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ABSTRACT

A central theme of welfare reform is recipients are required to engage in work activities. In many states these work requirements apply to mothers whose children are a few months old, potentially increasing the costs and decreasing the prevalence of breastfeeding. Given the substantial benefits of breastfeeding, any reduction represents an important negative consequence of these requirements. Our results suggest that, in the absence of welfare reform, the national breastfeeding rate six months after birth would have been 5.5% higher in 2000. Such negative consequences of these policies must be weighed against potential benefits as states refine their welfare programs.

INTRODUCTION

Federal welfare policy changed fundamentally with the passage of the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) of 1996. Policy decision-making was shifted to the state and even county level, which gave rise to the adoption of a myriad of different policies across the nation. However, in almost every locale, emphasis was placed squarely on families becoming self-sufficient through employment.

Numerous observational studies have examined the causal impact of these reforms on children and families, but most of these studies suffer from two common methodological limitations. First, most of the observational studies rely on outcomes that are fairly indirect measures of child well-being, such as welfare participation, employment, earnings, and income.[1] One explanation for this focus is that many of the dimensions of well-being that are of interest—education, cognitive development, and health status—do not change quickly, implying that potential policy impacts will only be observed in the long-run. Second, relatively few studies have estimated the impact of specific policies that were adopted during the reform period but instead estimate the impact of the total bundle of adopted policies.[2] However, only through understanding the impact of specific policies can states appropriately modify the policy bundle they have chosen.

This study, which examines the impact of welfare reform on breastfeeding, addresses both of these limitations. Breastfeeding is closely related to well-being as the short-term and long-term health benefits to children and mothers are well documented. Moreover, breastfeeding prevalence is an outcome that can be affected in the short-term, and thus any impacts of the recent reforms can be estimated more easily than when examining outcomes that change more slowly, such as completed years of education or cognitive development. The specific reforms

that are expected to affect breastfeeding are ones that focus on mothers with infants. This study quantifies the specific policies—work requirements for mothers with a six-month old child and sanctions for not satisfying these requirements—and estimates their impact.

There is reason to suspect that welfare reforms could be causing a reduction in breastfeeding. Previous research has found a positive causal impact of welfare reforms on employment and a negative correlation between working and breastfeeding. If such employment effects were to exist among mothers with infants, then welfare reform could be causing some new mothers to enter the workforce and, in turn, stop breastfeeding.

Our basic identification strategy relies on comparing the change in breastfeeding in states that adopted stringent work policies versus the change in states that adopted lenient policies. Relying on national data for the period 1990 to 2000, we find that work requirements reduce breastfeeding substantially. Our preferred estimates imply that the most stringent work requirements cause the breastfeeding rate six months after birth to decline 3.1 percentage points (22%) for new mothers enrolled in the Special Supplemental Program for Women, Infants, and Children (WIC) and 2.1 percentage points (9%) for all new mothers. These results imply that, if the nation had not adopted the reforms that were implemented in 1996 and subsequent years, national breastfeeding would have been 5.5% higher than it actually was in 2000. Such negative impacts of particular policies (full-family sanctions coupled with moderate to high hours requirements) must be weighed against potential benefits as states develop and refine their overall welfare programs.

BACKGROUND

In this section, we first review the relevant breastfeeding literature and the welfare reform literature. We then briefly sketch a conceptual framework that guides our analysis.

Breastfeeding Literature

Numerous studies conclude that human milk is the gold standard for infant nourishment (see American Academy of Pediatrics (1997) and Lawrence (2000) for useful reviews). For example, studies have found that human milk is associated with lower rates of urinary tract infections, lower and upper respiratory tract infections, diarrhea, allergic diseases, otitis media, bacterial meningitis, botulism, bacteremia, and necrotizing enterocolitis for infants and children (e.g., Beaudry, Dufour, and Marcoux 1995; Duncan et al. 1993). In addition to the physiological health benefits, human milk also benefits children's cognitive and educational abilities (e.g., Horwood and Fergusson 1998; Lucas et al. 1992).

Studies also suggest that breastfeeding is beneficial for the mother's health (see Labbok (2001) for a useful review). The list of beneficial health outcomes includes lowered risk of breast and ovarian cancers, decreased incidence of long-term osteoporosis and pregnancy-induced obesity, more rapid return to the prepartum state, and reduced menstrual blood loss (e.g., McTiernan and Thomas 1986). Some evidence further demonstrates an improved sense of self-esteem, bonding with infant, and success with mothering (e.g., Locklin and Naber 1993).

Given that the benefits of breastfeeding are well established, barriers to breastfeeding have clinical and policy significance. One potential barrier is maternal employment. Research has documented a negative correlation between full-time maternal employment and the duration of breastfeeding (see Lindberg (1996b) for a useful review). Results are mixed on how part-time employment affects breastfeeding rates compared to those not working, with some studies finding a significant difference (Lindberg 1996a) while others do not (Fein and Roe 1998).

Welfare Reform Evaluation Literature

The 1996 federal welfare legislation PRWORA, which replaced AFDC (Aid for Families with Dependent Children) with TANF (Temporary Assistance for Needy Families), changed welfare policy in two important respects: it increased the emphasis on work and it gave states greater discretion in designing their programs. Some policies that states enacted include lifetime limits for welfare receipt, higher earnings disregards, family caps, and work participation requirements (Rowe 2000).

There have been numerous experimental studies of welfare-to-work programs (see Grogger, Karoly, and Klerman (2002) and Hamilton et al. (2001) for useful reviews). These studies generally find that welfare-to-work programs modestly increase labor supply, particularly when the policies are coupled with some type of enforcement mechanism. In addition to the employment effects, the experimental studies find that the programs do not lead to higher total family income because the increased earnings were offset by reductions in welfare transfer income. Furthermore, studies have found little impact on children's well-being.

Although these experimental studies provide important evidence on the likely impacts of welfare reform, they suffer from at least one significant drawback: most experimental designs only include individuals who initially participated in welfare, and therefore they are not informative regarding individuals who did not enroll in welfare due to the reforms. Grogger, Haider, and Klerman (2003) conclude that reductions in entry accounted for roughly half of the decline in welfare caseloads in the 1990s, implying that the experimental studies could substantially misstate the impact of reforms.

