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Do Child Development Accounts Promote Account Holding, Saving, and Asset Accumulation for Children's Future?

Evidence from a Statewide Randomized Experiment

Yunju Nam

University at Buffalo, State University of New York

Youngmi Kim

Virginia Commonwealth University

Margaret Clancy

Center for Social Development

Robert Zager

Center for Social Development

Michael Sherraden

Center for Social Development

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Do Child Development Accounts Promote Account Holding, Saving, and Asset Accumulation for Children's Future?: Evidence from a Statewide Randomized Experiment

This study examines the impacts of Child Development Accounts (CDAs) on account holding, saving, and asset accumulation for children, using data from the SEED for Oklahoma Kids experiment (SEED OK). SEED OK, a policy test of universal and progressive CDAs, provides a 529 college savings plan account to every infant in the treatment group with automatic account opening and an initial deposit. SEED OK also encourages treatment participants to open their own 529 accounts with an account opening incentive and a savings match. Using a sample of infants randomly selected from birth records (N=2,670) and randomly assigned to treatment and control groups, this study runs probit and OLS regressions. Analyses show significant differences between treatment and control groups in all outcome measures in the targeted accounts. Nearly 100 percent of the treatment group accepted the automatically-opened state-owned account. Compared to 1 percent of the control group, 16 percent of the treatment group hold a participant-owned account. On average, the treatment group has saved significantly larger amounts in participant-owned accounts, although a difference in savings amount is modest between the two groups (\$47 vs. \$13). A difference in total 529 assets of \$1,040 is estimated between the treatment and control groups. These early findings from SEED OK suggest that CDAs have positive effects on savings and asset accumulation for children's future development. Further research is required to test long-term cost effectiveness of CDAs.

Key words: *College Savings; Social Experiment; Automatic Enrollment; Asset-building; Wealth*

Account holding and assets accumulated for college education may promote long-term socioeconomic development of young people through multiple pathways. Empirical evidence suggests that household assets, especially financial assets, have a positive association with children's educational attainment and other developmental outcomes (Conley, 2001; Lerman & McKernan, 2008; Nam, Huang, & Sherraden, 2008). Most obviously, college savings can help pay for postsecondary education. College savings may motivate young people to study hard and prepare for college by increasing their confidence in financing higher education. Savings for college may teach young people about financial management and nurture future orientation (Nam, Huang, & Sherraden, 2008; Shapiro, 2001; Sherraden, 1991). Despite the potential benefits of asset holding, many families have little savings, especially families headed by members of racial and ethnic minority groups and individuals with low levels of education. The median value of financial assets of families led by nonwhites is \$9,000 (Bucks et al., 2009), less than the average cost of one year at a public four-year university (National Center for Education Statistics, 2009). The level of asset ownership of non-high-school graduates is even lower, with median financial assets of \$3,000 (Bucks et al., 2009).

A low level of savings among families in general, and among vulnerable populations in particular, suggests inadequate institutional supports for asset accumulation for long-term development. Although individual characteristics (e.g., education) and behaviors (e.g., financial management practices) are closely related to saving and asset accumulation, institutional constructs, such as access, incentives, and information also shape individuals' saving behavior and outcomes (Beverly, 1999; Beverly et al., 2008). In addition, recent empirical evidence shows that low-income families can save in structured and subsidized accounts, though saving remains difficult (Duflo et al., 2006; Schreiner & Sherraden, 2007; Sherraden, 2001; Sherraden & McBride, 2010).

Recognizing both the role of institutional supports (e.g., asset-building policies for children) and the difficulties associated with saving, several countries, including Canada, Singapore, South Korea, and the United Kingdom, have adopted Child Development Accounts (CDAs). CDAs are savings accounts for children that provide a structured opportunity to save and accumulate assets by providing access, information, and incentives (Cramer & Newville, 2009; Sherraden, 1991). Some of these policies—for example in Singapore and the United Kingdom—have implemented a structure that provides an initial deposit to CDAs (Loke & Sherraden, 2009).¹ By design, many CDA policies are paternalistic, with initial deposits, matching deposits, and restrictions on withdrawals and use of funds. Interest in CDAs has grown also in the United States, as shown by legislative discussion of several bills at the federal level: the America Saving for Personal Investment, Retirement, and Education (ASPIRE) Act, 401Kids Accounts, and Baby Bonds (Cramer & Newville, 2009).

Despite increasing interest, we know little about asset-building programs for children's long-term development. Existing studies have focused mainly on asset-building programs for adults, e.g., retirement savings programs—such as 401(k)s and Individual Retirement Accounts (IRAs)—and Individual Development Accounts (IDAs) for low-income adults (Choi, Laibson, & Madrian, 2004; Engelhardt & Kumar, 2007; Madrian & Shea, 2001; Nam, McKernan, & Ratcliffe, 2008; Poterba, Venti, & Wise 1995; Schreiner & Sherraden, 2007). Since savings goals for adults are likely different from those for children, previous studies are limited in informing us about CDAs. A small number of empirical studies of CDAs rely mostly on observational data collected on program participants (Le Grand, 2009/10; Mason et al., 2010; Nam & Han, 2010). Without comparable control groups, these studies are unable to establish causality since they cannot rule out the possibility that positive savings outcomes in these programs may have been caused by factors other than CDAs (Orr, 1999).

This study investigates the impacts of a CDA program on savings outcomes, using data from SEED for Oklahoma Kids (SEED OK). SEED OK is a policy test of a universal and progressive CDA. SEED OK is *universal* in that it opens a savings account on behalf of every infant in the treatment group, and is *progressive* in that it offers additional incentives to infants from low- and moderate-income families. In terms of study design, SEED OK is a social experiment using a probability sample. The sampling frame is birth records of every infant born in Oklahoma during certain periods in 2007. Following the baseline survey, the sample was randomly assigned into a treatment and a control group, thus creating an ideal condition for estimating intervention effects and establishing causality. Since random assignment generates a control group that can be expected to be equivalent to the treatment group except for access to the treatment (saving incentives and

¹ In Singapore's Baby Bonus program, the initial deposit ranges from US\$3,000 to 6,000, more than US\$2,000 to 4,000. In the United Kingdom, the Child Trust Fund from 2005 through 2010 had an initial deposit of £250 to 500, or over US\$300 to 600.

information in our study) and sampling variability (Orr, 1999), differences in savings outcomes between the two groups can be attributed to SEED OK impacts.

