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THE TRANSITION FROM WELFARE TO WORK

Robert J. Lemke‡  
(Lake Forest College)

Robert J. Witt  
(University of Surrey)

&

Ann Dryden Witte  
(Wellesley College and NBER)

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Department of Economics  
University of Surrey  
Guildford  
Surrey GU2 7XH, UK  
Telephone +44 (0)1483 689380  
Facsimile +44 (0)1483 689548  
Web [www.econ.surrey.ac.uk](http://www.econ.surrey.ac.uk)

## The Transition from Welfare to Work<sup>†</sup>

Robert J. Lemke<sup>‡</sup>  
*Lake Forest College*  
lemke@lakeforest.edu

Robert J. Witt  
*University of Surrey*  
r.witt@surrey.ac.uk

Ann Dryden Witte  
*Wellesley College and NBER*  
awitte@wellesley.edu

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**Abstract:** We consider the effects the child care market, child care vouchers, early childhood education programs, and welfare reforms have on welfare recipients in their transition from welfare to work. Specifically, we are interested in determining which factors encourage single mothers to move directly from welfare to work and which factors encourage the pursuit of additional schooling or job retraining before entering the labor market. Using Massachusetts data from July 1996 through August 1997, we find that the availability, quality, and cost of formal child care are all positively related to transiting directly from welfare to work. We also find that single mothers with older children are more likely to pursue a job and forego additional schooling, while single mothers with infants are more likely to advance their education before seeking employment.

**Key Words:** Welfare Reform, Child Care, Vouchers, Time Limits, Labor Supply.

**JEL Classification:** I38, H40, J22, I20.

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<sup>‡</sup> Corresponding author: Department of Economics and Business, Lake Forest College, Lake Forest, IL, 60045, USA. Phone: 847-735-5143. E-mail: lemke@lakeforest.edu

## 1. Introduction

In this paper, we consider the effects the child care market, child care subsidies, early childhood education programs, and welfare reforms have on the transition of welfare recipients from welfare to work. In particular, we are interested in identifying which factors encourage single mothers to move directly from welfare to work (i.e., to “work first”) and which are more likely to encourage her to pursue more schooling or job training before entering the labor market (i.e., to “school first”).

Our study builds on previous work in a number of ways. First, whereas most studies use only the cost of child care to capture the effects of child care needs, we also take into account the quality and availability of child care. Second, we use data on the availability and funding of child care vouchers and other state policies to analyze the role of vouchers. Third, we consider the impacts of a broad range of early childhood education programs designed to care for and educate low-income children, including Head Start and full-day kindergarten. Fourth, our data span the introduction of time limits. Thus, we are in a position to comment on the effect time limits had on the decision to work. As far as we are aware, there is no published work that considers simultaneously the impact of these varied programs.

We use a unique data set for Massachusetts, a state that began welfare reform in 1995 under a federal waiver, for the period July 1996 through August 1997 to carry out our analysis. The primary data set contains information from monthly interviews on over ten thousand current and former welfare recipients who used a child care voucher during the month. In an effort to focus on a set of households with similar choice sets, we restrict our analysis to single mothers with at most a high school education. By using a second data set that allows us to predict the probability of using a voucher for all individuals in our primary data set, we are then in a position to consider how welfare recipients transit off of welfare and into work or schooling.

There is a large literature showing that the cost of child care plays a major role in the labor market decisions of women with children. (See Anderson and Levine, 2000; Blank, 2002; Blau, 2001; and Chaplin et al., 2000 for reviews. Walker, 1991 and 1992, provide discussions of the market for informal child care.) In addition to costs, it has long been recognized that the availability and quality of

child care also affect the demand for care (Gustafsson and Stafford, 1992; Hofferth, 1991; Hofferth and Wissoker, 1992; and Waite et al., 1991). Paucity of data, however, has usually prohibited measuring the impact of these other aspects of the child care market. Using resource and referral agency data from the Massachusetts' Office of Child Care Services and Department of Transitional Assistance, however, we are able to include measures of the availability, price, and quality of child care for each township.

Our results suggest that the availability, quality, and cost of care are all positively related to transiting directly from welfare to work. For a typical individual, a slight increase in the number of child care slots available can be expected to increase the probability of choosing immediate employment by almost 8 percentage points. Likewise, an increase in the weekly cost of care from \$80 to \$120 is expected to increase the probability of choosing immediate employment by over 10 percentage points. These results concerning the market for child care suggest that mothers place great value on having access to dependable, flexible, and high quality child care when working.

It is also widely maintained that child care provision and early childhood education programs play prominent roles in determining the successes and/or failures of welfare reform. Indeed, federal welfare reform legislation substantially revised and expanded funding for child care subsidies at the same time it imposed work requirements and eliminated the entitlement to cash assistance. Following recent welfare reforms, most state governments have not only expanded funding for child care subsidies but have also increased funding for early education programs (Loprest et al., 2000). In order to analyze these factors, we incorporate data on the availability, funding, and administration of both state and federal child care subsidies and early education programs.

As expected, we find that increased funding for child care subsidies and an increased probability in a mother's ability to use a voucher are associated with an increased probability of working first. Likewise, we find that the presence of a Head Start program or having full-day kindergarten offered in the public schools are also associated with single mothers being more apt to choose to transit immediately to work without first pursuing more schooling or job training.

We are also able to investigate the effect the imposition of time limits has had on the decision to work first versus to school first. Massachusetts had in place a mandatory work requirement for all welfare recipients whose youngest child was at least six years-old during the entire sample period we study, but a time limit regulation was enacted as a part of federal welfare reform almost mid-way through our sample period. Specifically, money assistance was limited to 24 months in any consecutive 60 month span for any single mother whose youngest child was at least two years-old. Thus, similar to Grogger (2003, 2004) and Grogger and Michalopoulos (2003), we use the age of the youngest child to identify responses to time limits.

We find that the pattern of decisions regarding work versus schooling is consistent with the incentives provided by Massachusetts' "work first" welfare reforms coupled with their time limit regulation that favors schooling by mothers with infants. Specifically, those households with school-aged children are subject to both time limits and work requirements and, we find, are most likely to work first. In contrast, mothers with infants are subject to neither time limits nor the work requirement. We find this group of recipients to be much more likely to advance their education before seeking employment.

The outline of the paper is the following. We describe welfare reform and policies in Massachusetts for our sample period in the next section. In section three we describe our estimation techniques and discuss our treatment of several modeling issues. The data are described in section four. We then present our results in section five before concluding with some brief remarks concerning policy implications in section six.

## **2. Massachusetts' Welfare Reform**

In April of 1995, the Commonwealth of Massachusetts requested a welfare reform waiver from the federal government. Massachusetts' proposal included job training, a work requirement, time limits, medical assistance, and centralization of the public assistance system. The waiver was granted in full except for time limits. Overseen by the newly formed Department of Transitional Assistance, these reforms were initiated on November 1, 1995. The following August, President Clinton signed the

Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA). PRWORA replaced the previous AFDC program with block grants from the federal government to the states, known as TANF (Temporary Assistance to Needy Families). Although some restrictions were placed on the TANF block grants, states were given considerable leeway in setting eligibility requirements for assistance as well as the benefit level for each family. Two novel components of PRWORA were work requirements and time limits. Massachusetts met the work requirements of PRWORA, and, with its passage, was also able (and now required for federal funding) to implement time limits.

In Massachusetts, anyone subject to the time limit is permitted to receive TAFDC (as the TANF program is called in Massachusetts) funds for a maximum of 24 months in any consecutive 60 months. Anyone subject to work requirements must, within 60 days of receiving TAFDC funds, be actively involved in some type of work activity for at least 20 hours per week. If the person fails to find a job, she is required to perform 20 hours of community service per week. Although there are some other exceptions (mainly for the disabled and for teenaged parents), the Massachusetts program is straightforward. A TAFDC recipient is exempt from the time limits *and* the work requirement if her youngest child is under the age of two. The clock on time limits starts ticking on the youngest child's second birthday. The recipient remains work exempt, however, until her youngest child turns six years old and enters the first grade. It is important to note that these are separate requirements. If one receives benefits while her youngest child is two and three, thus exhausting her time limits, the time limit deadline comes into effect and benefits are terminated even though the recipient would otherwise remain classified as work exempt for the next two years as her youngest child passes through the ages of four and five. Massachusetts' welfare reforms, therefore, promote training and education for those with children under two years old. Although recipients with a youngest child at least two but not yet six years old remain work exempt, they are subject to time limits. Thus, they are allowed to pursue education/job training if they so choose, but this is possibly a riskier proposition as they will not receive public assistance monies after two years of support. Finally, households with a youngest child at least six years old face a "work first" welfare system, as these recipients are subject to both time limits and the work requirement.