In addition to the experimental evidence, several studies using observational data have attempted to identify the causal impacts of the various welfare policies. These causal studies of

the reforms have usually focused on the welfare caseload (e.g., CEA 1997, 1999; Grogger forthcoming; Ziliak et al. 2000). Such studies cannot provide information regarding whether or not potential recipients are made better off by the reforms. A few recent observational studies focus on employment, income, poverty, and family structure (e.g., Bitler, Gelbach, and Hoynes 2003; Ellwood 2000; Grogger forthcoming; Moffitt 1999; Schoeni and Blank 1999). Consistent with the experimental evidence, these studies tend to conclude that welfare reform contributed to the rise in employment among low-income mothers (Grogger forthcoming; Meyer and Rosenbaum 2001; Moffitt 1999; O'Neill and Hill 2001; Schoeni and Blank 1999).

A Simple Conceptual Framework

A new mother will decide when to stop breastfeeding (and whether to initiate breastfeeding) by evaluating its underlying costs and benefits. This decision is made continually over time as new information and constraints arise. Employment can potentially increase the cost of choosing to rely on breast milk, depending on a mother's flexibility to breastfeed or pump during the workday and a mother's access to pump and cooler technology (Hills-Bonczyk et al. 1993). When the breastfeeding costs associated with work are sufficiently high, then policies that increase the labor supply of mothers will adversely impact the prevalence of breastfeeding. However, it is not clear that mandated work would increase the cost sufficiently to cause a woman to stop breastfeeding, nor is it clear that the women who are directly impacted by welfare-to-work laws would have breastfed in the absence of the law. Moreover, the change in labor force attachment induced by welfare policies may increase total income, which in turn may increase breastfeeding, all else equal. The goal of the empirical analysis is to estimate the net effect of the policy changes on breastfeeding.

Very few states require mothers to work within the first few weeks after birth; therefore, any impact on breastfeeding in the hospital (which we can measure in our data) can be interpreted as an anticipatory effect. Specifically, mothers may decide not to breastfeed in the hospital because they expect that the work requirements they will face a few months after birth will cause them to enter the workforce and, in turn, stop breastfeeding. This anticipatory effect will tend to be small if the costs of learning to breastfeed are small or if the perceived benefits of breastfeeding are relatively high within the first few months after birth.

Given previous research, we expect anticipatory effects to be small. Ryan (2000) finds nearly identical breastfeeding rates in the hospital for women who are employed and not employed (67.7% for those employed vs. 68.0% for those not employed), but the rates diverge at six months (26.6 vs. 35.4%) and at twelve months (13.6 vs. 22.0%). In addition, previous research suggests that the benefits of breastfeeding are highest within the first few months after birth (American Academy of Pediatrics 1997).

THE DATA

To examine the impact of changing welfare laws on breastfeeding, we require data on breastfeeding that enable us to examine state-by-state variation over the 1990s, when welfare policies were changing rapidly across states. Aggregate breastfeeding data from the Ross Laboratories Mothers Survey (RLMS) are the only suitable data that are publicly available.[3]

Breastfeeding Rates

RLMS, a proprietary survey of Ross Laboratories, is a large, national mail survey conducted since 1955 to determine patterns of milk feeding from birth to 12 months. Mothers are asked to recall the type of milk their baby was fed in the hospital, at week one of age, in the last 30 days, and in the last week.[4] Questionnaires are mailed to a probability sample of new mothers selected

from a list of names that represent approximately 80 to 85% of all national births, where the list includes names from hospital sources, county records of birth registrations, photography and diaper services, and newspapers. The samples are very large, with 420,000, 720,000, and 1.4 million questionnaires mailed in 1991, 1992, and 2000, respectively. Such large sample sizes allow relatively precise state-by-state estimates in each year. See Ryan (1997, 2000) for additional information on the RLMS.

Despite the incomplete coverage of the RLMS and a low response rate that is common among mail surveys (approximately 45% over the time period of interest), its national breastfeeding prevalence estimates are very similar to those produced using several other well known national surveys, including the National Survey of Family Growth (NSFG) and the National Health and Nutrition Examination Survey (NHANES) III (Hediger et al. 2001; Ryan et al. 1991). Moreover, national trends in breastfeeding (from 1955 to 1987) and differentials across socio-demographic characteristics are similar in the RLMS and the NSFG (Ryan et al. 1991).

Although the underlying RLMS micro-data are proprietary and are not made available to researchers outside Ross Laboratories, annual estimates of four different breastfeeding rates for the 50 states and the District of Columbia from 1990 to 2000 are published (Ryan 2000). These four rates are for all new mothers in the hospital just after giving birth, all mothers six months later, WIC mothers in the hospital just after giving birth, and WIC mothers six months later. In these data, a WIC mother is defined as any new mother who received WIC for herself or her infant at any time after the birth of the child, including the six-week postpartum period of benefits granted to pregnant WIC recipients. We use these data as the outcomes in our analysis.

In Table 1, we present national estimates of the four different breastfeeding rates by year based on the RLMS aggregate data. Two important patterns emerge from the estimates in Table

1. First, there was a secular increase in breastfeeding in the United States (U.S.) for all new mothers and for WIC mothers. The increase, which occurred both in the hospital and six months after birth, corresponds with the growing belief that breast milk is the optimal source of infant nutrition. Second, breastfeeding prevalence six months after birth is substantially less than the prevalence in the hospital. Thus, many women who begin breastfeeding do not continue breastfeeding for the six to twelve months recommended by the American Academy of Pediatrics (1997).

Welfare Policies

Because of the numerous policy changes that were enacted as part of welfare reform and the significant variation in policies across states, it is difficult to develop a parsimonious yet meaningful classification of state policies. For our purposes, we classify states based on their policies that directly relate to the work requirements for mothers of six-month old infants (corresponding to the RLMS outcome data). We construct this classification based on three work policies: (1) whether any work is required for mothers of six-month old infants, (2) the minimum number of hours of work that are required, and (3) sanction policies.