Background

Despite increasing interest in asset-building policies, especially those for children's future (Cramer & Newville, 2009; National Governors Association, 1997; Sherraden, 1991), knowledge of effectiveness is far from conclusive. For example, we have not yet reached consensus on whether asset-building policies and programs increase savings among target populations (Duflo et al., 2006, 2007; Engen, Gale, & Scholz, 1996; Grinstein-Weiss, Zhan, & Sherraden, 2006; Mills et al., 2006; Poterba, Venti, & Wise, 1995, 1996; Schreiner & Sherraden, 2007). Researchers do not agree on the effectiveness even of retirement saving programs, which have been investigated more than other types of asset-building programs. Some researchers find that 401(k)s and IRAs are effective tools in promoting retirement savings because a substantial proportion of savings in these retirement accounts are net savings, not transferred from other types of assets (Poterba, Venti, & Wise, 1996, 1995), while others maintain that these programs influence only the allocation of savings and wealth but not the amount of total savings (Engen, Gale, & Scholz, 1996). Results on saving incentives for low- or moderate-income adults are also mixed. Using experimental data from the American Dream Demonstration (ADD), a matched saving program for low- and moderate-income adults, Mills and colleagues (2008) show that ADD moderately increased homeownership rates among renters, but did not have significant effects on other types of assets and net worth. Duflo and her colleagues (2006) tested a saving match program in an experiment at H&R Block's tax preparers' offices. Their findings demonstrate that the offer of a savings match significantly and substantively increased low-income tax filers' enrollment rates and contribution amounts to IRAs. In comparison with the H&R Block saving match program, the federal Savers' Credit retirement savings incentive is estimated to have much smaller effects on IRA contributions, although it provides the same level of economic benefits in the form of a tax credit (Duflo et al., 2007). The differing effects of H&R Block's savings match program and the Savers' Credit tax incentive suggest that not only the amount of incentive, but also the form of incentive, influences saving programs' impacts on a target population's savings (Duflo et al., 2006, 2007).

Invaluable as it is, empirical evidence on adults' saving and asset-building programs is limited in helping us understand CDAs. First, savings goals are different: Adult saving programs promote savings for retirement, homeownership, or small business start-up, while CDAs encourage mostly education. Second, the beneficiaries of savings programs are usually identical to savers in adults' programs but this is not always true of CDAs, especially in cases where very young children are the beneficiaries.

Few existing empirical studies have examined the effects of CDAs on savings and asset accumulation for children's future. According to Dynarski (2004), tax-based college saving accounts, such as 529 college savings plans and Coverdell programs, rarely benefit low-income families since these families' economic gain from tax deductions is small or nonexistent, and savings in these accounts could possibly reduce college financial aid. As a result, economically and socially advantaged groups are more likely to save in these programs than those in disadvantaged groups, as reflected by higher median income and net worth and a higher percentage of college-educated parents among participants (Dynarski, 2004).

Universal or progressive CDA programs seem to be more effective in helping a wider range of families than tax-based programs. For example, after the United Kingdom implemented the Child Trust Fund (CTF) and offered saving vouchers to every infant born after August 31, 2002, the average monthly saving amount for children rose from £15 to £24 (or \$23 to \$36) (Le Grand, 2009/10). Another study also estimated that the CTF increases savings for children, especially for those who would have no or very low levels of assets in the absence of the policy, although its impact on net household saving may be negligible (Jacobson, 2010). Similarly, in Korea's Child Development Account program for children in the child welfare system, savings increased for the majority of CDA participants after the implementation of the program (Nam & Han, 2010). Although participants' own saving amounts are moderate—an average of \$30 per quarter—a CDA program in the United States has helped children from low- and moderate-income families accumulate substantial amounts in their accounts (an average of \$1,518) by encouraging them to save and depositing saving incentives into their accounts (Mason et al., 2010).

A few studies examine effects of specific program features on savings outcomes. Automatic account opening is consistently estimated to be effective in promoting enrollment in savings programs. Automatic account opening is a tool for overcoming inertia by opening accounts for eligible individuals without requiring them to initiate account-opening procedures. Automatic—or default—account opening still allows participants to opt out of a program by requesting account closure or non-opening. Participation rates in 401(k) plans are substantially higher in programs with automatic account opening compared to those requiring sign-up (Choi, Laibson, & Madrian, 2004). Moreover, positive effects of automatic account opening are most evident among those who are traditionally low savers: younger employees, lower-paid employees, and African-Americans and Hispanics (Choi, Laibson, & Madrian, 2004; Madrian & Shea, 2001). Automatic account opening, however, does not necessarily increase saving amounts. The level of deposits (contributions) is often lower in an automatic account opening plan than in an opt-in plan, especially when the default contribution rate is low (Choi, Laibson, & Madrian, 2004; Madrian & Shea, 2001).

A savings match is another program feature frequently used to promote savings. There is evidence that the availability of a savings match increases participation rates, especially among low-wage workers (Choi, Laibson, & Madrian, 2004; Huberman, Iyengar, & Jiang, 2007). However, it is not clear whether higher match rates raise saving amounts. Some studies find positive associations between match rates and saving amounts (Duflo et al., 2005), while others show no or even negative associations (Engelhardt & Kumar, 2007). In contrast, higher match limits (maximum amount of savings eligible for matches) are associated with higher savings amounts (Mason et al., 2010; Schreiner & Sherraden, 2007). For example, controlling for many individual and program features, one study estimates that every one dollar increase in the match limit in IDAs is associated with a more than 50 cent increase in IDA savings (Schreiner & Sherraden, 2007).

In this study, we examine the effects of a universal and progressive CDA policy test on account holding, individual savings, and total asset accumulation, using data from the SEED OK experiment. This study focuses on CDAs, while the majority of existing studies investigate asset-building programs for adults. This study differs from existing empirical studies on CDAs, which lack a control group and use data from a non-probability sample. The current study uses experimental data collected from a probability sample and, therefore, conducts more robust tests on the impacts of CDAs.

The SEED OK “Treatment”

The overall purpose of the SEED OK experiment is to test a universal and progressive policy of life-long asset building beginning at birth. The primary questions of interest are: (1) Can a universal policy of asset-building accounts be successfully put in place, i.e., can accounts be opened for and held by all or nearly all in the target population? (2) To what extent do individuals save in OK 529 accounts and how much? (3) How much assets accumulate in the accounts? (4) Do the accounts themselves and/or assets accumulated in the accounts affect attitudes and behaviors of parents, and later outcomes for children, especially cognitive, behavioral, and educational outcomes? These comprise the key policy questions in SEED OK.