Massachusetts' job training and education program, the Employment Services Program (ESP), is available to all TAFDC recipients. Participation in the ESP is voluntary if one is exempt from the work requirement and mandatory for those not exempt; however, all recipients are strongly encouraged to participate in the ESP. The program includes on-the-job training, job skill development, education, and a "structured job search" program.

It is important to understand how the work requirement affects participation in the ESP. First, as long as the adult TAFDC recipient remains work exempt, she can enter job training and education programs paid for by the ESP. This includes continuing a high school education, obtaining a GED, or even enrolling in a state-funded college for up to two years. Second, the education programs of the ESP are available to all TAFDC clients. Clients subject to the work requirement, however, must be working at least 20 hours a week within 60 days of receiving assistance. This means that any educational or training programs offered by the ESP must be attended in addition to working. Pursuing schooling (unlike job training or on-the-job training, which are less time intensive), therefore, becomes more difficult once the individual becomes subjected to the work requirement.

In addition to offering the employment services, the DTA also offers child care vouchers to anyone who is receiving TAFDC monies and participating in approved activities (e.g., work, schooling, actively seeking employment, job training). Vouchers can be used to purchase formal or informal child care. The state legislated reimbursement rate varies by age of the child, the type of care, state region, and the amount of child care provided. For those receiving cash assistance, the Commonwealth pays the entire cost of care, i.e., the provider receives the entire reimbursement rate directly from the state. Other families are required to pay part of the cost of the care purchased with vouchers, where the co-payment depends on family income, family size, and the amount of child care used.

Current TAFDC recipients automatically qualify for a voucher. Former TAFDC recipients can also apply for a voucher if they earn less than 75 percent of the state median income, but there is usually a waiting period for these families as voucher funds are limited. Having access to a voucher, however, does not always lead one to use the voucher. Some mothers will not be able to find a provider who accepts the

voucher – only about 40 percent of group facilities accept vouchers. Others may not be able to find care during the hours they need or for the age of their child – some providers set minimum or maximum age requirements. Others may gain access to free child care such as with Head Start or a Community Partnership for Children. It is also possible that some voucher-eligible mothers are unaware of the program and therefore fail to apply for a voucher.

When a TAFDC recipient’s case is closed due to exhaustion of her time limit or increased earnings, she may remain eligible to receive medical assistance, food stamps, child care vouchers, transportation subsidies, and access to the structured job search program for at least one year. After one year, eligibility for the above mentioned programs are means-tested.

### **3. Empirical Strategy and Estimation**

In light of welfare reform, we are interested in studying the transition from welfare to work. Specifically, what factors influence a TAFDC recipient’s decision to work or to pursue more schooling (and then work)? Massachusetts’ series of welfare reforms – notably, time limits and the work requirement – emphasize a “work first” approach for those with school aged children but allow for a “school first” approach for those with infants. Other factors, of course, will also affect the transition path.

Our data, introduced formally in the next section, allow us to consider the choices made by single mothers who are current and former TAFDC recipients and are income-eligible for a child care voucher. We refer to this population of single mothers as “voucher-eligible” even though, in actuality, they must also be employed or pursuing a schooling option to qualify for a voucher.<sup>1</sup> In contrast, our results do not apply to TAFDC recipients who are not voucher-eligible, possibly because of their marital status, age of children, or disability.

We estimate a reduced form model of the probability that voucher-eligible single mothers choose to work versus choosing to pursue schooling. We model this decision as depending on human-

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<sup>1</sup> Most single mothers who receive TAFDC, however, are voucher-eligible as states are only allowed to exempt at most 20 percent of their monthly rolls from the work requirement and time limits specified in PRWORA.



capital/socio-demographic characteristics of the individual ( $H$ ), characteristics of the market for child care ( $C$ ), policy and administrative variables related to the Massachusetts child care voucher system ( $V$ ), characteristics of early childhood education programs ( $E$ ), other public policy variables including welfare reform legislation ( $P$ ), and local labor market conditions and community characteristics ( $L$ ). In general, the model we estimate can be written as:

$$(1) \quad \text{Prob. of Work}_{i,t} = \text{Logit} ( \beta H_{i,t} + \alpha C_{i,t} + \gamma V_{i,t} + \phi E_{i,t} + \delta P_{i,t} + \xi L_{i,t} + \varepsilon_{i,t} )$$

for individual  $i$  in time period  $t$ .

As we observe households over time, the estimation of equation (1) involves unobserved family-specific attributes that may affect the unbiasedness and consistency of the estimation.<sup>2</sup> Specifically, we assume that the error term in equation (1),  $\varepsilon_{i,t}$ , is comprised of an individual effect,  $\mu_i$ , and a time-specific effect  $v_{i,t}$ , so that

$$\varepsilon_{i,t} = \mu_i + v_{i,t}.$$

Although the fixed-effects estimator requires few assumptions other than that the unobservable family-specific effect be constant over time, it relies only on deviations from family-specific means to estimate the parameters, and thus it ignores time-invariant information as well as the initial values of time-variant information. Also, generalizing the results from random-effects estimation out of sample rests of firmer ground than generalizing results from fixed-effects estimation. The traditional (or structured) random-effects estimator, however, has been criticized, because it imposes a constant correlation across all time periods on the unmeasured, family-specific effect, i.e.,

$$\text{Cor}(\varepsilon_{i,s}, \varepsilon_{i,t}) = \rho \text{ for all } i \text{ and } s \neq t.$$

This is equivalent to requiring that unmeasured family-specific behavioral patterns have a constant correlation across all time periods. To the contrary, most behavioral models suggest that the degree to which behaviors are correlated declines with time. Liang and Zeger (1986) and Liang et al. (1992)

provide for an unstructured random-effects estimator that is free from the restrictive assumption of the traditional random-effects model. Specifically, they allow for

$$\text{Cor}(\varepsilon_{i,s}, \varepsilon_{i,t}) = \rho_{s,t} \text{ for all } i \text{ and } s \neq t.$$

To discern the robustness of our results, we estimate equation (1) using a fixed-effects estimator, an unstructured random-effects estimator that imposes no structure on the correlation of the family-specific random-effects over time, and a structured random-effects estimator. We also calculate robust standard errors to adjust for the heteroskedasticity imparted by the unbalanced panels of households, as we observe households for varying lengths of time as they enter and leave the child care voucher program.

In addition to specifying the structure of the error term, we must address two data issues. First, our primary data set contains only single mothers who use vouchers. In order to apply our results to the population of voucher-eligible households, therefore, we employ a two-step estimation procedure following Pagan (1984, 1986). We first use a random sample of all voucher-eligible mothers to predict the probability of using a voucher. We then include this “generated regressor” in our estimation of equation (1). Appendix A provides the details and results of the first step of the estimation.

Second, when estimating labor supply responses, typically a data set of mothers is used in which it is known if the mother is employed and, if so, her wage and how much she pays for child care. Using the sub-sample of all working mothers, a predicted wage is then estimated for all mothers in the sample.<sup>3</sup>

The cost of child care for each mother is predicted similarly. Finally, a labor market participation equation is estimated for the entire sample that includes the predicted wage and predicted price of child care for each mother. Anderson and Levine (2000) and Hotz and Kilburn (1991), however, demonstrate that the results from this procedure are sensitive to the empirical specification and exclusion restrictions.

We take a different approach. We limit consideration to single mothers with at most a high school degree so that the employment opportunities and potential wage offers faced by the mothers in our

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<sup>2</sup> See Chamberlain (1983) and Liang and Zeger (1986) for more detailed discussions of the econometric issues and the techniques employed.