Our primary source for information on welfare policies is the Urban Institute's Welfare Rules Database (WRD);[5] see Rowe (2000) for a useful summary of the WRD. We supplement these data with information on sanction policies from the Council of Economic Advisors (CEA) (1999). In addition, when information on hours requirements were not available in the WRD, either because it was missing or states determined hour's requirements on a case by case basis, we used data on hours requirements from the State Policy Documentation Project (SPDP). The SPDP contains information on the actual implementation of hours requirements.[6]

The first policy component that we consider is whether there are any work requirements for a mother with a six-month old infant. Before TANF, some states had instituted work requirements, but all states exempted mothers with a child under 36 months old. PRWORA mandated that all states adopt work requirements for its general welfare population but allowed states latitude in exempting mothers of young children from these work requirements. By 2000, young-child exemptions ranged from 0 to 48 months across the 50 states and the District of Columbia, with approximately 60% of states having an exemption of more than six months. However, even the states that allow young-child exemptions often place restrictions on its use, such as a limit on the number of months it is applicable or on which mothers can use them.[7] Based on these exemptions, we categorize states as either not requiring work from a mother with a six-month old infant or requiring at least some work from a mother of a six-month old infant.[8]

Previous research suggests that breastfeeding declines substantially only when women work full time (see Section II). Therefore, the second dimension of welfare policy is the minimum number of hours a state requires a new mother to work. In 2000, 43 states and the District of Columbia require that single-parent welfare participants work a minimum number of hours per week. We categorize states into three exhaustive categories: no hour requirements (0), moderate hour requirements (18-30), and high hour requirements (32 or more). No states have hour requirements of 1-17 or 31.

The third and final component is the sanction policy a state adopted. Sanction policy refers to the penalties that are imposed on families that do not meet the work requirements. "Full-family" sanctions withhold the entire family's cash assistance, while "partial-family" sanctions only withhold a portion of the family's benefits. Some states impose sanctions after the first offense while others only penalize after repeated offenses. We examine sanction policies because they

indicate the consequences that a person would face if she does not meet the specified work requirements. Experimental evidence suggests that a stringent work requirement policy will have less of an impact when there are few consequences to violating the policy (Hamilton et al. 2001). We classify states as having a "sanction" if the state imposes a full-family sanction for the first or later violations; otherwise, a state is classified as having "no sanction."

Based on these three work policies, we classify states into eight categories.[9] Table 2 summarizes the policy categories and Table 3 presents the variation in policies across time; detailed policy information for each state is available from the authors upon request. A state with a given policy in place for more than half of the calendar year is coded to have a policy indicator equal to one, otherwise the policy indicator variable takes the value zero.

Turning to Table 3, none of the states required work for young mothers nor did they have sanction policies in the early 1990s. A few states adopted sanction policies as a waiver during 1994 to 1996, and these states are categorized as "no work/-/sanctions." States did not begin to adopt work requirements for mothers with infants until 1996.

Although our primary interest is the effects of welfare work requirements, we also include two other measures of welfare generosity: the maximum level of cash assistance for a family of three and whether a lifetime termination time limit is in effect. These data were taken from CEA (1999) and updated through 2000 using the WRD.

Other Data

Two significant laws affecting breastfeeding were passed in some states during the 1990s.[10] The first law reinforces that mothers are permitted to breastfeed in public areas. The second law attempts to accommodate breastfeeding in the workplace. The stipulations of the workplace law vary among states, from acknowledging the importance of employers to allow their employees to

breastfeed at work, to requiring employers to allow mothers to breastfeed at work and make appropriate accommodations for them. We rely on two indicator variables to capture the existence of these two laws, with the respective indicator taking the value of one if the policy is in effect in the state in a given year and zero otherwise. The prevalence of these laws across years is also presented in Table 3.

We use the state unemployment rate from the Bureau of Labor Statistics to measure local labor market opportunities. The numbers of live births by state and year, which are used as weights in the regression analysis, are available from the National Center for Health Statistics, *National Vital Statistics Reports*.[11]

ANALYTICAL APPROACH

To identify the impact of the changes in welfare law on breastfeeding, we rely on a "difference-in-difference" strategy in which we exploit both the time and state variation in the data. Specifically, we compare the change in breastfeeding rates in states that adopted the various combinations of policies. Such a strategy flexibly controls for any initial differences and common time trend in breastfeeding across all states, while allowing us to focus on the direct impact of work requirement changes.

Graphical Analysis

To demonstrate our basic analytic strategy, we classify states by their 2000 policy category and then pool the 28 states that are in the two relatively stringent policy categories ("work/high hours/sanctions" and "work/moderate hours/sanctions") and the five states that are in the two relatively weak policy categories ("no work/-/no sanctions" and "no work/-/sanctions"). For these pooled policy categories, we compute the prevalence of breastfeeding for WIC mothers in the years before and after the implementation of the states' policies. For example, we can obtain

the prevalence in breastfeeding for each of the two groups in each of the years before the law was passed (denoted as years -3, -2, and –1), the year the law was changed (denoted as year 0), and the years after the law was passed (denoted as years +1, +2, and +3).[12]

Figures 1 and 2 present the prevalence of breastfeeding in the hospital and six months after birth, respectively. As can be observed in Figure 1, there exist distinct differences between the two groups of states in their initial prevalence of breastfeeding in the hospital, but both sets of states exhibit the same general time trend. The absolute gap between the two groups remains approximately constant at 16 to 17 percentage points. A difference-in-difference strategy compares the differences in the later years to the differences in the early years to obtain an estimate of the impact of the policies. Such a comparison implies that welfare policies had little impact on breastfeeding in the hospital, which is consistent with there being no anticipatory effects.

Turning to the results for breastfeeding at six months (Figure 2), the results look much different. The states that adopted a stringent work policy did not experience the increase in breastfeeding that was enjoyed by those states that did not adopt a strict policy. A difference-in-different estimate would suggest the policy caused the gap to grow by roughly 3 percentage points (i.e., evaluated at the average of the three years before versus after reform).

Regression Analysis

We extend this basic difference-in-difference approach using a regression analysis. The extension will allow us to include other time-varying factors that may influence the breastfeeding rate and pool the various years and policy choices across states.