The second question above, which asks about individual savings performance, is meaningful and is addressed in this paper, but it is not the sole rationale for the SEED OK experiment. Questions 1, 3, and 4 are also important for this policy test, because SEED OK is a test of a universal and progressive asset-building policy. That is to say, SEED OK is designed not only to estimate the impact of CDAs on individuals' savings performance but also to test overall impacts of CDAs on the target population, including attitudes and behaviors of parents and children. This paper focuses on the first three questions related to account holding, savings, and asset accumulation.²

SEED OK is a partnership among the State of Oklahoma (Treasurer's Office, Department of Health, Department of Human Services, Tax Commission, and Oklahoma College Savings Plan), the Center for Social Development (CSD), and RTI International (RTI). The SEED OK account structure uses the Oklahoma College Savings Plan, or OK 529, an existing state-sponsored 529 savings program that was created to help families save for postsecondary education. 529 plans provide tax incentives for college savings: Investments grow tax-free if used for qualified education expenses. In the OK 529 plan, contributions up to \$10,000 per year (or \$20,000 for couples filing jointly) are deductible on the state income tax return. Money in 529 accounts may be used at both in-state and out-of-state eligible educational institutions. Non-qualified withdrawals of investment earnings (but not contributions) are subject to federal and state taxes and an additional 10 percent federal tax (Oklahoma 529 College Savings Plan, n.d.).

In addition to the 529 plan tax incentives, SEED OK offers its own financial incentives. All treatment participants: 1) received \$1,000 in a state-owned OK 529 account for their child; 2) were encouraged to open their own (private, not state-owned) 529 account with the opportunity for a time-limited \$100 account-opening incentive;³ and 3) are offered a match to deposits made in their participant-owned accounts, if income-eligible. SEED OK provides a 1:1 savings match to treatment participants whose households' annual adjusted gross income (AGI) is below \$29,000 and a 0.5:1 match to those with an AGI from \$29,000 to \$43,499.

² Data related to the fourth question will be collected later in follow-up surveys in the SEED OK experiment.

³ The Oklahoma 529 plan, OCSP, requires a \$100 minimum initial contribution to open a new account. To remove any financial barriers to account opening, SEED OK deposited the required \$100 initial contribution for treatment participants who opened an account by April 15, 2009. In consideration of administrative delays, SEED OK deposited the \$100 incentive for all treatment participants who opened an OK 529 account by May 15, 2009. Treatment participants opening their account after that date must deposit the \$100 themselves.

Some observers might dismiss this experimental test as not meaningful because individuals did not actually save the \$1,000 seed deposit, but this interpretation would be too narrow. As stated above, the main purpose of SEED OK is a policy test for universal and progressive policy for account holding, long-term asset accumulation, and later developmental outcomes; it is not simply a test of individual savings performance.

The essence of the experimental test is to implement the treatment, and then test for the impacts of interest at a later point in time. In this regard, the presence of SEED OK funds *at a later point in time* is an impact of the experiment. This would be similar, for example, to offering a job as an employment strategy, then measuring jobs held at a later point in time. Nor is individual action or agency required for testing an experimental policy impact. Some policy interventions are quite paternalistic in the sense that institutions instead of individuals do most of the “behaving.” A test of a savings program with automatic enrollment can increase holding of accounts later (e.g., Madrian & Shea, 2001), even though individual choice is not fully responsible.

Other observers may ask whether a \$1,000 initial deposit is a realistic policy test, a good question. Several countries have Child Development Accounts with initial deposits (Loke & Sherraden, 2009). In the most generous case of Singapore, several thousand dollars are universally available at birth, and thousands more in saving matches in the early childhood years. The total amount of public funds available for each child in Singaporean CDAs exceeds \$30,000 (Loke & Sherraden, 2009). Singapore is the most generous CDA example, and we cannot predict what will happen in the United States, but CDA policy proposals have been introduced in the Congress that include initial deposits (Cramer and Newville, 2009).

The SEED OK policy test consists of automatic (or “default”) 529 account opening with an initial deposit, unless the participant actively opts out. Following random selection into the treatment group, the Oklahoma Treasurer’s Office communicated to treatment participants the details of the \$1,000 deposit for their child, the opportunity to open their own OK 529 account and save further, and information about how to take advantage of SEED OK savings incentives. As described above, SEED OK uses the Oklahoma 529 Plan as the vehicle for its accounts, so the standard 529 materials (e.g., account application and disclosure booklet) were provided to all SEED OK treatment participants.⁴ Each treatment child, as the account beneficiary, receives a quarterly statement showing the amount of money in the state-owned account. All communications specific to SEED OK supplement the standard 529 materials.

Prior to the account opening incentive deadline (April 2009), treatment participants received communications reminding them of the opportunity to open an account and receive the \$100 account opening incentive. In addition, treatment participants receive postcards and e-mails encouraging them to save, and periodic reminders that a state-owned 529 account has been set up for the benefit of their child. Communications also remind treatment participants about the savings match incentive, available through December 31, 2011, to encourage them to save for their child’s education. In order to calculate the match, treatment participants were asked to send a one-time Match Eligibility Form (MEF) that permits the Oklahoma Tax Commission to search their tax records annually to determine income eligibility for the savings match (Zager et al., 2010).

⁴ The OK 529 has a standard account application and disclosure booklet that provides legal details of the account for all account openers, whether or not they are SEED OK participants.

A universal CDA policy would ideally have a single account structure. If the policy vehicle is a college savings plan, there would be a single 529 plan account for each participant holding all deposits and earnings. However, as an artifact of the SEED OK experiment and the existing state policy structure, a single account structure was not possible.⁵ Accordingly, SEED OK has three different types of 529 accounts (Table 1): state-owned, participant-owned, and other private accounts. First, a state-owned account was automatically opened on behalf of every SEED OK treatment child, with an “opt-out” option. Therefore, every treatment child has a state-owned account unless his/her parents declined the offer by notifying the State of Oklahoma. This account holds SEED OK incentives that consist of a \$1,000 “seed” deposit and matches on individual savings in participant-owned accounts. State-owned accounts are available only to the treatment children because, by design, the control group does not receive SEED OK financial incentives. Because of the long time horizon (the children will be 18 years old or older when they use the funds), the 529 Balanced Option—a mix of stocks and bonds—was selected as the investment vehicle for money in the state-owned accounts.⁶ Each treatment child, as the account beneficiary, receives a quarterly statement showing how much money is in the state-owned account. Money in state-owned accounts can be used only for the child’s postsecondary education, and non-qualified withdrawals are not permitted. These withdrawal rules distinguish state-owned accounts from participant-owned and other private accounts where 529 plan withdrawal rules apply. As described above, money in participant-owned and other private accounts can be withdrawn for unqualified purpose although owners would pay a financial penalty (Zager et al., 2010).

Second, a participant-owned account is available to both treatment and control participants. SEED OK encouraged treatment participants to open a 529 account with a time-limited offer of a \$100 opening incentive, savings matches, and information on 529 accounts. In contrast, control participants were offered no SEED OK financial incentives or information about 529s, although they are free to open 529 accounts or any other savings account, the same as any individual not participating in the study. Participants who open their own 529 account can choose from a variety of investment options, including an equity fund, a bond fund, a balanced fund, a guaranteed option, and age-based funds. Owners of participant-owned accounts receive quarterly statements (Zager et al., 2010).