<sup>3</sup> Michalopoulos et al. (1992) and Ribar (1995) stand out as two exceptions that undertake structural estimation.

sample are likely to be similar. Moreover, the extent to which opportunities and wages differ are likely to be due to observable individual characteristics (e.g., age or race) or to depend on the conditions of the local labor market to which their job market search is limited. Thus, in lieu of estimating a wage for each mother, we include the conditions of their local labor market. Likewise, in place of including the actual child care costs paid by each mother, which is nothing for most mothers in our sample, we focus on the entire market for child care. We use the Care Finder records maintained by five Child Care Resource and Referral agencies in Massachusetts to calculate, by the age of the child, the average cost of child care for every township. This approach is similar to that of Blau and Hagy (1998) and Blau and Robbins (1988).<sup>4</sup>

#### **4. Data**

Our data have been provided by several state agencies in Massachusetts. We use the Office of Child Care Services (OCCS) monthly files on the use of child care vouchers by current and former TAFDC recipients. We match to this, the monthly files of the Department of Transitional Assistance (DTA) which tracks those enrolled in Massachusetts' Employment Services Program. Merging these data produce a longitudinal data set containing 14 months of data. We add to this individual data, other information that varies either by geographic region and/or time to better capture local child care programs, welfare policies, labor market conditions, and other economic factors. While not perfect, we believe these data more effectively capture local labor and child care markets than most previous studies. We describe our data and sources below. Summary statistics for our 58,170 monthly observations of 10,297 single mothers who hold at most a high school education are reported in Table 1.

##### *Individual Data*

Our individual data are available for 14 months, July 1996 through August 1997. The DTA

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<sup>4</sup> Blau and Hagy (1998) take the price of care to be an average of the prices charged by different providers in the same city. Blau and Robbins (1988) take the price of care to be the average price paid by the working women within the same SMSA or county.

intake interview gives us information on several characteristics of the recipient. For as long as the voucher recipient continues to receive public assistance or is enrolled in the ESP, the monthly re-evaluation interviews report the recipient's labor market activities. We restrict the sample to single mothers with at most a high school degree in order to focus on a sample of households that face similar labor market conditions. As reported in Table 1, almost 59 percent of voucher recipients worked during the previous week.<sup>5</sup> The recipients in our sample tend to be about 28 years-old and English speaking. A particularly attractive feature of the data is its racial diversity, with blacks, Hispanics, and whites each comprising over 30 percent of the sample.

Mobility into and out of our sample, i.e., the starting and stopping of using child care vouchers, is an important issue. Of our 58,170 monthly observations, over 75 percent come from households that remain in our sample from the month we first see them through the end of our sample period. Over 85 percent come from households that remain in our sample through June 1997, which corresponds with the end of the school year. Thus, most of our mobility comes from households that start using vouchers, not from households that stop. Reasons for leaving the sample, however, could be many, including moving out of our sample area, getting married, or a change in one's work hours or schedule.

### *Characteristics of the Market for Child Care*

A single mother's decision to work or to pursue additional schooling is likely affected by the location, cost, availability, and quality of child care. To control for the availability of care in each township, we aggregate the number of slots offered by family care providers as reported in the May 1996 Licensing List (published by OCCS) and then rescale by the number of children aged 0 to 11<sup>6</sup> to arrive at a "slots-per-tot" measure of availability. Unlike family care providers, group care providers report slots by age. We define four types of care: infant (0 to 23 months), toddler (24 to 47 months), pre-school (48

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<sup>5</sup> A mother is classified as working if she worked positive hours the previous week, regardless of her participation in education/job training programs. Of the 34,118 observations that report positive hours worked, 838 also participated in an education or job-training program. Our results are not overly sensitive to how we code these observations.

<sup>6</sup> For all population estimates, we start with the 1990 census which reports populations by age. We then use a 1997 estimate of the total population provided by the Census to estimate the 1997 township populations by age group.

to 59 months), and school aged (60 months or older). We then calculate the number of group care slots per 100 kids in the age group of the recipients' youngest child. Using the OCCS billing files, we also approximate the number of child care slots per 100 children contracted by the state. Table 1 shows that family and group care are almost equally represented, with 5 and 6.4 slots per 100 children available respectively on average. State contracted slots provide very little of the availability – just 1.4 slots per 100 children on average.

We measure the quality of care in each township with three variables. First, we calculate the percent of group care slots offered by providers certified by the National Association for the Education of Young Children (NAEYC). To do this, we match providers listed in the May 1996 Licensing List to the NAEYC's January 1998 list of accredited providers.<sup>7</sup> The 1996 Licensing List is also used to calculate the percent of group care slots in each township that are offered by providers who have been in service for at least three years as well as the median years in service of family care providers in each township. Less than 17 percent of group care slots are offered by NAEYC accredited providers; almost 80 percent of such providers, however, have been in operation for at least three years and the median family care provider in the average town has been in operation for over five years.

Finally, we also include the local cost of care. Using the 1997 Resource and Referral Database (provided by OCCS), we calculate each township's median weekly price of group child care for the age group of the household's youngest child. The cost of weekly group care averages just over \$80, with a median of just under \$73.

A note on endogeneity is warranted. Although cost, quality, and availability of child care affect the decision to use these services, it is also likely that demand for services affects the supply. If so, our reduced form model is mis-specified. This concern is somewhat mitigated as we focus only on the child care decisions of the very poor, whereas the supply of child care services responds to the demand of all households. Also, our measures of availability are determined by the available slots in May of 1996,

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<sup>7</sup> As the OCCS list is for May 1996 and the NAEYC list is for January 1998, our matching procedure is not ideal. However, as providers are accredited for three years, the problem should be kept to a minimum.

which predates our data by two months. The extent to which demand by poor single mothers results in more providers being NAEYC accredited or affects the median cost of care, however, is less clear.

### *Child Care Voucher Variables*

In terms of obtaining and using child care vouchers, the two most important decisions made by the state are the co-payment schedule and reimbursement rate. The state legislature sets the maximum reimbursement rate that it will pay to providers for care under the voucher program, which varies by type of care, age of child and area of the state. Mothers with child care vouchers are not directly affected by reimbursement rates, even if they are required to make co-payments. However, mothers are indirectly affected by the reimbursement rate because of its effect on providers. Higher rates should encourage more providers to accept vouchers. Higher rates may also encourage providers to alter the characteristics of the care they provide (e.g., increase their quality of care, extend the hours of care, or provide transportation). Reimbursement rates range from \$14 per day up to \$38 per day.

Those receiving cash assistance in Massachusetts do not face a co-payment, while former cash assistance recipients face a co-payment schedule that depends on family income, family size and whether care is part-time or full-time.<sup>8</sup> The schedule relating income to co-payments is analogous to a tax schedule. Thus, one can identify its effect on behavior only if there are exogenous changes to the schedule. Unfortunately, the schedule did not change during our period of study. Hence, we are unable to estimate the impact of co-payments on the probability of working. We do, however, include the number of household dependents to capture, in part, the affect of the co-payment schedule.

State and federal funding for child care vouchers has steadily increased with time. Using the statewide voucher budget reported by OCCS, we calculate government spending on vouchers to have totaled \$434 per poor child in fiscal year 1997 (which ended June 30, 1997).<sup>9</sup> For fiscal year 1998, we

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<sup>8</sup> Seventy percent of our sample make no co-payment, ninety-eight percent pay a co-payment of \$8 or less per day.

<sup>9</sup> Throughout the paper, we define “poor” as being in a household earning less than 185 percent of the poverty level. This definition is used to determine which children in the public schools qualify for reduced price or free lunch.

calculate an average of \$511 was budgeted for each poor child, an 18 percent increase.

Finally, single mothers face time limits and a work requirement under the new welfare reform rules and therefore need to become economically active whether or not they apply for a child care voucher or are able to find acceptable care. Thus, the probability of being able to use a child care voucher will affect a single mother's ability to devote hours to a job or to further her schooling. Following Pagan (1984, 1986), we use a random sample of all welfare recipients who are income-eligible to receive a child care voucher to estimate the probability of using a voucher. The details and complete results of this procedure are in Appendix A. On average, the probability of receiving a voucher is just under 48 percent. In order to isolate the effect of voucher use pre- and post- welfare reform, we also interact the probability of voucher use with a dummy variable indicating when the PRWORA welfare reforms were enacted.