Specifically, consider the following regression model,

$$Y_{st} = \alpha + \beta_1 Policy_{st} + \beta_2 X_{st} + \gamma_s + \lambda_t + \varepsilon_{st} \qquad (1)$$

The dependent variable Y_{st} is the proportion of new mothers that breastfeed in state *s* in year *t* and $Policy_{st}$ is a vector of the seven policy indicators described in Table 2, with the "no work/-/no sanctions" category being the excluded group. Importantly, the basic model also includes state and year fixed effects to mimic the difference-in-difference approach described with the graphical analysis. The state fixed effects (γ_s) control for factors that are fixed within a state over time such as the racial/ethnic, education, and income distributions of a state. The year fixed effects (λ_t) capture the effects of factors that are common across all states but change over time, such as information regarding the benefits of breastfeeding. Thus, the coefficient β_1 represents the difference in the breastfeeding rate for mothers who live in states that implemented the given policies relative to mothers who live in states that retained the "no work/-/no sanctions" category. Implicitly, this formulation measures the mean impact of the policy change during the years following the change.

We estimate the basic model both with and without a series of controls (X_{st}) to capture other factors that could potentially confound the results. Two of the control variables capture other aspects of welfare policy: an indicator that takes the value of one in states/years that a lifetime termination time limit is in effect and the (log of the) maximum cash benefit for a family of three. The inclusion of these factors is intended to capture the general character of welfare policy in a state, and thus ensure that the work-requirement variables are actually capturing the effects of the work requirement policies per se. We also include two indicator variables for whether the two major breastfeeding laws were in effect in the state in the given year. Finally, we include the state unemployment rate to capture cyclical changes in economic opportunities that may affect employment and, in turn, breastfeeding.

The analysis is conducted on two populations: all new mothers and new mothers who participate in WIC. We present results for all new mothers because they will provide population-level estimates that will be useful in assessing the total impact of the welfare law changes. Because many new mothers might not be affected by welfare policies, such estimates could hide large impacts on certain subgroups. Therefore, we also present results for new mothers who participate in WIC. WIC participants provide a useful sub-population that may be particularly affected by TANF policies because they are almost all low-income families. New WIC mothers must meet income and nutritional risk requirements to be eligible. The income threshold for WIC is 185% of the poverty line, and throughout the 1990s all AFDC/TANF recipients were income eligible for WIC.[13] Therefore, WIC is restricted to individuals who are relatively poor and are likely to be influenced by AFDC and TANF program rules. A second motivation for studying the WIC population is much more practical: breastfeeding prevalence for the WIC population is the only other aggregate tabulations available from the RLMS.

There is one potential drawback to focusing on WIC participants as a study population. WIC participation is a choice, and changes in who chooses to participate in WIC could potentially confound these results.[14] For example, if states that adopted relatively stringent work requirements also changed their WIC policies in a manner that affects who chooses to participate in WIC, then we would mistakenly attribute the change in who chooses to participate in WIC to being a welfare policy effect on breastfeeding. However, we believe such concerns to be relatively minor. First, as was observed in the graphical analysis, a comparison of in-hospital breastfeeding rates between the two groups of states suggests that the states experienced the same underlying trends. Second, we can compare the results for WIC mothers to all mothers as a further empirical check of whether the WIC results are driven by changes in participation; these

comparisons (reported in the next section) suggest that changing participation is not driving our results.

We note three final aspects about our regression analysis. First, we examine the impact of welfare reform on breastfeeding at two points after birth: in the hospital and when the infant is six months old. Again, based on previous research and the graphical analysis, we expect there to be little effect of the policies on breastfeeding in the hospital, indicating that anticipatory responses to the policies are small. Second, we weight all of our regressions (by the number of live births) because the RLMS survey sampled across states with equal probability, and thus the precision of the breastfeeding estimates varies by state.[15] Third, we report standard errors for all models that allow for an arbitrary correlation matrix within states (the so-called Huber-White sandwich estimator) because of changing sample size over time and the possibility of serially correlated errors within states.

REGRESSION RESULTS

The regression results for WIC participants are reported in Table 4. We begin with the models of breastfeeding in the hospital, which are reported in columns [1] and [2]; the models are identical except for the fact that model [2] is augmented with the control variables discussed in the previous section. Recall that we expect the policies to affect breastfeeding in the hospital only if there are anticipatory effects. We find no support for there being anticipatory effects for the stringent welfare policies. Model [2] suggests a puzzling result in that one policy variable has a positive and significant coefficient ("work/moderate hours/no sanctions"). This finding is hard to explain in the context of our conceptual framework and suggests that there might be an important omitted factor in our analysis. However, this estimate is small relative to the rate of

breastfeeding in the hospital (see the dependent variable mean in the table). We will return to the possibility that there might be an important omitted factor in the next subsection.

Turning to the analyses of breastfeeding six months after birth, the coefficients tell a consistent story and imply large impacts of work-related welfare requirements. Concentrating on the model that includes the controls (column [4]), the policy coefficient that implies the largest effect is the one for the most stringent work requirements ("work/high hours/sanctions"). This coefficient implies that stringent work requirements reduce the breastfeeding prevalence by 3.1 percentage points relative to the status quo of "no work/-/no sanctions." Given that the overall breastfeeding prevalence is 14.0% among WIC mothers six months after birth, this represents a reduction of approximately 22%. The two policies that have the next largest effects are the policies that require work and are enforced by sanctions: "work/moderate hours/sanctions" has a coefficient of –0.028 and "work/no hours/sanctions" has a coefficient of –0.023.[16]

The results for all mothers, presented in Table 5, mirror those for WIC mothers. There is no support for the claim that the anticipation of binding work requirements several months after birth impact breastfeeding rates in the hospital. For the results six months after birth, a consistent story emerges again. The policy coefficients imply that there is a large and significant reduction of breastfeeding in states that adopt the most stringent welfare policy; the decline in states adopting the "work/high hours/sanctions" policies is 2.1 percentage points and the decline in states adopting the "work/moderate hours/sanctions" policies is 1.7 percentage points.

When interpreting these magnitudes, it is important to note that breastfeeding is much more common among all new mothers than among WIC mothers, with rates of 23% and 14% six months after birth, respectively. Therefore, although the effects of strong work policies are only 1.0 percentage points higher for WIC mothers (3.1 percentage points) than all mothers (2.1

percentage points), this translates into a much larger percent change among WIC mothers: 22% (3.1/14.0) versus 9% (2.1/23.0).