Third, other private 529 accounts can be opened for SEED OK children by individuals other than the study participants, such as other family members or friends. This type of account is available to both treatment and control groups. SEED OK does not provide any incentives or information specifically for owners of other private accounts in either group (Zager et al., 2010).

As stated above, the policy test conducted in SEED OK is the concept of a *single account*, as if the different 529 accounts were merged. Due to administrative constraints, separate accounts exist, but

⁵ SEED OK preferred to retain ownership of the initial deposit and matching funds. Therefore, these contributions were made in state-owned OK 529 accounts, with the child named as beneficiary. In this way, access to SEED OK incentives in state-owned accounts is restricted for the intended purpose of postsecondary education. In addition, separating deposits made by treatment participants from those made by the State of Oklahoma prevents the state-owned accounts from jeopardizing families’ eligibility for federal financial aid for college or other public benefits. If a CDA policy were available to all Oklahoma residents, the OK 529 plan structure could be changed to separate state-owned assets from deposits made by individual families via separate investment portfolios in a single account.

⁶ The value of the state-owned account rises and falls with the financial markets since it is invested in the Balanced Option. There is no guaranteed interest rate for this OK 529 investment option.

this is not the key point. The key point is that treatments in SEED OK receive automatic opening, deposits, and saving incentives, while controls do not, although controls can open a 529 account whenever they want, with no restrictions. This is the nature of the experimental test in SEED OK.

The impact test in this study is on account holding, individual savings, and asset accumulation *in 529 accounts*. We do not measure any asset reshuffling that may occur. At this stage in SEED OK, we do not have data on changes in other assets and liabilities in the household and, therefore, we are not able to conduct an impact test on net worth.

Table 1. SEED OK 529 Account Structure and Incentives by Treatment Status

	Treatment	Control
State-owned 529 Account	State-owned 529 account opened automatically for child with \$1,000 deposit.	No state-owned account for child.
	Savings into participant-owned 529 account is matched and deposited into state-owned account, if income-eligible.	
Participant-owned 529 Account	Participant-owned 529 account opening encouraged. Time-limited \$100 account-opening incentive offered.	529 account (or any other savings account) may be opened. No information or incentives offered. No savings match.
Other Private 529 Account	Anyone (e.g., family member or friend) may open other private accounts for child. No SEED OK financial incentives.	Anyone (e.g., family member or friend) may open other private accounts for child. No SEED OK financial incentives.

Methods

Data and sample

The SEED OK experiment sample consists of infants randomly selected from the birth records of all infants born in two three-month periods in 2007 (April through June and August through October).⁷ The SEED OK experiment oversampled three minority groups—African Americans, American Indians, and Hispanics—using a stratified random sampling method to ensure sufficient statistical power for separate analyses. By using birth records as the sampling frame, SEED OK was able to create a sample of potential study participants that is representative of the target population: infants born in Oklahoma.

⁷ The SEED OK experiment drew a second sample of infants among those born between August and October in 2007 because of a lower response rate from the first sample than expected.

The Oklahoma State Treasurer sent a letter that invited the primary caretakers (mostly mothers) of selected infants to participate in the SEED OK study. These letters were followed up on by the survey research firm. The invitation letter informed potential study participants (those selected for the study) that they had a 50–50 chance of receiving a 529 account with a \$1,000 seed deposit for the child if they participated in the study. SEED OK experiment participants who completed the baseline survey received \$40 for their time.

Among 7,328 infants selected from birth records, 213 cases were excluded because they were ineligible (e.g., due to the death of the infant or mother). Out of 7,115 eligible potential participants, caregivers of 2,704 infants agreed to participate in the study and completed telephone interviews, a response rate of 38 percent. Out of 2,704 completed interviews, 218 interviews were conducted in Spanish. The baseline survey was conducted from fall 2007 through spring 2008 (Marks, Rhodes, & Scheffler, 2008; Zager et al., 2010).

The study participation rate of 38 percent in SEED OK may seem low, but it was somewhat anticipated. To put this in context, survey participation rates have continuously declined for many decades. For example, the survey participation rate declined from 72 percent in 1979 to 48 percent in 2003 in the Survey of Consumer Attitudes (Curtin, Presser, & Singer 2005), and from 36 percent in 1997 to 25 percent in 2003 in Pew Research Center's national surveys using standard random digital dial method (Keeter et al., 2006). SEED OK study requirements may also have reduced the participation rate. Mothers were asked to provide their infant's Social Security Number (SSN),⁸ a requirement to open an OK 529 account. The survey research firm anticipated unwillingness by mothers to disclose the child's SSN, and therefore estimated a study participation rate of less than 50 percent. Moreover, reluctance to provide SSNs may have been compounded by public education broadcasts in Oklahoma during the take-up period for the study, warning people to protect their SSNs and other identifiers. Finally, it is plausible that the low participation rate was due to skepticism about features in SEED OK. For some parents, a 50 percent chance of receiving a \$1,000 deposit into their OK 529 account may have sounded too good to be true (Marks, Rhodes, & Scheffler, 2008; Zager et al., 2010).

Although the low participation rate was expected, it nonetheless raises questions about external validity of study findings. In this regard, we note that higher response rates may not guarantee lower bias. Efforts adopted to increase study participation rates (e.g., repeated contacts) may disproportionately increase responses among those with high propensities for survey response, while having no effects on those with low propensity (Groves 2006; Keeter et al., 2000, 2006). To estimate nonresponse bias, we compare study participants and non-participants on observed variables in birth records. Analysis results indicate that SEED OK study participants do not differ from non-participants in a statistically significant way for the following characteristics: infant's race and Hispanic origin, gender, and birth-weight; mother's marital status and metropolitan residency; and father's age. SEED OK participants' mean is significantly higher than non-participants at the 0.05 level for the following characteristics: mother's age (25.53 vs. 25.22 years), mother's education (12.53 vs. 12.22 years of schooling), and mother's nativity (87 vs. 84 percent of native-born mothers). Overall, participants and non-participants do not differ significantly on many characteristics, and

⁸ This is another challenge of running an experiment compared to initiating a full policy. In a universal CDA policy, asking for the child's SSN would not be an issue because the government could provide the SSNs and open accounts automatically.

even for characteristics with significant differences, gaps are not substantively large (less than one year of difference in mother's education and age, and a three percent-point difference in native-born mothers). Nevertheless, it is possible that participants systematically differ from non-participants in unobserved characteristics (i.e., information not included in birth records), and therefore caution is still appropriate regarding external validity of study results.

In analyses, we have used weighted data to adjust for study participation rates, as well as the oversampling of minority groups (Marks, Rhodes, & Scheffler, 2008). Weighting is a commonly used post-survey adjustment (Groves 2006).