### *Early Education Programs*

We incorporate information on the three major early education programs in Massachusetts – Head Start, publicly provided pre-kindergarten and kindergarten programs, and Community Partnerships for Children which are local grants funded by the state.

We have collected the 1996-97 and 1997-98 Program Information Reports filed by the 28 Head Start delegate agencies in Massachusetts. Using information on when Head Start programs operate, we determine if the household's youngest child is "Head Start Eligible". To be eligible there must be a Head Start program in town, it must be open (not on winter or summer break), and it must serve the age group of the household's youngest child.<sup>10</sup> Roughly 45 percent of our observations are in towns with a Head Start, and roughly 12 percent have a Head Start eligible youngest child.

We obtained information from the Massachusetts Department of Education as to which school districts offered a free pre-k program and/or full-day kindergarten and each school district's age

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<sup>10</sup> Whether the children in our sample are eligible for Head Start is unknown. Their mother qualifies for a child care voucher, so qualifying for Head Start is somewhat likely, but is not for certain. In 2001, if a single mother worked 40 hours a week at the minimum wage and only had one child, her child would not have qualified for Head Start. If she had worked just 20 hours a week or had had two or more children, however, her children would have qualified.

requirement for starting kindergarten in the fall of 1996. We then determined the pre-k, kindergarten, and elementary school eligibility of the youngest child in the household. As before, eligibility requires that the youngest child be of the required age and that the program be operating. Almost 85 percent of our observations are in towns with full-day kindergarten. Only 8.4 percent of our observations have a youngest child who is eligible for a half-day program (pre-k or kindergarten) and only 10.1 percent of our observations have a youngest child that is eligible for full-day public school.

Starting in the early 1990s, the Massachusetts Department of Education invited grant applications from private organizations, public schools, charities, and others to help care for children. Each grant recipient, no more than one per township, is called a Community Partnership for Children (CPC). Over the years, the monies have been renewed annually and increased and more CPCs have been funded. By fiscal year 1998, 229 townships received almost \$60 million through 157 different CPCs. We include in our analysis the township's annual CPC budget per poor child.

#### *Welfare Reform and Other Policy Variables*

The two biggest issues of welfare reform directly affecting the decision to work first or to school first are time limits and the work requirement. As of November 1, 1995, TAFDC recipients in Massachusetts with a youngest child at least six years old and in the first grade became subject to a work requirement within 60 days of receiving cash assistance. As of December 1, 1996, TAFDC recipients with a youngest child of at least two years-old became subject to time limits, receiving at most 24 months of benefits in any 60 month span. To account for these regulations, we include binary variables indicating the appropriate age group of the recipients' youngest child, a binary indicating the imposition of time limits, and the interaction of these in order to observe changes in behavior when facing time limits.

We also include a time trend and a binary variable indicating whether standard operations at the local welfare office consolidate responsibilities across caseworkers. A binary variable accounting for the October 1996 hike in the federal minimum wage and changes in federal employer tax credits is also included. Finally, during the time period of our study, the Massachusetts Office of Business



Development funded 439 certified projects intended to foster economic revitalization throughout the state. On average these projects spent \$439 per worker.

### *Local Labor Market and Community Characteristics*

Using the Bureau of Labor Statistic's ES 202 data, we include each township's percent of local jobs that are in the retail trade and service sectors as most working women of the type in our sample are employed in the services and trade sectors (Witte, et al., 2000). On average, there is over 1 such job for every 2 workers in each town. We also include the percent of workers using public transportation (measured at the zip code level by the 1990 Census) to capture the ease with which one can travel to a job. We include a binary variable at the township level indicating the presence of a job center operated by the Massachusetts Division of Employment and Training. Using the 1990 Census data again, we also include median household income for each household's zip code. Lastly, we include a complete set of binaries denoting township, Boston neighborhoods, welfare offices, and metropolitan statistical areas. Boston neighborhoods vary by zip code and were provided by the Boston Development Authority. Table 2 provides a complete listing of the 58,170 observations across locations.

## **5. Results**

The coefficient estimates and  $t$ -statistics from estimating equation (1) with fixed-effects, unstructured random-effects, and structured random-effects are presented in Table 3. Because of the logit form of equation (1), the point estimates give the direction of the impact of the explanatory variable, but do not directly provide estimates of the magnitude of the impacts.

Under the null hypothesis that the fixed-effects model is appropriate, we have performed a Hausman test on both random-effects specifications. The test statistic, distributed  $\chi^2$  with 55 degrees of freedom, is 1,008 for the unstructured random-effects model and is 938 for the structured random-effects model. Both tests, therefore, suggest that the random effects models are mis-specified in that the explanatory variables are correlated with the individual effects. Thus, we focus our discussion on the

fixed-effects specification. We present all three sets of results, however, to emphasize that our qualitative results hold across specifications.<sup>11</sup>

In order to make the magnitude of the predicted effects from some of the variables clearer, Table 4 reports the difference in the estimated probability of choosing to work over schooling under several different scenarios. These effects are calculated for a “base case” individual.<sup>12</sup> For example, using the fixed-effects estimator, the probability that the base case mother chooses to work increases from 0.587 to 0.663 when the number of group care slots increases from 10 to 15 per 100 kids.<sup>13</sup> Thus, the increase in group care slots is predicted to increase the probability that the mother chooses to work by 7.6 percentage points, which is what is reported in the first entry of Table 4. Further, this is a statistically significant effect as the *t*-statistic is 3.636. The unstructured and structured random-effects estimators predict the change in group slots to increase the probability of working by 4.2 and 2.3 percentage points respectively, but only the effect from the unstructured estimation results are significant. The results from Tables 3 and 4 are now discussed in more detail.

### *Child Care Effects*

Table 3 shows that having more group care slots available significantly increase the probability of working first over schooling first. Table 4 shows that increasing the availability of group care from 10 to

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<sup>11</sup> The structured random-effects model estimates a 0.6725 correlation across all time periods for the same household, while the unstructured model estimates a declining correlation from 0.8630 for a one month lag to 0.4051 for a 14 month lag.

<sup>12</sup> The base case individual is a 28 year old, black mother with a high school degree and two children living in the South Dorchester neighborhood in Boston. Her youngest child is between two and five years old. English is spoken at home, and time limits have yet to be imposed. Her neighborhood does not have a job center, and her local welfare office is not consolidated. Her neighborhood has 5 family care, 10 group care, and 2 state contracted slots available for every 100 children. The local daily reimbursement rate is \$27. The NAEYC accredits 15 percent of all group slots; half of all family and group providers have been in service for 5 and 3 years respectively. The median weekly price of child care is \$80. The state and federal child care subsidy per poor child is \$434. She has a 50 percent chance of receiving a voucher. The local CPC budget is \$50 per poor child. There is no local Head Start program, public school kindergarten is not full-day, and her youngest child is not age-eligible for any public school program. For all other variables, she is assigned the average value over all observations in her neighborhood.

<sup>13</sup> The predicted probability of working for the base case individual is 0.525 under unstructured random-effects and is 0.568 under structured random-effects. In order to simulate predicted effects using the fixed-effects coefficients, we have associated with the base case individual a fixed-effect so that she has a 0.587 probability of working, which matches the sample average.

15 slots per 100 children is associated with increasing the probability of working by 7.6 percentage points. Having more family care slots available, however, has no discernable effect in the decision to work or to get more schooling. These effects are probably expected as the characteristics of group care such as more flexible hours, more permanent establishments, and a greater willingness to accept siblings of all ages, make center care more compatible with the demands of employment.

The only observed quality variable that consistently has a statistically significant effect on the decision to work or pursue education is NAEYC accreditation. Increasing the percent of slots accredited from fifteen to twenty-five percent increases the probability that a parent in our sample will choose work over schooling by 3.2 percentage points.

The effects of the cost of child care are strong, as expected. Single mothers receiving assistance can apply for a child care voucher if they work or are getting more education. If they receive a voucher, their cost of care is zero or a small co-payment; if they find themselves on the waiting list, however, they must pay for care out of their own pocket. Thus, when deciding to work or to get more education, single mothers in high cost of care areas will have more of an incentive to work first than to school first. Increasing the median market price of care from \$80 to \$120 is associated with increasing the probability of working by 10.7 percentage points.