The relative size of the effects for WIC mothers versus all mothers is consistent with their representation in the population. Specifically, we estimate that the effect of adopting the most stringent welfare policy amounts to a reduction in breastfeeding by 3.1 percentage points among WIC mothers (column [4] from Table 4), and suppose we assume that the effect of the policy is zero among non-WIC mothers.[17] Analysis of the RLMS shows that roughly 45% of all new mothers are enrolled in WIC. Therefore, we would expect to find the effect among all new mothers to be roughly 45% of the size of the effect among WIC mothers. We find that the ratio of estimated effects is somewhat larger at 68% (i.e., -0.021 relative to -0.031).

Sensitivity Analysis

As a check of the robustness of our results, we estimate an additional specification that controls much more flexibly for differences across states. In particular, the fixed-effects specification estimated thus far effectively controls for any factors that are constant over time within a state and any factors that change systematically over time across all states. However, suppose that there were state-specific temporal changes that were correlated with the law changes. For example, it is possible that states that increasingly placed greater emphasis on breastfeeding or passed WIC polices to encourage breastfeeding also adopted less-stringent welfare reforms. Any such changes would confound our estimation strategy given that we account only for fixed state and year effects.

To control more generally for secular changes within states, we estimate models that include the breastfeeding rate *in the hospital* as a control in regressions that use the six-month breastfeeding rate as the dependent variable. We interpret the inclusion of the in-hospital rate as

controlling for any state-specific factors that generally affect the propensity of mothers to begin to breastfeed; this would include other policy changes and public health initiatives, for example. Thus, such a strategy provides for a significantly more flexible control for state-specific secular changes. However, such a strategy necessarily ignores any effects of the work policies on breastfeeding in the hospital (i.e., anticipatory effects), but our estimates in Table 4 and 5 imply that these effects are small.

We present these estimates for WIC mothers in column [5] in Table 4 and for all mothers in column [5] in Table 5. In both models the effects of policy are essentially unchanged, and our basic finding still holds: stringent work requirements for new mothers reduce the prevalence of breastfeeding.

How Much Lower was National Breastfeeding Because of Welfare Reform?

The central question of interest is the extent to which welfare reform caused reductions in breastfeeding. To provide a comprehensive answer to this question, we use the estimates of the effects of welfare work policies for all mothers six months after birth and compute what the breastfeeding prevalence would have been if the welfare work requirements were not adopted. The change in breastfeeding caused by the change in policy between 1995 (before PRWORA) and 2000 (the most recent year of available data) is calculated as,

$$\Delta_{policy} = \beta_1 (Policy_{'00} - Policy_{'95}) . \quad (2)$$

The estimates of β_1 are reported in column [5] of Table 5. $Policy_t$ is a vector of the proportion of live births in year *t* that are born under each of the policy regimes; these proportions were reported in the bottom panel of Table 3.

Equation [2] implies that the national breastfeeding rate six months after birth is 1.2 percentage points lower in 2000 than it would have been if PRWORA welfare work policies for

new mothers had not been implemented. Prior to reforms in 1996, 21.6% of mothers breastfed when their child was six months old (Table 1). Therefore, welfare reform caused breastfeeding to decline by 5.5%.

Although the measured effect is moderate from an aggregate perspective, it implies that the policy impact is sizeable, but plausible, among those mothers likely to be effected by the change. Sixty percent of live births in 2000 were in states that had adopted work requirements with strict sanctions (Table 3, last row). Forty-six percent of infants in these states are enrolled in WIC,[18] and just prior to reform roughly 13% of new WIC mothers breastfed six months after birth (Table 1). Using the 2000 Current Population Survey Food Security Supplement, we estimate that 73.5% of WIC female participants with a child under one do not work full time (i.e., at least 35 hours per week). Therefore, the share of live births in the nation at risk of being affected by the policy change is roughly 2.64% (i.e., 0.60x0.46x0.13x0.735).[19] With an estimated effect of 1.2 percentage points, this means that among new mothers who were breastfeeding, not working full time, and were living in the states that adopted the strict sanction policies, roughly half (1.2/2.64) of them changed their breastfeeding practices because of the policies.

DISCUSSION AND CONCLUSION

Previous research has suggested that employment can negatively impact the breastfeeding rate of women with infants. We examine whether the recent welfare reforms that require work among women with infants have affected the prevalence of breastfeeding. We find that these work requirements substantially and statistically significantly reduce breastfeeding. Our preferred estimates imply that for women on WIC, which is a group of new mothers that is at substantial risk of entering welfare, the most stringent laws reduce breastfeeding by 22% relative to imposing no work requirements on new mothers. The second most stringent laws reduce

breastfeeding by about 20% relative to imposing no work requirements. The estimates for all mothers, not just those participating in WIC, imply that if welfare reform had not been adopted, national breastfeeding rates six months after birth would have been 5.5% higher than they are today.

These findings are particularly important given the substantial evidence documenting the benefits of breastfeeding for children and their mothers. However, the costs of the decrease in breastfeeding accrue not only to recipients and their children but also to society as a whole. Recent studies have shown that breastfeeding decreases health care costs as well as increases the productivity of working mothers through decreases in absenteeism at work (Montgomery and Splett 1997; Tuttle and Dewey 1996). Because the women who are most at risk of being adversely affected by these policies are poor, it is possible that a greater financial burden will be placed on Medicaid.

There is political and popular support for policies that encourage welfare recipients to work, and these policies have been applied to mothers whose children are just a few months old. Our results suggest that these policies could impose a significant cost on infants and their mothers by reducing the prevalence of breastfeeding. This cost must be weighed against the potential benefits associated with the rise in employment. However, the vast majority of the harmful effects on breastfeeding would be eliminated if mothers of infants did not face the combined policies of (full-family) sanctions and work requirements of more than 18 hours per week, requirements that are currently in place in 28 states.

[1] Two exceptions are Paxson and Waldfogel (2003) who examine child abuse and neglect and Meyer and Sullivan (2001) who examine consumption.

[2] Some exceptions include CEA (1999), Grogger (Forthcoming), Rector and Youssef (1999), and Ziliak et al. (2000).