Following the telephone baseline survey, SEED OK randomly assigned 1,358 study participants to the treatment group and 1,346 to the control group. After the random assignment, SEED OK provided financial incentives and sent information packages⁹ only to the treatment group. In this way, the SEED OK experiment aimed to generate a condition where variation in access to an intervention (SEED OK incentives and information, in this case) was the only systematic difference between the treatment and control groups. That is to say, random assignment in SEED OK created a treatment group equivalent to the control group in both observed and unobserved characteristics, except for sampling variability. As a result, differences in outcomes can be attributed to the intervention itself, not to individual, environmental, or other characteristics that may be associated with study participants (Manski & Garfinkel, 1992; Orr, 1999).

In assessing SEED OK's treatment impacts, this study uses data from three sources: 1) birth records; 2) a baseline survey; and 3) Oklahoma 529 account and savings records. First, birth record data contain demographic information collected at or shortly after the birth of an infant. Second, baseline survey data were collected by RTI through telephone interviews before random assignment placed participants into the treatment or control group, as described above. The baseline survey data include more detailed demographic, socioeconomic, and family characteristic information than the birth records. Third, account and savings data have been provided each quarter by the OK 529 plan program manager through an agreement with the OK 529 plan board. The account data contain detailed information such as account balance, quarter-to-date, year-to-date, and life-to-date deposits and withdrawals, and owner relationship to beneficiary for every OK 529 plan account that lists a SEED OK child as the beneficiary. This study uses account data collected for the first 18 months of SEED OK (from January 1, 2008 when SEED OK participants were first notified of their treatment status through June 30, 2009).

Among 2,704 study participants, the study excludes from analyses 22 participants who did not live in Oklahoma at the time of the baseline survey. Oklahoma residents potentially gain from the OK 529 plan through state income tax benefits, while non-residents may be better off investing in a 529 plan offered by their state of residency. Non-resident control group participants may have an incentive to invest in a 529 plan outside of Oklahoma, and treatment group participants, regardless of their state

⁹ The notification of treatment status was sent to stage one participants in January, 2008 and to stage two participants in May 2008. A packet containing information about the OK 529 plan and SEED OK financial incentives was sent to treatment participants at the time of the notification. Some stage one participants (95 in the treatment group and 91 in the control group) were notified of their treatment status at the same time as stage two participants. SEED OK information packages were provided in Spanish to participants who indicated in the survey that it was their primary language.

of residency, have financial incentives to open an OK 529 plan account. Thus, non-residents were excluded because including them in the analysis sample might overestimate SEED OK intervention effects.

In addition, the analysis sample excludes five study participants who are not parents of SEED OK children (grandparents or siblings of children), because the ability and willingness to save for SEED OK children may be different for non-parent guardians than for parents. The analysis sample also excludes seven cases with missing values for independent variables included in the analytical models described below. The final analysis sample consists of 2,670 cases.

Measures

The dependent variables include three types of savings outcomes: 529 account holding, individual 529 savings, and total 529 assets. We have information on OK 529 accounts only, not on other 529 accounts in other states that parents or others may have opened for infants. We assume that study participants are unlikely to hold 529 accounts administered by other states because the OK 529 provides tax advantages to Oklahoma state residents and we exclude non-Oklahoma residents from the sample.

The first savings outcome measure is 529 account holding. This is a dichotomous variable indicating whether an OK 529 account was held for a child as of June 30, 2009. We assigned the value of “1” to those with open accounts and “0” to others. Second, individual 529 savings is the net deposit (deposits minus withdrawals) made by individuals, such as mothers, fathers, other relatives, or friends of SEED OK children during the observation period (January 1, 2008 to June 30, 2009). This variable does not include SEED OK incentives. Third, total 529 assets is the net deposit to an account, including both SEED OK incentives and individual savings. SEED OK incentives consist of the \$1,000 seed deposit plus any saving matches deposited in the state-owned account and the \$100 account-opening incentive deposited into the participant-owned account. For the two continuous savings outcomes (individual 529 savings and total 529 assets), we created a logarithm of each measure for multivariate analyses. We assigned the value “1” to cases with a zero or negative value¹⁰ before conversion so that the log conversion would not generate missing values.

We created these three types of savings outcomes for each type of 529 account: state-owned, participant-owned, and other private accounts. In addition, we generated combined-account measures that consider all three account types together. The combined-account measure provides the best estimate of the impact of CDA policy where there would be a single account rather than multiple accounts. Given administrative difficulties in an applied policy test, this is the closest approximation to the central policy question in SEED OK.

The main independent variable of this study is an indicator of treatment status (“1” for those in the treatment group and “0” for those in the control group). In addition, we have created variables related to children, their primary caregivers, their households, and environmental factors. We use two child characteristic variables: race (non-Hispanic white, non-Hispanic African-American, non-

¹⁰ One control participant made deposits (\$1,113.82) before SEED OK was implemented (January 2008) and withdrew the money during the observation period. For this reason, this one case has negative values for individual savings and total assets.

Hispanic American Indian, and Hispanic),¹¹ and gender (1 for male and 0 for female). Caregivers' characteristics include age (24 or younger, 25 to 34, and 35 or older), education (less than high school degree, high school diploma or GED, and bachelor's degree or higher), marital status (married or not), and nativity status (U.S. native or foreign-born).

We have created seven variables of household characteristics. Household size has three categories: two or three members; four members; and five or more members. The number of children is categorized into households with only one child, two children, three or more children, or a missing value. Household income is measured before taxes and deductions for the past 12 months and categorized into three groups: income of less than \$43,500, income equal to or more than \$43,500, and missing income information. Homeownership is a dichotomous variable with "1" for homeowners and "0" for non-owners. Financial asset ownership is also a dichotomous variable. We have assigned the value of "1" to households that own one or more types of the following assets: CDs (certificate of deposits), treasury bills, or corporate bonds; savings bonds; retirement accounts; other stocks or mutual funds; savings at home or with a trusted friend or family member; or other types of savings. We have assigned the value of "0" to households that report not having any type of financial assets. Sixth, the language spoken predominantly at home is categorized as English, Spanish, or other languages. Lastly, an indicator of internet service at home is a dichotomous variable (1=yes; 0=no).

We have also generated one macroeconomic indicator—the county unemployment rate—and one study recruitment-process variable—date of recruitment to the study. The county unemployment rate variable is constructed by averaging annual county-level unemployment rates from 2007 to 2009. The unemployment rate information was obtained from the Bureau of Labor Statistics.¹² As described above, SEED OK recruited study participants in two stages. We assigned the value of "0" to those who were recruited between August and December, 2007 (stage one sample), and "1" to those recruited between January and April, 2008 (stage two sample).