The state reimbursement rate also has a positive effect on the probability of choosing to work first. Increasing the state reimbursement rate from \$27 to \$36 per day increases the probability of working by 9.3 percentage points. Interpreting this result, however, requires care. The regression model includes both the market price of child care and observed quality. Thus, the coefficient on reimbursement rates holds fixed the price and observable quality of local care. An increase in the reimbursement rate, holding market price constant, can have two effects. It could increase the number of providers willing to accept vouchers, thus increasing the availability of care for parents with vouchers. Or, it could increase aspects of the quality of care supplied by providers who accept vouchers that we do not observe. In either case, the potential increase in availability and quality appears to make working a more desirable option compared to schooling.

Funding for child care subsidies is also strongly related to the decision to work. Increasing funding per poor child from \$434 in fiscal year 1997 to \$511 in fiscal year 1998 is associated with mothers increasing their probability of working by 8.6 percentage points. These results are similar to results obtained using data for Miami-Dade County in Florida (Queralt et al., 2000; Witte et al., 2000).

The probability of using a voucher has a strong positive effect on choosing to work first instead of to school first. If the probability of using a voucher increases from 50 to 60 percent, the probability of working over schooling increases by 12.4 percentage points. The positive relationship is statistically significant and demonstrates the high value placed on vouchers by workers as they tend to need more inflexible hours of child care compared to non-workers. Blau and Tekin (2003) and Meyers et al. (2002) also find that an increased probability of receiving a voucher is strongly related to labor market activities.

#### *Early Childhood Education Effects*

The presence of a local Head Start program and full-day kindergarten programs are positively related to the decision to work in Table 3. According to Table 4, the presence of a Head Start program or a full-day kindergarten program are both associated with increasing the probability of working by roughly 20 percentage points. Similarly, Tekin (2004) finds that single mothers are more likely to use their voucher for day-time hours of work. Although the presence of Head Start and full-day kindergarten has a strong effect, eligibility for these Head Start or half-day school programs appears to have no significant effect. Only eligibility for full-day public education is statistically related to an increased chance of choosing employment over schooling.

#### *Regulatory Effects*

The first two entries of Table 4 under Regulatory Effects concern the effect the age of one's youngest child has on the probability of choosing to work rather than to pursue schooling prior to the imposition of time limits (but following the imposition of a work requirement). In particular, mothers with children under the age of two are 23 percentage points more likely to enroll in education programs as

compared to mothers with a youngest child at least two but not yet six years old. In contrast, mothers whose youngest child is at least six years old are 19 percentage points more likely to choose working over schooling than mothers with a youngest child at least two years old but not yet six years old. The last three entries in Table 4 show that change in the effects based on the youngest child's age following the imposition of time limits largely did not affect behavior.<sup>14</sup>

Notice that the results prior to time limits are what one would expect following the imposition of the entire welfare reform package, i.e., in the presence of work requirements and time limits. In particular, under Massachusetts' age-sensitive rules for time limits and the work requirement, one would expect that mothers who are exempt from time limits and the work requirement (because their youngest child is under two years-old) would have more freedom to pursue education programs. At the other end of the spectrum, mothers with a youngest child at least six years old would be more likely to choose employment as they are required to work within 60 days of receiving benefits. In short, the reforms emphasize a "work-first" approach as one's youngest child gets older. This is exactly the behavior we see, except that we see it during periods with and without time limits.

There are at least three possible explanations as to why behavior before time limits were imposed matched anticipated (and observed) behavior under time limits. First, work requirements are in place for our entire sample period. Thus, one interpretation of the results is that the decision to work is strongly affected by the work requirements and more so the closer one gets to facing the requirement (i.e., more so as one's youngest child approaches the age of six), but time limits change behavior very little. Under this interpretation, as most education/training programs, with the possible exception of pursuing a two- or four-year college degree, are of short duration, the decision to enroll in such a program is affected by the work requirement and other household constraints but unaffected by a two-year limit on benefits. A second explanation, however, rests with the timing of our sample. Because our data span only five

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<sup>14</sup> The debate over whether time limits affect welfare case loads remains unresolved. Whereas Ziliak et al. (2000) find that time limits have little effect, Grogger (2003, 2004) and Grogger and Michalopoulos (2003) find strong negative effects when controlling for the age of the youngest child.

months preceding time limits, it is possible that welfare recipients could have anticipated this change and had already started to make decisions accordingly.<sup>15</sup> Fourth, instead of being very long-sighted (as suggested by the third possibility), TAFDC recipients could be extremely short-sighted, and have not yet responded to time limits as none of them in our sample have exhausted their two-year clock on benefits.

### *Personal Effects*

Though not listed in Table 4, the predicted effects from the random-effects models associated with three personal characteristics are interesting to note. First, the probability of working increases with the age of the mother up to age 35. Using the unstructured random-effects results, the probability that a 35 year-old mother works is over 10 percentage points higher than a comparable 28 year-old mother. Thus, as mothers proceed through their twenties and early thirties, the probability decreases that they choose further training or schooling in place of immediate employment. Second, mothers yet to receive a high school degree are 8.3 percentage points more likely to use their child care voucher to enable them to attend an education program than mothers who already have a high school degree. And finally, blacks and Hispanics are more likely than whites to work first, though only the results for Hispanics are statistically significant.

## **6. Discussion of Results and Policy Implications**

We have estimated a reduced form specification of the decision of voucher-eligible, single mothers with at most a high school education to work versus pursue more schooling in their transition off of public assistance. A unique feature of our study is the wealth of data we assembled from several government agencies that oversee TAFDC, employment services, child care vouchers, and child care providers. With this data, we were able to control for several factors that may affect decisions when transitioning off of assistance, including the availability, quality, and cost of child care, the voucher

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<sup>15</sup> After President Clinton signed PRWORA into law, the rules concerning time limits were explained to welfare recipients during office visits starting in September of 1996.

system, early childhood education programs, and welfare reform legislation.

We consistently find that an improved market for formal child care – i.e., increased availability and quality – are positively related with the decision to transit to work rather than to schooling. Increased costs are also associated with a greater propensity to transit off of welfare by seeking employment without first pursuing more education. Similar results hold with respect to the availability of publicly provided education programs such as Head Start and full-day kindergarten. These results suggest that welfare recipients value vouchers mostly for their ability to allow them to pursue employment opportunities. Although the success of welfare reform will undoubtedly require continuing to assist mothers in meeting their child care obligations in order to allow them to pursue employment opportunities; our results highlight the need to also focus attention on schooling issues. Much public debate focuses not just on employment or jobs but the quality of jobs and worker productivity. Thus, while welfare recipients are using expanded child care services to more aggressively pursue work, public policy should also be concerned with increasing the human capital in low-wage workers in order to allow them to obtain and retain higher paying jobs. Our results suggest that these incentives need to come from other places in addition to an improved child care market.

Unlike our results on the effects of the child care market on behavior, our results concerning the effects of work requirements and time limits are more difficult to interpret. Work requirements are in place in Massachusetts for all single mothers with no children under the age of six during the entire duration of our sample period, while time limits were signed into law close to the start of our sample period but were not enforced until five months into our sample period. We find no evidence that behavior changed after time limits were imposed. This could mean that welfare recipients began adjusting their behavior when time limits were signed into law (five months before they were enacted) or that welfare recipients simply did not respond to time limits because none of them had exhausted their time limits by the end of our sample period.

The pattern of behavior that we observe, in any case, is exactly what one would expect under Massachusetts' system of time limits (applied to everyone without children under the age of two) and

work requirements (applied to everyone without children under the age of six). That is, compared to mothers with a youngest child at least two years-old but not yet six years old, we find consistent evidence that mothers with children under two years in age are much more likely (between 10 and 26 percentage points) to pursue schooling options in place of working, whereas mothers with a youngest child at least six years-old are more likely to choose to work. Much work on welfare reform has focused on the effect of time limits. Our results suggest at a minimum that work requirement might also play an important role. Given the rules in Massachusetts, this should not be surprising. An individual is allowed to receive benefits for 24 months before she exhaust her benefits, but the work requirement stipulates that she must be active in work, job retraining, or community service within two months of receiving assistance. Clearly, the work requirement is the more pressing constraint for those individuals that face both regulations. Moreover, it must be recognized that imposing regulations that specify benefits, opportunities, or constraints by the age of one's children will naturally lead to unequal treatment of children as their mothers face substantially different choices.