[3] The RLMS data are used by the National Institute of Health to monitor the *Healthy People 2010* objective to increase U.S. national breastfeeding rates. See Grummer-Strawn and Li (2000) for a review of the available data on breastfeeding.

[4] Starting in 1997, Ross Laboratories mailed their survey to mothers with infants one month of age, two months of age, three months of age, etc., up to twelve months of age. In earlier years, surveys were mailed to mothers when their infants were six or twelve months of age. Respondents were asked to recall the type of milk fed to their infants immediately after birth, in the hospital, and during each of the first 12 months of life. The one complication that this change in design causes is that sample sizes are smaller in later years, implying that the aggregate data are heteroskedastic over time.

[5] We obtained these data from the Urban Institute website (www.urban.org) during January 2003.

[6] We obtained these data from the SPDP website (www.spdp.org) during September 2001. In results not reported here, we re-estimated all of the models presented in the paper using the SPDP data for hour requirements and the results are quantitatively unchanged. For example, we report in a later section that the breastfeeding rate would have been 5.5% higher if it were not for welfare reform. Relying on the SPDP hours data instead of the WRD hours data, the comparable number is 5.6%.

[7] For example, several states do not allow exemptions to apply to "capped" children, i.e., children born or conceived while the mother was already on welfare. In addition, some states based exemption criteria on the mother's characteristics (e.g., age and education). See Rowe (2000) and the Welfare Rules Database.

[8] Given this classification, it is possible that a sufficiently long exemption for new welfare entrants could keep a mother with a young child from having to work, despite there not being a young-child work exemption in the state. However, no state has implemented a long initial exemption in conjunction with a short child exemption; thus, such concerns are not empirically relevant.

[9] We attempted to separate states that would always require a mother to work versus those that sometimes require a mother to work. The results (not reported here) proved to be very noisy, which is not surprising given that we had 14 policy categories rather than the current eight policy categories.

[10] We obtained these data from the La Leche League website (www.lalecheleague.org) during September 2001.

[11] We obtained these data from the National Center for Health Statistics website (www.cdc.gov/nchs/births.htm) during November 2001.

[12] The three states that remained in the "no work/-/no sanctions" category do not have a date of implementation since their policy did not change during the period. For these states a "date of implementation" is assigned by randomly selecting (with equal probability) one of the 28 states in the "stringent policy" category to provide an implementation date. In addition, one of the states in the stringent policy category (Wisconsin) adopted its policy in 1998, and thus the

breastfeeding prevalence three years after the policy is not observed in our data; we simply compute the prevalence among the observed states for this entry. When we produce the same figure (not shown here) but exclude Wisconsin from every year, the figure is essentially unchanged.

[13] An exception to the 185% cut-off is that Medicaid recipients are adjunctively eligible for WIC, and some states have Medicaid cut-offs that are above 185% of the poverty line.

[14] Several studies examine whether WIC rules affect breastfeeding behavior directly. To the extent any such effects are constant over time, then our difference-in-difference estimation strategy should still identify the true impact of welfare policy changes on breastfeeding. There were WIC policy changes that were intended to directly change the impact of WIC on breastfeeding behavior; however, these WIC policies were enacted before 1994 and thus should not be correlated with the welfare policy changes we analyze. See Chatterji et al. (2002) and the cites therein about the various WIC policy changes.

[15] Alan Ryan graciously provided the sample sizes by state for 1999, and from these data, it appears that the survey is based on a simple probability sample. However, because sample sizes were not available for all years, we could not use this information directly.

[16] The category "no work/-/sanctions" has a coefficient of –0.020; states that adopted these policies have an odd combination of tough sanctions policies but yet no work requirement for mothers with children six months old. Although 13 states implemented these policies at some point during the 1990s, only two states still had the policies in effect in 2000. Therefore, virtually all states implemented these policies for a short period of time. These complexities make it difficult to interpret the effects of this policy category.

[17] We cannot test this hypothesis because estimates of breastfeeding among mothers who are not enrolled in WIC are not available.

[18] We calculated WIC participation among infants in states with full-family sanction policies using estimates of the number of live births from the *National Vital Statistics Reports* (downloaded from the NCHS website, www.cdc.gov/nchs/births.htm, in August 2002) and number of infants participating in WIC (Bartlett et al. 2002) in each state in 2000.

[19] This calculation assumes that the proportion working full time does not differ between breastfeeding and non-breastfeeding women. If we assume that this difference is maximal, i.e., that 100% of breastfeeding women do not work full time, then the proportion at risk is slightly higher at 3.59 (0.60x0.46x0.13x1.0).

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Table 1. Breastfeeding Prevalence, by Year and Category

	New WIC Mothers		All New Mothers	
Year	In the Hospital	Six Months After Birth	In the Hospital	Six Months After Birth
1990	0.353	0.086	0.518	0.178
1991	0.385	0.095	0.536	0.183
1992	0.403	0.106	0.545	0.190
1993	0.431	0.114	0.562	0.191
1994	0.456	0.122	0.576	0.198
1995	0.477	0.131	0.597	0.216
1996	0.475	0.133	0.592	0.216
1997	0.511	0.170	0.623	0.259
1998	0.531	0.189	0.642	0.285
1999	0.565	0.198	0.671	0.306
2000	0.573	0.203	0.683	0.313

Note: These tabulations are based on state-level aggregate breastfeeding rates, weighted by the number of live births in the state/year.

Table 2. Categorization of State Welfare Policies

Category (Most Stringent to Least Stringent)	Welfare Policies		
	Any work Requirements for Mothers of 6 Month Old?[a]	Hour Requirements[b]	Full-family Sanction?
1. Work/high hours/sanctions	Yes	32-40	Yes
2. Work/moderate hours/sanctions	Yes	18-30 hours	Yes
3. Work/no hours/sanctions	Yes	0 hours	Yes
4. Work/high hours/no sanctions	Yes	32-40	No
5. Work/moderate hours/no sanctions	Yes	18-30 hours	No
6. Work/no hours/no sanctions	Yes	0 hours	No
7. No work/-/sanctions	No	Not applicable	Yes
8. No work/-/no sanctions	No	Not applicable	No

[a]Work requirements for new mothers are defined as policies that require mothers to return to work within the first six months of having a child.
[b]These groups are exhaustive as no state has hour requirements of 1-17 or 31 hours.