Statistical approach

Since the SEED OK experiment randomly assigned study participants to treatment and control groups before implementation of the intervention, a simple difference in means (or proportions for dichotomous variables) between the two groups indicates the impacts of the SEED OK intervention, unless there was sampling variability in the assignment process. In other words, the random assignment is intended to create a treatment group not systematically different from the control group in both observed and unobserved characteristics, except for their access to the intervention. For this reason, differences in outcomes may be attributed to the intervention itself, not to individual, environmental, or other characteristics that may be associated with study participants, when taking into account sampling variability (Orr, 1999).

Accordingly, after presenting sample characteristics by treatment status, we undertake simple difference-in-mean analyses that compare savings outcomes between the treatment and control

¹¹ The category of non-Hispanic whites includes 26 Asians. Due to the racial composition of Oklahoma, we could not include enough Asian infants to create a separate racial category. Analyses excluding Asians from the analysis sample produced results that do not substantively differ from those reported in this paper.

¹² <http://www.bls.gov/lau/#tables>

groups. Second, we run multivariate analyses to take into account sampling variability. We use probit regressions for dichotomous dependent variables (529 account holding for different types of accounts) and ordinary least squares (OLS) regressions for continuous outcome variables (logarithm of individual 529 savings and total 529 assets).¹³ These multivariate analyses control for observed discrepancies between the two groups generated during the assignment process, and reduce the influence of sampling variability in estimating the intervention impacts (Orr, 1999). The analysis model is expressed as follows:

$$Y_i = \beta_0 + \beta_1 * T_i + \beta_2 * X_i + \epsilon_i \quad (1)$$

where Y_i indicates the savings outcome (e.g., log individual 529 savings) for participant i ; T_i denotes the treatment status; X_i is a vector of control variables; and ϵ_i indicates random error.

In equation (1), the coefficient of the treatment indicator (β_1) is the parameter of interest. It indicates difference in savings outcomes between the treatment and control groups after taking into account child, caregiver, household, and environmental characteristics. If the coefficient of the treatment indicator is statistically significant and positive, we can conclude that SEED OK improved the savings outcome of interest.

Additional analyses on participant-owned accounts examine the impact of the match on savings outcomes. We run two separate sets of regressions: one with those whose household income is within the match eligibility level (below \$43,500) and another with those whose income exceeds this level. Excluded from these analyses are those participants with missing values in the household income variable ($n=103$). The regressions by income group include the same control variables as the primary analyses described above, with the exception of an income variable. Since we divide the sample by income level, the income variable does not vary in each subgroup.¹⁴

The savings match income eligibility measure used for these analyses, however, is imprecise. Treatment participants' eligibility for the savings match is determined by the SEED OK program using household federal adjusted gross income (AGI), which is not available for this research. This study uses total household income collected from the baseline survey, which does not take into consideration deductions such as retirement account contributions. Thus, our measure of match eligibility is an estimate, does not correspond perfectly to true match eligibility, and may understate the number of participants who are income-eligible for the savings match.

The analyses described here estimate the average causal effect of assignment on outcomes based on a conventional intent-to-treat approach (Lee et al., 1991; Orr, 1999). That is, we include everyone in the sample for individual 529 savings and total 529 assets analyses, regardless of their account holding status. We cannot separate out treatment participants who were motivated to open an OK

¹³ Tobit regressions may be used for these continuous dependent variables since they are left-censored (Greene, 2003). However, in most analyses in this study, Tobit regressions are not identified, because the numbers of left-censored cases are too large. When identified, Tobit regressions produced substantively identical results to those from OLS regressions reported here.

¹⁴ In consideration that household income has variation with each income group, we run additional regressions after controlling for log household income. Analysis results from these additional regressions do not substantially differ from results reported in this study. Results from these robustness checks are available from the authors upon request.

529 account by the SEED OK treatment from those who would have opened an account even in the absence of SEED OK. Therefore, the traditional intent-to-treat approach is better than analyses including only account openers in assessing SEED OK's impact on individual 529 savings and total 529 assets, because the latter approach suffers from selection bias (Lee et al., 1991). The intent-to-treat approach is able to estimate accurately the overall impact of SEED OK assignment on individual 529 savings and total 529 assets across the full population sampled, and this is the key policy consideration.

To check the robustness of our findings, we undertake supplementary analyses. First, we run analyses using the whole sample in SEED OK including study participants who lived outside the state of Oklahoma and those who are not parents of the SEED OK child. Second, we run analyses after excluding the small number of Asians ($n=26$) from the sample. In the main analyses reported here, Asians are categorized in the same group as whites. Third, we test models with alternative measures of income and number of children in the household: One model uses continuous measures of the number of children in the household and household income (logarithmic form) instead of the categorical measures in the main model; Another model employs a categorical measure of income with four categories (less than \$29,000, from \$29,000 to \$43,499, \$43,500 or higher, and missing). Fourth, we also run regressions with the actual dollar amount of individual 529 savings and total 529 assets, in addition to the logarithm form of continuous variables. Fifth, we run logit regressions on dichotomous dependent variables instead of probit regressions. Supplementary analyses produce results that are substantively identical to those reported in this paper.¹⁵ In all analyses in this study, including descriptive and multivariate analyses, we use weights that account for the oversampling of minority groups and nonresponse biases (Marks, Rhodes, & Scheffler, 2008).

Results

Table 2 presents demographic and socioeconomic characteristics of the SEED OK sample by treatment status. Treatment and control groups are not significantly different from each other in any variable at the 0.05 level, indicating that these two groups are comparable to each other at least for observed characteristics. A majority of SEED OK infants are non-Hispanic white and have high school graduates as their primary caregivers. The majority come from households with incomes below \$43,500. The average annual county-level unemployment rate is 4.4 percent for both treatment and control groups. Oklahoma's unemployment rates were much lower than the national average between 2007 and 2009 (authors' assessment based on the Bureau of Labor Statistics' information on state-level unemployment rates from <http://www.bls.gov/lau/tables.htm>).

¹⁵ Results from these supplementary analyses are available upon request.