## **Appendix A. Predicting the Probability of Using a Voucher.**

Child care vouchers are administered in Massachusetts by thirteen Child Care Resource Agencies (CCRAs). Each CCRA operates in specific locations. The primary data set used in the paper comes from five of these CCRAs. The records from these five CCRAs for all voucher users between July 1996 and August 1997 were obtained from the Massachusetts' Office of Child Care Services (OCCS). These data are for 58,170 monthly observations on all 10,297 single mothers who used a child care voucher administered by any one of the five CCRAs during the specified time period. We combine these data with other data from the Department of Transitional Assistance in order to have labor market data as well, but for ease of reference we will refer to this primary data set as the OCCS data.

Estimating equation (1) using the OCCS data, therefore, is problematic as everyone in the data set not only qualified for a voucher but actually used a voucher. As we are interested in the transition from welfare to work of all welfare recipients, we do not wish to only consider voucher users. In order to address this selection problem, we must take into account the probability of using a voucher. To do this, we follow Pagan (1984, 1986) and estimate the probability of using a voucher from a second data set. Using those results, we predict voucher use for everyone in the OCCS data set, and include this in the estimation of equation (1). Pagan refers to the predicted variable as a generated regressor.

Using a twenty percent random sample of welfare recipients assembled by the Massachusetts Department of Revenue, we have access to records on 22,851 individual households headed by a single mother in 1997. Using data on quarterly earnings, we designate households as voucher-eligible only if their income is below 75 percent of the state median income. Keeping only income-eligible households leaves us with 20,410 observations. However, we only know which CCRA each household is associated with if the household actually used a voucher. Thus, before estimating the probability of voucher use in the five CCRAs represented in the OCCS data, we use geocode information to determine which CCRA each family is most likely to work with. When we do this, we are left with 6,626 household observations. We will refer to this as the DOR data for ease for reference. In order to be confident in the mapping of geocodes to CCRA's, Table A1 presents the percent frequency counts for each CCRA in the OCCS and

the DOR data sets. Except for the New England Farm Workers Council, which has 27.65 percent representation in the OCCS data but only 17.50 percent representation in the DOR data, the CCRAs in the DOR data closely match their representation in the OCCS data.

Table A2 presents the summary statistics for the DOR data. Compared to the OCCS data, the age of the mother, the percent with a high school degree, and the number of dependents are roughly the same. The most striking difference between the data sets is the racial compositions. Although the percent of mothers who are black is roughly the same, the DOR data contains a greater percentage of whites than the OCCS data, and thus necessarily, the OCCS data contains a much greater percentage of Hispanics. A similar discrepancy also exists in the percent of observations that come from Boston. Over half of the OCCS observations come from Boston (and not coincidentally have a greater percentage of minorities), whereas less than forty percent of the DOR observations come from Boston.

We are now in a position to estimate the probability of voucher use equation. There are two main issues at this point. First, we can only include variables in the regression that we also have available in the OCCS data as the ultimate objective is to predict the probability of use for individuals in that data set. Second, we need exclusion restrictions to identify the probability of voucher use equation from the probability of work versus schooling equation. Mathematically, we could rely on functional form differences to identify the equations, but in this case, association with a CCRA serves as a particularly important exclusion restriction. CCRAs administer vouchers and help in the finding of appropriate child care. Thus, CCRAs clearly facilitate voucher use. They are not, however, particularly focused on helping welfare recipients find work or schooling. This is left to welfare offices, case workers, and the ESP. Thus, we include association with one of our five CCRAs in the probability of voucher use equation by including four dummy variables.

The probability of using a voucher equation is estimated with a Probit model in which individual characteristics and CCRA association are included as explanatory variables. The regression results are reported in Table A3. These results are then used to predict the probability of voucher use for each observation in the OCCS data. This variable is then included when estimating equation (1).

## References

- Anderson, Patricia M. and Phillip B. Levine, "Child Care and Mothers' Employment Decisions," in David Card and Rebecca Blank, eds., *Finding Jobs: Work and Welfare Reform*, New York: Russell Sage, 2000.
- Blank, Rebecca M., "Evaluating Welfare Reform in the United States," *Journal of Economic Literature*, 40(4), pp. 1105-1166, December 2002.
- Blau, David M., *The Child Care Problem: An Economic Analysis*, New York: Russell Sage, 2001.
- Blau, David M., and Alison P. Hagy, "The Demand for Quality in Child Care," *Journal of Political Economy*, 106(1), pp. 104-146, February, 1998.
- Blau, David M., and Philip K. Robins, "Child-Care Costs and Family Labor Supply," *Review of Economics and Statistics*, 70(3), pp. 374-381, August, 1988.
- Blau, David M. and Erdal Tekin, "The Determinants and Consequences of Child Care Subsidies for Single Mothers," NBER working paper 9665, April, 2003.
- Chamberlain, Gary, "Panel Data," in Zvi Griliches and Michael Intriligator eds., *Handbook of Econometrics*, Vol. II., Amsterdam: North-Holland, pp. 1247-1317, 1983.
- Chaplin, Duncan D., Philip K. Robins, Sandra L. Hofferth, Douglas A. Wissoker and Paul Fronstin, "The Price Elasticity of Child Care Demand," manuscript, 2000.
- Grogger, Jeff, "The Effects of Time Limits, EITC, and other Policy Changes on Welfare Use, Work, and Income Among Female-Headed Families," *Review of Economics and Statistics*, 85(2), pp. 394-408, May, 2003.
- Grogger, Jeff, "Time Limits and Welfare Use," *Journal of Human Resources*, 39(2), pp. 405-424, Spring, 2004.
- Grogger, Jeff and Charles Michalopoulos, "Welfare Dynamics under Time Limits," *Journal of Political Economy*, 111(3), pp. 530-554, June, 2003.
- Gustafsson, Siv, and Frank Stafford, "Child Care Subsidies and Labor Supply in Sweden," *Journal of Human Resources*, 27(1), pp. 204-230, Winter, 1992.
- Hofferth, Sandra L., "Comment on The Importance of Child Care Costs to Women's Decision Making," in *The Economics of Child Care*, in David M. Blau ed., Russell Sage Foundation, New York, pp. 119-126, 1991.
- Hofferth, Sandra L. and Douglas A. Wissoker, "Price, Quality, and Income in Child Care Choices," *Journal of Human Resources*, 27(1), pp. 70-111, Winter, 1992.
- Hotz, V. Joseph and M. Rebecca Kilburn, "The Demand for Child Care and Child Care Costs: Should We Ignore Families with Non-Working Mothers?" Harris School of Public Policy Working Paper 92-1, 1992.