Table 3. Number of States and Proportion of Live Births by Policy Category and Year

	Work-related Welfare Policy Categories								Passed Breastfeeding Laws	
Work?	Yes	Yes	Yes	Yes	Yes	Yes	No	No		
Hours	High	Mod.	None	High	Mod.	None	N/A	N/A		
Sanctions?	Yes	Yes	Yes	No	No	No	Yes	No	Public	Emp.
Number of States										
1990	0	0	0	0	0	0	0	51	1	0
1991	0	0	0	0	0	0	0	51	1	0
1992	0	0	0	0	0	0	0	51	1	0
1993	0	0	0	0	0	0	0	51	3	0
1994	0	0	0	0	0	0	2	49	5	1
1995	0	0	0	0	0	0	3	48	10	2
1996	0	0	2	0	0	2	8	39	10	2
1997	5	17	6	0	9	0	6	8	15	3
1998	5	24	6	0	11	0	2	3	17	4
1999	4	24	7	0	11	0	2	3	26	7
2000	4	24	7	0	11	0	2	3	26	7
Proportion of Live Births										
1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.07	0.00
1991	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.07	0.00
1992	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.07	0.00
1993	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.14	0.00
1994	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.99	0.20	0.05
1995	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.95	0.37	0.12
1996	0.00	0.00	0.03	0.00	0.00	0.01	0.16	0.80	0.37	0.13
1997	0.08	0.33	0.11	0.00	0.17	0.00	0.04	0.27	0.56	0.14
1998	0.10	0.38	0.11	0.00	0.25	0.00	0.02	0.14	0.57	0.27
1999	0.09	0.38	0.13	0.00	0.25	0.00	0.02	0.14	0.66	0.33
2000	0.09	0.38	0.13	0.00	0.25	0.00	0.02	0.14	0.66	0.34

Note: See Table 2 for further details regarding the welfare policy categorizations.

Table 4. Regression Models: New WIC Mothers

	In Hospital		Six Months After Birth		
Variable	[1]	[2]	[3]	[4]	[5]
Work req./hour req. /sanction policy					
Work /high hours/sanctions	-0.004	0.006	-0.037**	-0.031**	-0.032**
	(0.015)	(0.011)	(0.016)	(0.014)	(0.013)
Work/moderate hours/sanctions	-0.003	0.007	-0.034**	-0.028***	-0.030***
	(0.008)	(0.007)	(0.015)	(0.010)	(0.010)
Work/no hours/sanctions	-0.011	0.002	-0.029	-0.023	-0.024*
	(0.011)	(0.011)	(0.017)	(0.014)	(0.014)
Work/high hours/no sanctions	-	-	-	-	-
	-	-	-	-	-
Work/moderate hours/no sanctions	0.007	0.015**	-0.008	-0.004	-0.008
	(0.007)	(0.006)	(0.017)	(0.014)	(0.014)
Work/no hours/no sanctions	0.001	0.004	-0.007	-0.006	-0.006
	(0.003)	(0.004)	(0.005)	(0.005)	(0.005)
No work/-/sanctions	-0.017**	-0.014	-0.020	-0.020*	-0.016*
	(0.008)	(0.010)	(0.012)	(0.011)	(0.010)
Unemployment rate		-0.019		0.082	0.086
		(0.185)		(0.288)	(0.284)
Maximum benefits (log)		-0.069**		-0.080**	-0.063*
		(0.028)		(0.038)	(0.036)
Time limit		0.003		0.014*	0.013*
		(0.007)		(0.007)	(0.008)
Public law		0.011**		-0.001	-0.004
		(0.005)		(0.006)	(0.006)
Employment law		0.004		0.006	0.005
		(0.007)		(0.009)	(0.009)
In-hospital breastfeeding rate					0.243***
					(0.072)
Mean of dependent variable	0.468	0.468	0.140	0.140	0.140
Observations	561	561	561	561	561

Notes: All models include state and year effects. Adjusted standard errors in parentheses. Reference category is "no work/-/no sanctions." No state is categorized as "work/high hours/no sanctions."

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

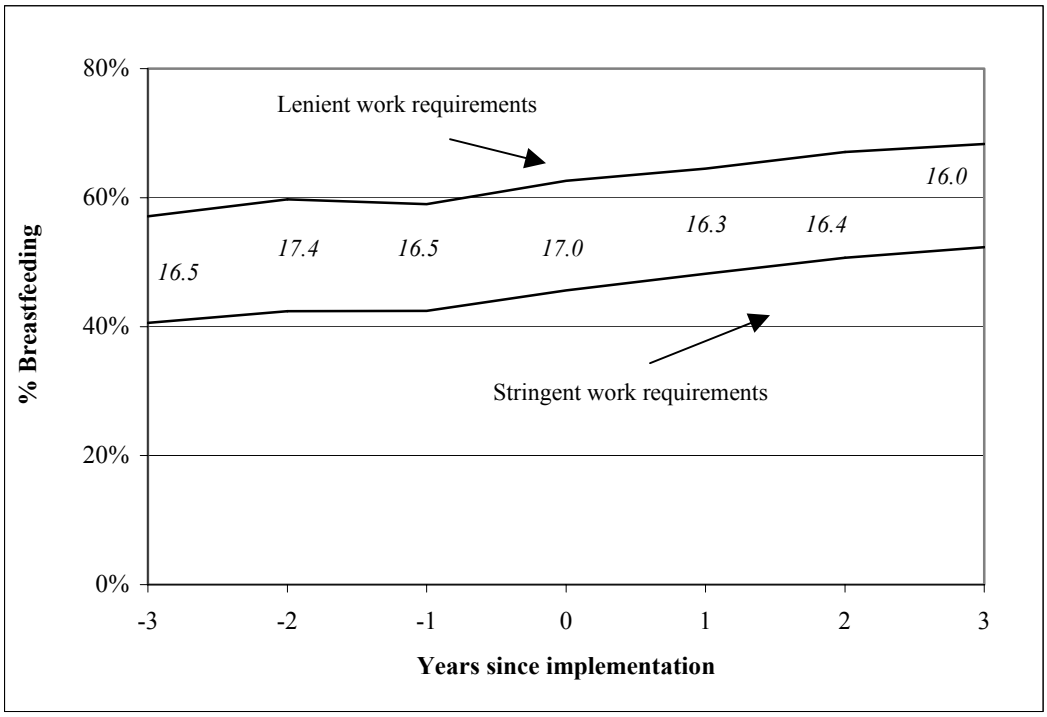
Table 5. Regression Models: All New Mothers