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Table 2. Demographic and Socioeconomic Characteristics of the Sample by Treatment Status

Variables	Treatment (%)	Control (%)	Total (%)
<i>Infant's Characteristics</i>			
Race			
White	66.71	66.42	66.56
African-American	8.77	9.02	8.90
American Indian	11.45	11.45	11.45
Hispanic	13.07	13.11	13.09
Male	53.46	52.73	53.09
<i>Caregiver's Characteristics</i>			
Age			
24 or younger	46.14	44.31	45.23
25-34	47.40	47.18	47.29
35 or older	6.46	8.50	7.48
Education			
Less than high school	23.97	22.56	23.27
High school graduate	55.89	59.96	57.91
Bachelor's or more	20.14	17.48	18.82
Married	61.45	61.67	61.56
U.S. native	90.14	90.00	90.07
<i>Household's Characteristics</i>			
Household size			
2 or 3	32.08	34.67	33.37
4	33.20	32.26	32.74
5 or more	34.72	33.07	33.90
Number of kids			
1	33.69	36.90	35.29
2	33.49	33.15	33.32
3 or more	31.15	29.00	30.08
Missing	1.67	0.94	1.31
Household Income			
Less than \$43,500	65.75	67.17	66.46
\$43,500 or more	30.42	30.36	30.39
Missing	3.83	2.47	3.15
Home owner	42.09	41.77	41.94
Financial assets	53.67	55.44	54.56
Internet at home	58.11	57.53	57.82
Language spoken at home			
English	90.85	89.95	90.40
Spanish	8.12	8.68	8.40
Other	1.03	1.38	1.20

Other Factors

County unemployment rate	4.44	4.44	4.44
Recruited at stage 1	38.66	40.49	39.57
Unweighted Sample Size	1,340	1,330	2,670

Notes: Percentages may not sum to 100 percent due to rounding.

In testing the statistical significance between the treatment and control groups, we use χ^2 tests for categorical variables and F-tests for continuous variables.

Descriptive results

Table 3 compares three types of savings outcomes between the treatment and control groups: 529 account-holding rate, mean individual 529 savings amount, and mean total 529 assets amount. As described in the measurement section, individual 529 savings does not include SEED OK incentives, while total 529 assets does. Because SEED OK consists of three distinct types of accounts, we report separate results for each type of account and one summary measure that combines all three. Again, savings outcomes for combined accounts provide the best reflection of a single, unified account in a potential CDA policy. Results in Table 3 demonstrate large and statistically significant differences in all savings outcomes by treatment status, except for other private accounts.

Account holding

First, account-holding rates are significantly higher for the treatment group than for the control group, for all types of accounts except other private accounts. For state-owned accounts, all but one member of the treatment group has an account. One participant in this group declined the SEED OK offer (this treatment participant opted out of a state-owned account, stating that for religious reasons the family could not accept an account with earnings on capital). The account-holding rate for state-owned accounts among the control group is 0 percent by design.

Results for participant-owned accounts also show a significant difference in 529 account-holding rates by treatment status (16.3 percent for treatments vs. 0.9 percent for controls). This result indicates that 16 percent of caregivers who received information on SEED OK accounts and incentives as part of the SEED OK intervention had opened and held a 529 account for their infant 18 months after SEED OK began. In contrast, less than one percent of the control caregivers who did not receive the SEED OK intervention held an account for their infant.

Account-holding rates for other private accounts are very low in both treatment and control groups (lower than two percent), and the difference between the two groups is not statistically significant. This finding is not surprising because SEED OK does not provide any financial incentives or information about 529 accounts to anyone other than primary caregivers of infants in the treatment group.

Because of large differences in state-owned and participant-owned account-holding rates, the gap in 529 account-holding rates in the summary account measure (all accounts combined) is large (99.9 percent vs. 2.3 percent) and statistically significant. The results for combined-accounts emphasize

the huge impact on account-holding rates of automatic account opening, combined with an initial deposit.

Table 3. Savings Outcomes and Impacts by Treatment Status (N=2,670)

Account Type	Treatment	Control	Difference
529 Account-Holding Rate (%)			
State-owned 529 account	99.94	0.00	99.94**
Participant-owned 529 account	16.31	0.92	15.39**
Other private 529 account	1.81	1.43	0.38
All 529 accounts combined	99.94	2.32	97.62**
Individual 529 Savings (without SEED OK incentives), Mean (\$)			
State-owned 529 account	0.00	0.00	0.00
Participant-owned 529 account	46.95	12.93	34.02**
Other private 529 account	14.72	27.55	-12.83
All 529 accounts combined	61.67	40.48	21.19
Total 529 Assets (with SEED OK incentives), Mean (\$)			
State-owned 529 account	1002.13	0.00	1002.13**
Participant-owned 529 account	63.25	12.93	50.32**
Other private 529 account	14.72	27.55	-12.83
All 529 accounts combined	1080.10	40.48	1039.62**

** = $p < .01$

Notes: 529 account-holding rates are percentages while the differences in account-holding rates are percentage-point differences. Individual 529 savings and total 529 assets amounts are mean U.S. dollar amounts for all treatment or control participants, regardless of whether or not they hold an account. In testing the statistical significance between the treatment and control groups, we use χ^2 tests for categorical variables and an F-test for continuous variables.

Individual 529 savings

The second panel in Table 3 reports results for individual 529 savings. Based on the intent-to-treat approach, we include both account holders and non-holders in these analyses. State-owned accounts have no individual 529 savings because, by design, they contain solely SEED OK incentives. The mean individual savings in participant-owned accounts is significantly higher in the treatment, a \$34 difference. However, the mean individual 529 savings in other private accounts does not significantly differ between the two groups. For all private accounts combined, the mean individual savings is also higher for the treatment group, but the \$21 difference is not statistically significant.

Total 529 assets

The third panel in Table 3 reports results for total 529 assets. Again, we include both account holders and non-holders in these analyses. The mean 529 assets amount is significantly higher for

the treatment group than for the control group in the state-owned account, the participant-owned account, and all accounts combined. The mean assets amount in state-owned accounts is \$1,002 for the treatment group, with the \$1,000 initial seed deposit comprising almost all of the assets deposited and matches making up only 0.2 percent of deposits.¹⁶ For participant-owned accounts, the mean 529 assets amount is significantly higher in the treatment group (\$63 vs. \$13). Total assets in other private accounts are the same as the individual 529 savings reported in the second panel, since other private accounts do not have any SEED OK incentives. The difference in mean total 529 assets in combined accounts is \$1,040 and is statistically significant.

Multivariate results

Table 4 reports results from multivariate analyses for state-owned accounts, participant-owned accounts, other private accounts, and all accounts combined.

State-owned 529 accounts

Column 1 in Table 4 reports results for total 529 assets in state-owned accounts. We do not run a probit regression on account holding because treatment status explains almost all variation in the probability of holding a state-owned account. We do not analyze individual savings in this account because state-owned accounts include only SEED OK incentives and no individual savings. Results demonstrate a large treatment effect on 529 assets in state-owned accounts, as indicated by the statistically significant and large coefficient for the treatment indicator. The treatment coefficient indicates that the treatment group's assets amount is 998 times that of the control group if demographic, socioeconomic, and environmental factors are controlled [$\exp(6.906)=998$]. As anticipated, none of the demographic and socioeconomic factors has a significant association with total assets in the state-owned account. Assets accumulated in state-owned accounts are solely composed of SEED OK incentives, which are directly linked with treatment status.