- Liang, Kung-Yee and Scott L. Zeger, "Longitudinal Data Analysis Using Generalized Linear Models," *Biometrika*, 73(1), pp. 13-22, April, 1986.
- Liang, Kung-Yee, Scott L. Zeger and Bahjat Qaqish, "Multivariate Regression Analyses for Categorical Data," *Journal of the Royal Statistical Society, Series B*, 54(1), pp. 3-24, 1992.
- Loprest, Pamela, Stefanie Schmidt and Ann D. Witte, "Welfare Reform under PRWORA: Aid to Children with Working Families," *Tax Policy and the Economy*, 14: 157-203, 2000.
- Meyers, Marcia K., Theresa Heintze, and Douglas A. Wolf, "Child Care Subsidies and the Employment of Welfare Recipients," *Demography*, 39(1), pp. 165-179, February, 2002.
- Michalopoulos, Charles, Philip K. Robins and Irwin Garfinkel, "A Structural Model of Labor Supply and Child Care Demand," *Journal of Human Resources*, 27(1), pp. 166-203, Winter, 1992.
- Pagan, Adrian, "Econometric Issues in the Analysis of Regressions with Generated Regressors," *International Economic Review*, 25(1), pp. 221-247, February, 1984.
- Pagan, Adrian, "Two Stage and Related Estimators and Their Applications," *Review of Economic Studies*, 53, pp. 517-538, 1986.
- Queralt, Magaly, Ann Dryden Witte, and Harriet Griesinger, "Changing Policies, Changing Impacts: Employment and Earnings of Child-Care Subsidy Recipients in the Era of Welfare Reform," *Social Service Review*, 74(4), pp. 588-619, December, 2000.
- Ribar, David C., "A Structural Model of Child Care and the Labor Supply of Married Women," *Journal of Labor Economics*, 13(3), pp. 558-597, July, 1995.
- Tekin, Erdal, "Single Mothers Working at Night: Standard Work, Child Care Subsidies, and Implications for Welfare Reform," NBER working paper 10274, January, 2004.
- Waite, Linda J., Arleen Leibowitz and Christina Witsberger, "What Parents Pay For: Child Care Characteristics, Quality, and Costs," *Journal of Social Issues*, Vol. 47(2), pp. 33-48, 1991.
- Walker, James R., "Public Policy and the Supply of Child Care Services," in *The Economics of Child Care*, in David M. Blau ed., Russell Sage Foundation, New York, pp. 51-77, 1991.
- Walker, James R., "New Evidence on the Supply of Child Care: A Statistical Portrait of Family Providers and an Analysis of Their Fees," *Journal of Human Resources*, 27(1), pp. 40-69, Winter, 1992.
- Witte, Ann Dryden, Magaly Queralt, Tasneem Chipty and Harriet Griesinger, "Unintended Consequences: Welfare Reform and the Earnings of the Working Poor," *Social Service Review*, Vol. 74, December, 2000.
- Ziliak, James P., David N. Figlio, Elizabeth E. Davis and Laura S. Connolly, "Accounting for the Decline in AFDC Caseloads: Economic Growth or Welfare Reform?" *Journal of Human Resources*, Vol. 35(3), pp. 570-586, Summer, 2000.

Table 1. Descriptive Statistics (N = 58,170).

	Mean	Median	Std Dev	Min	Max
<b>Individual Characteristics</b>					
Worked positive hours last week.	0.587	1	0.492	0	1
Age of mother.	27.935	26.667	6.865	15	56
Age of mother squared.	827.5	711.1	422.4	225	3136
Mother has no high school degree.	0.464	0	0.499	0	1
Mother has a high school degree or GED.	0.536	1	0.499	0	1
English is spoken in the household.	0.936	1	0.245	0	1
English is not spoken in the household.	0.064	0	0.245	0	1
Household race is black.	0.381	0	0.486	0	1
Household race is Hispanic	0.344	0	0.475	0	1
Household race is white, non-Hispanic.	0.276	0	0.447	0	1
<b>Child Care Market Characteristics</b>					
Family care slots per 100 kids.	5.036	5.503	1.669	1.304	7.427
Group care slots per 100 kids by age of child.	6.415	5.269	4.284	0	24.743
State contracted slots per 100 kids.	1.409	1.667	0.516	0.034	2.675
Percent group centers NAEYC accredited.	0.164	0.151	0.146	0	1
Percent group slots existed 3 or more years.	0.784	0.878	0.228	0	1
Median years of family care providers.	5.339	5.455	0.755	2.099	7.551
Median weekly price of care by age group	80.19	72.96	27.67	45	225
<b>Child Care Voucher System</b>					
State daily reimbursement rate.	24.98	27.50	8.13	14	38
Number of household dependents.	2.648	2	0.969	1	8
State & federal subsidy per poor child in \$100.	4.475	4.34	0.293	4.34	5.11
Probability of using a voucher.	0.476	0.484	0.140	0.022	0.810
Probability of using a voucher after welfare reform.	0.339	0.406	0.246	0	0.810
<b>Early Education Programs</b>					
Head Start exists in township.	0.454	0	0.498	0	1
Full-day kindergarten.	0.847	1	0.360	0	1
CPC funding per poor child in town.	5.255	3.523	3.606	0	53.126
Youngest child is Head Start eligible.	0.121	0	0.326	0	1
Youngest child is half-day school eligible.	0.084	0	0.278	0	1
Youngest child is full-day school eligible.	0.101	0	0.301	0	1
<b>Welfare Reform and Policy Variables</b>					
Youngest child is under 2 years old.	0.262	0	0.440	0	1
Youngest child is 2 to 5 years old.	0.521	1	0.500	0	1
Youngest child is at least 6 years old.	0.217	0	0.412	0	1
Time limits imposed on Dec. 1, 1996.	0.712	1	0.453	0	1
Time limits * youngest child is under 2.	0.184	0	0.387	0	1
Time limits * youngest child is 2 to 5.	0.370	0	0.483	0	1
Time limits * youngest child is over 5 years old.	0.158	0	0.365	0	1
Time trend.	8.218	9	3.949	1	14
Welfare office is consolidated.	0.437	0	0.496	0	1
October 1996 minimum wage increase.	0.842	1	0.365	0	1
Economic revitalization dollars per worker.	439	32	534	0	2349
<b>Labor Market and Community Characteristics</b>					
Retail and service jobs per worker in town.	0.549	0.561	0.069	0.205	0.808
Percent workers use public transportation.	0.161	0.081	0.150	0	0.433
DET Job Center exists in township.	0.570	1	0.495	0	1
Median household income in zipcode.	26,499	25,723	6,542	13,721	70,928

Table 2. Frequency of Monthly Observations by Location.

<i>Townships</i>					
Acushnet	189	Framingham	1,184	Springfield	11,146
Boston	21,399	Holyoke	2,031	Taunton	976
Cambridge	1,190	Lowell	3,920	Waltham	625
Chelsea	1,375	New Bedford	4,839	Wareham	462
Chicopee	1,454	Newton	226	Westfield	610
Dartmouth	347	Revere	797	Winthrop	143
Fall River	3,979	Somerville	943	Woburn	335
<i>Boston Neighborhoods</i>					
Allston-Brighton	549	Jamaica Plain	742	South Boston	695
Central Boston	569	Mattapan	1,428	South Dorchester	7,988
Charlestown	646	North Dorchester	1,634	South End	905
East Boston	1,040	Roslindale	838	Not in Boston	36,771
Hyde Park	854	Roxbury	3,511		
<i>Welfare Offices</i>					
Bowdoin Park	9,622	New Bedford	5,375	Taunton	976
Davis Square	3,005	New Market Square	6,229	Waltham	625
Fall River	3,979	Revere	3,355	Wareham	462
Framingham	1,184	Roslindale	3,862	Westfield	610
Holyoke	2,031	Springfield Liberty St	12,600	Woburn	335
Lowell	3,920				
<i>Metropolitan Statistical Areas</i>					
Boston	29,655	New Bedford	5,375	Springfield	15,241
Lowell	3,920	Providence	3,979		

Table 3. Estimation Results.