	In Hospital		Six Months After Birth		
Variable	[1]	[2]	[3]	[4]	[5]
Work req./hour req. /sanction policy					
Work /high hours/sanctions	0.004	0.004	-0.025***	-0.021***	-0.022***
	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)
Work/moderate hours/sanctions	0.014***	0.014**	-0.022***	-0.017***	-0.020***
	(0.005)	(0.006)	(0.007)	(0.006)	(0.006)
Work/no hours/sanctions	0.002	0.002	-0.020*	-0.014	-0.014
	(0.007)	(0.008)	(0.011)	(0.011)	(0.011)
Work/high hours/no sanctions	-	-	-	-	-
	-	-	-	-	-
Work/moderate hours/no sanctions	0.016*	0.016***	-0.004	-0.001	-0.004
	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)
Work/no hours/no sanctions	0.008	0.008	-0.001	0.001	-0.001
	(0.005)	(0.005)	(0.003)	(0.003)	(0.004)
No work/-/sanctions	-0.003	-0.003	-0.015*	-0.014*	-0.013*
	(0.004)	(0.006)	(0.009)	(0.007)	(0.007)
Unemployment rate		-0.094		0.110	0.127
		(0.145)		(0.161)	(0.163)
Maximum benefits (log)		0.013		-0.038*	-0.041*
		(0.024)		(0.022)	(0.024)
Time limit		-0.004		0.003	0.004
		(0.006)		(0.004)	(0.005)
Public law		0.002		0.005	0.005
		(0.004)		(0.004)	(0.004)
Employment law		-0.002		0.001	0.001
		(0.006)		(0.005)	(0.006)
In-hospital breastfeeding rate					0.173*
					(0.089)
Mean of dependent variable	0.594	0.594	0.230	0.230	0.230
Observations	561	561	561	561	561

Notes: All models include state and year effects. Adjusted standard errors in parentheses. Reference category is "no work/-/no sanctions." No state is categorized as "work/high hours/no sanctions."

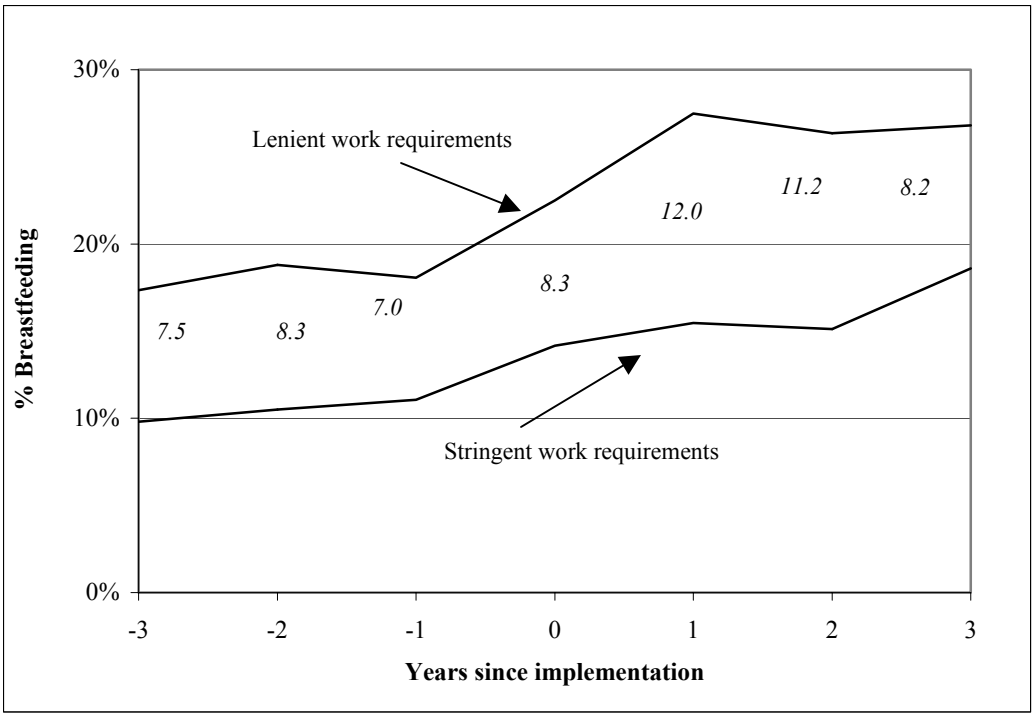
* significant at 10%; ** significant at 5%; *** significant at 1%

Figure 1. Breastfeeding Rate for New WIC Mothers in the Hospital
by Broad Welfare Policy Category
(Difference Between Groups in Each Year Reported in Italics)



Notes: Tabulations are based on state-level prevalence rates from the RLMS. Prevalence rates are weighted by number of live births in the given state/year. States are classified with respect to their policy regime in 2000. Lenient work requirement states are states whose 2000 policy places them in the "no work/-/no sanctions" or "no work/-/sanctions" category in Table 2. Stringent work requirement states are states whose 2000 policy places them in either the "work/high hours/sanctions" or "work/moderate hours/sanctions" categories.

Figure 2. Breastfeeding Rate for New WIC Mothers at Six Months
by Broad Welfare Policy Category
(Difference Between Groups in Each Year Reported in Italics)



Notes: Tabulations are based on state-level prevalence rates from the RLMS. Prevalence rates are weighted by number of live births in the given state/year. States are classified with respect to their policy regime in 2000. Lenient work requirement states are states whose 2000 policy places them in the "no work/-/no sanctions" or "no work/-/sanctions" category in Table 2. Stringent work requirement states are states whose 2000 policy places them in either the "work/high hours/sanctions" or "work/moderate hours/sanctions" categories.