Center Regulations</b>						
Average Staff-Child Ratio	6.823 (5.760)	9.082 (7.004)	30.972 (16.241)*	43.366 (20.559)**	24.149 (11.154)**	34.283 (16.577)**
Average Education Requirement	-0.002 (0.028)	-0.027 (0.040)	-0.135 (0.088)	-0.218 (0.151)	-0.133 (0.065)**	-0.191 (0.121)
R <sup>2</sup>	0.20	0.02	0.08	0.01	0.06	0.01
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Establishment Fixed Effects	No	Yes	No	Yes	No	Yes
Unit of Observations	Establishment		Establishment		Establishment	
Number of Observations	137,030	89,466	137,030	89,466	137,030	89,466

## Appendix: Variable Construction

### *Measures of Entry and Exit*

We follow Dunne, Roberts, and Samuelson (1988) to construct aggregate measures of entry and exit rates. We assume that establishments first appearing in the 1992 Census entered between 1987 and 1992 and those first appearing in the 1997 Census entered between 1992 and 1997. As we never observe the pool of potential entrants, we measure entry at an aggregate level. Similarly, we assume that establishments last appearing in the 1987 Census exited between 1987 and 1992, and those last appearing in the 1992 Census exited between 1992 and 1997. We are able to measure exit at both the aggregate and individual level.

We define the following variables:

$NE_{mt}$  = the number of establishments that enter market  $m$  between census year  $t-5$  and  $t$ ;

$NT_{mt}$  = the number of establishments that exist in market  $m$  at Census year  $t$ ;

$NX_{mt}$  = the number of establishments that exit market  $m$  between census years  $t$  and  $t+5$ ;

Using the above definitions, we define the entry rate for market  $m$  at Census year  $t$  as:

$$ER_{mt} = \frac{NE_{mt}}{NT_{m,t-5}}.$$

We define the exit rate for market  $m$  at Census year  $t$  as:

$$EX_{mt} = \frac{NX_{mt}}{NT_{mt}}.$$

### *Measures of Payroll, Revenue, and Profit per Employee*

From the Census we observe the payroll and revenue of a child care establishment. We adjust payroll and revenue from nominal values to real values using 1997 as the base year. From the payroll and revenue data we construct an accounting measure of profitability, which is:

$$Profit_{jt} = Revenue_{jt} - Payroll_{jt}$$

A more accurate definition should also have the operating expenses deducted from revenue. However, in the Census above 60% of the establishments report zero expenses. Lack of documentation on the Census

of Services prevents us from finding out the reasons why so many establishments report no expenses. Our estimation results are robust to using alternative definitions with or without expenses deducted from profit.

***Measures of Payroll, Revenue, and Profit per Employee***

We define payroll, revenue, and profits per employee of firm  $j$  at Census year  $t$  as:

$$\text{Payroll per Employee}_{jt} = \frac{\text{Payroll}_{jt}}{\# \text{Employees}_{jt}},$$

$$\text{Revenue per Employee}_{jt} = \frac{\text{Revenue}_{jt}}{\# \text{Employees}_{jt}},$$

$$\text{Profits per Employee}_{jt} = \frac{\text{Profits}_{jt}}{\# \text{Employees}_{jt}}.$$

***Measures of Market Accreditation Rates***

We aggregate by market the number of establishments in the Census and the number of accredited establishments in the accreditation database. We then match the Census and the accreditation database by market and define the accreditation rate in market  $m$  at Census year  $t$  as:

$$\text{Accreditation Rate}_{mt} = \frac{\# \text{Accredited Establishments}_{mt}}{\# \text{Establishments}_{mt}}.$$