	Fixed Effects		Random-Effects Unstructured Corr.		Random-Effects Structured Corr.	
	Coef.	<i>t</i> - stat	Coef.	<i>t</i> - stat	Coef.	<i>t</i> - stat
Age of mother.			0.3827	16.927	0.3943	16.546
Age of mother squared.			-0.0054	-15.156	-0.0055	-14.777
Mother has no high school degree.			-0.3153	-5.626	-0.2975	-5.357
English is not spoken in the household.			-0.4948	-6.385	-0.4775	-6.099
Household race is black.			0.0380	0.562	0.0766	1.177
Household race is Hispanic			0.1176	1.718	0.1272	1.928
Family care slots per 100 kids.	-0.4162	-3.834	-0.0861	-1.263	-0.1059	-1.817
Group care slots per 100 kids.	0.0646	2.894	0.0183	1.407	0.0341	3.100
State contracted slots per 100 kids.	0.5558	2.147	-0.0022	-0.028	-0.0128	-0.140
Percent group centers accredited.	1.3353	3.454	0.2831	1.263	0.4188	2.115
Percent group slots 3 years old.	0.0827	0.356	0.2265	1.695	0.0846	0.718
Median years of family care providers.	-0.1111	-0.482	-0.0221	-0.155	-0.1368	-1.077
Median weekly cost of care.	0.0116	3.333	0.0039	1.702	0.0033	1.834
State daily reimbursement rate	0.0445	4.325	0.0098	1.859	0.0143	2.963
Number of household dependents.			-0.0530	-2.199	-0.0585	-2.407
State & federal subsidy per poor child.	0.4796	3.098	0.2776	5.572	0.2755	4.848
Probability of using a voucher.	5.3978	3.503	0.9786	3.051	1.1485	3.632
Probability of using a voucher after reform.	-0.0757	-0.246	-0.1599	-1.206	-0.2964	-1.996
Head Start exists in township.	0.9285	1.973	0.2439	0.719	0.2434	0.817
Full-day kindergarten.	1.0000	1.574	0.4664	1.345	0.5974	1.868
CPC funding per poor child.	0.0563	2.511	-0.0039	-0.511	0.0076	0.905
Youngest child is Head Start eligible.	-0.0543	-0.611	-0.0240	-0.633	0.0205	0.613
Youngest child is half-day school eligible.	0.0644	0.514	0.0432	0.960	0.0257	0.566
Youngest child is full-day school eligible.	0.0879	0.766	0.0650	1.828	0.1121	2.990
Youngest child is under 2 years old.	-1.8409	-5.684	-0.8076	-4.810	-0.8884	-5.912
Youngest child at least 2, not yet 6 yrs old.	-0.8932	-4.112	-0.3916	-3.875	-0.4475	-4.791
Time limits imposed on Dec. 1, 1996.	-0.0654	-0.359	0.0501	0.723	0.1037	1.370
Time limits * youngest child is under 2.	-0.1436	-1.001	-0.0275	-0.544	-0.0102	-0.170
Time limits * youngest child is 2 to 6.	-0.1809	-1.408	-0.0288	-0.679	-0.0393	-0.783
Time trend.	0.1822	8.174	0.0346	2.801	0.0485	4.304
Welfare office is consolidated.	-2.1490	-3.209	-0.5127	-1.227	-0.6630	-1.803
October 1996 minimum wage increase.	-0.2439	-3.361	-0.1171	-5.002	-0.1131	-4.279
Economic revitalization dollars per worker.	0.0003	2.118	4.2E-06	0.069	0.0001	0.973
Retail and service jobs per worker.	1.5517	0.826	0.9332	0.874	0.9970	1.050
Percent workers use public transportation.	-1.7572	-0.887	-1.8634	-1.295	-1.1449	-0.924
DET Job Center exists in township.	-1.1293	-3.037	-0.4739	-1.812	-0.4583	-1.981
Median household income in zipcode.	2.5E-05	1.787	5.2E-06	0.556	7.4E-06	0.906
Number of observations.	20,704		58,170		58,170	
Number of families.	2,881		10,297		10,297	
Wald Test (chi-squared degrees of freedom)	1,592.1	(55)	1,613.2	(62)	1,646.8	(62)

Note: The dependent variable in each regression equals one if the mother is working and equals zero if she uses her voucher to pursue more schooling. Each regression also includes dummy variables for township, welfare office, Boston neighborhood, and metropolitan statistical area.

Table 4. Predicted Differences in the Probability of Working and *t*-statistics.

	Fixed Effects	Unstructured Correlation	Structured Correlation
<b><i>Child Care Effects</i></b>			
Group care capacity increases from 10 to 15 slots per 100 kids.	0.076 3.636	0.042 3.297	0.023 1.374
NAEYC accredited group centers increases from 15% to 25 %.	0.032 3.657	0.010 2.134	0.007 1.254
Median cost of weekly care increases from \$80 to \$120.	0.107 1.197	0.033 0.617	0.039 0.564
<b><i>Voucher Effects</i></b>			
State reimbursement rate increases from \$27 to \$36 per day.	0.093 6.944	0.032 3.145	0.022 1.801
State & federal child care subsidy increases from \$434 to \$511 per poor child in township.	0.086 7.577	0.052 6.014	0.053 5.086
Probability of using a voucher under time limits regulation increases from 0.5 to 0.6.	0.124 5.276	0.021 67.181	0.020 50.413
<b><i>Early Childhood Education Effects</i></b>			
A local Head Start program exists.	0.196 2.439	0.059 0.835	0.061 0.715
The local public school district offers full-day kindergarten.	0.208 1.998	0.140 2.037	0.116 1.353
Youngest child is Head Start eligible and Head Start is in session.	-0.013 -0.608	0.005 0.614	-0.006 -0.634
<b><i>Regulatory Effects</i></b>			
Youngest child is under 2 years old as compared to being at least 2 Years old but not yet 6 years old.	-0.232 -4.212	-0.110 -3.695	-0.098 -3.068
Youngest child is at least 6 old as compared to being at least 2 years old but not yet 6 years old.	0.190 3.598	0.107 4.615	0.097 3.922
<b><i>Imposition of the time limit:</i></b>			
When the youngest child is under 2 years old.	-0.046 -1.238	0.023 1.120	0.005 0.298
When the youngest child is 2 to 6 years old.	-0.061 -1.411	0.016 0.811	0.005 0.294
When the youngest child is at least 6 years old.	-0.012 -0.353	0.023 1.394	0.012 0.725

Note: Reported below the marginal effect for each change is the appropriate *t*-statistic. The base specification is for black, single mother with a high school degree and two children living in the South Dorchester neighborhood of Boston. The predicted probability of working for the base case is 58.7 percent under the fixed-effects model, 52.5 percent under the unstructured random-effects model, and 56.8 percent under the structured random-effects model. For more details, the reader is referred to footnote 12.



Table A1. Child Care Resource Agency Percent Frequency Counts across Data Sets.

	OCCS	DOR
<i>Child Care Resource Agency:</i>		
Child Care Choices of Boston	35.05%	41.67%
Child Care Resource Center	8.68%	11.82%
Child Care Search	11.18%	9.39%
New England Farm Workers Council	27.65%	17.79%
Child Care Works	17.44%	19.33%
<i>Number of Observations</i>	10,297	6,626

Table A2. Descriptive Statistics (N=6,626).

	Mean	Median	Std Dev	Min	Max
Probability of using a voucher.	0.3679	0	0.4823	0	1
Age of mother.	29.0	28.5	6.7	16	50
Age of mother squared.	887	812	412	245	2500
Age of youngest child (in months).	63.3	58.8	42.2	0	156
Age squared of youngest child (in months).	5791	3452	6268	0	24336
Mother has no high school degree.	0.4337	0	0.4956	0	1
Mother has a high school degree or GED.	0.5231	1	0.4995	0	1
Household race is black.	0.3456	0	0.4756	0	1
Household race is Hispanic	0.1601	0	0.3668	0	1
Household race is white, non-Hispanic.	0.4943	0	0.5000	0	1
Number of household dependents.	2.0660	2	1.2053	1	10
Household resides in Boston.	0.3885	0	0.4842	0	1
Household resides in Boston MSA.	0.5278	1	0.4965	0	1

Source: Twenty percent random sample of assistance recipients in the five Child Care Resource Agency areas of interest who were voucher-eligible in Massachusetts in 1998. Assembled by the MA Department of Revenue.

Table A3. Probit results from estimating the probability of using a voucher.

	Coef.	St. Error	p-value
Age of mother.	-0.0515	0.0219	0.019
Age of mother squared.	0.0003	0.0004	0.404
Age of youngest child (in months).	0.0130	0.0016	0.000
Age squared of youngest child (in months).	-0.0001	0.0000	0.000
Mother has no high school degree.	-0.3462	0.0347	0.000
Household race is black.	0.3427	0.0448	0.000
Household race is Hispanic	0.2640	0.0516	0.000
Number of household dependents.	0.0991	0.0152	0.000
Household resides in Boston.	0.0298	0.0914	0.744
Household resides in Boston MSA.	0.1159	0.1399	0.407
CCRA=Child Care Choices of Boston	0.1036	0.0953	0.277
CCRA=Child Care Search	0.3600	0.1462	0.014
CCRA=New England Farm Workers Council	0.5726	0.1471	0.000
CCRA=Child Care Works	0.5588	0.1455	0.000
Constant	0.1743	0.3398	0.608
Number of Observations	6,626		
Pseudo R-squared	0.0944		
Log-likelihood	-3947		