Participant-owned 529 accounts

Columns 2 to 4 in Table 4 present results for three savings outcomes in participant-owned accounts: account holding, individual 529 savings, and total 529 assets. Unlike state-owned accounts, demographic and socioeconomic factors have significant associations with savings outcomes for participant-owned accounts. Mother's education has significantly positive associations with these outcomes, while household size has negative associations. Significant coefficients of demographic and socioeconomic characteristics may be expected because participant-owned accounts require participants' own actions to open an account and save, unlike state-owned accounts.

Results also show that SEED OK has positive impacts on savings outcomes in participant-owned accounts. First, the coefficient of the treatment indicator is statistically significant and substantially large in the probit regression on account holding (column 2), suggesting that SEED OK encouraged treatment participants to open and hold a 529 account. Marginal-effect estimation shows that the

¹⁶Caregivers in the treatment group were required to return a Match Eligibility Form (MEF) to receive a saving match, and 424 out of 1,361 in the treatment group had returned the form as of June, 2009. In addition, among those who returned the MEF, 72 caregivers made deposits in their participant-owned accounts. Accordingly, a small percentage of the treatment group received a match on their savings (1.8 percent), which resulted in a very low average saving match.

predicted probability of account holding is 20 percentage-points higher in the treatment group than the control group when demographic and socioeconomic factors are taken into account.¹⁷ Second, the regression results for individual 529 savings show a moderate but significant effect of the SEED OK treatment: The individual savings amount in the treatment group is 1.4 times that of the control group when characteristics of the child, caregiver, household, and environment are taken into account (column 3). Last, the treatment coefficient in the total 529 assets regression is also significant and large. The coefficient size indicates that a treatment group member's total assets accumulated in participant-owned accounts are estimated to be 2.2 times that of a control group member with comparable characteristics (column 4).

Other private 529 accounts

Columns 5 and 6 in Table 4 present results for other private accounts. Treatment status does not have a statistically significant impact on savings outcomes in other private accounts, while mother's education, family economic conditions (income and financial asset ownership), and having internet access at home have positive associations with savings outcomes. These findings are expected because other private accounts do not receive any financial incentives from SEED OK, but saving requires the same (or perhaps even more) deliberate action by family members, relatives, or friends as in participant-owned accounts. Those recruited in stage two are less likely to open an account and they have lower individual savings, reflecting their shorter time period for savings (infants selected for SEED OK at stage two were born about four months later than those selected at stage one).

All 529 accounts combined

The last three columns in Table 4 report results for all accounts combined. Treatment status has a large and statistically significant coefficient in every analysis. The account holding result shows that SEED OK increased the treatment group's chance of account holding by 95 percentage points. This extremely large effect reflects the almost universal account-holding rate for state-owned accounts. The treatment effect for individual savings is also statistically significant, but the effect size is small: The individual 529 savings amount of the treatment group is 1.3 times that of the control group, similar to the marginal effect of participant-owned accounts. The total assets accumulated in 529 accounts of the treatment group are estimated at 899 times that of the control group; almost all of this difference is due to the \$1,000 seed deposit.

¹⁷ For account-holding status, we estimate the marginal effect of SEED OK treatment by comparing predicted probabilities between the treatment and control groups with comparable characteristics. We calculate each group's predicted probability under an assumption that an infant is a typical case in the sample: a white male infant whose caregiver is a 25 to 34-year-old married native-born woman with a high school degree; whose household consists of two to three members and has only one child with income less than \$43,500; whose household does not own a home but has financial assets; whose household has internet service at home and speaks mainly English; whose county's unemployment rate is 4.5 percent during the observation period; and whose caregiver was recruited for SEED OK at stage one.

Table 4. SEED OK Treatment Effects Based on Regression Analyses

	State- owned	Participant-owned		Other private		All accounts combined			
	Log Total Assets	Account Holding	Log Individual Savings	Log Total Assets	Account Holding	Log Individual Savings	Account Holding	Log Individual Savings	Log Total Assets
Marginal Effect +	998.25 ^a	19.73 ^b	1.38 ^a	2.20 ^a	1.51 ^b	1.00 ^a	94.95 ^b	1.34 ^a	898.75 ^a
Treatment	6.906** (0.005)	1.799** (0.180)	0.325** (0.056)	0.788** (0.070)	0.196 (0.170)	-0.002 (0.035)	16.740** (1.498)	0.296** (0.063)	6.801** (0.039)
<i>Infant's Characteristics</i>									
Race									
African	-0.000 (0.001)	-0.285 (0.176)	-0.087 (0.045)	-0.127 (0.083)	-0.406 (0.379)	-0.008 (0.032)	-0.876** (0.313)	-0.090 (0.057)	-0.048* (0.023)
American	0.006 (0.006)	-0.186 (0.142)	-0.039 (0.042)	-0.096 (0.062)	-0.229 (0.280)	-0.022 (0.027)	0.407 (0.281)	-0.064 (0.048)	-0.011 (0.028)
Indian	0.003 (0.005)	-0.356 (0.282)	-0.102 (0.055)	-0.099 (0.106)	0.508 (0.279)	0.142 (0.084)	0.696 (0.461)	0.045 (0.096)	0.073 (0.065)
Hispanic									
Male	-0.004 (0.005)	0.264* (0.107)	0.026 (0.057)	0.100 (0.071)	0.103 (0.161)	0.037 (0.034)	0.413 (0.264)	0.065 (0.063)	0.066 (0.038)
<i>Caregiver's Characteristics</i>									
Age									
25-34	-0.006 (0.006)	0.233 (0.125)	0.059 (0.037)	0.076 (0.063)	0.272 (0.251)	0.035 (0.025)	0.470 (0.429)	0.094* (0.043)	0.040 (0.025)
35 or older	-0.004 (0.003)	0.455* (0.185)	0.117 (0.127)	0.259 (0.155)	0.452 (0.329)	0.065 (0.127)	0.579 (0.634)	0.193 (0.167)	0.076 (0.124)
Education									
HS graduate	0.012 (0.012)	0.489** (0.186)	0.013 (0.026)	0.105 (0.057)	3.236** (0.316)	-0.024 (0.014)	4.302** (0.501)	-0.010 (0.029)	-0.017 (0.019)
BA or more	0.020 (0.015)	1.148** (0.225)	0.569** (0.121)	0.906** (0.156)	3.927** (0.341)	0.295** (0.071)	5.757** (0.632)	0.791** (0.135)	0.359** (0.076)
Married	-0.007 (0.006)	0.143 (0.138)	-0.017 (0.032)	0.040 (0.059)	0.003 (0.222)	0.008 (0.013)	0.173 (0.372)	-0.007 (0.034)	-0.005 (0.016)
U.S. native	-0.008 (0.006)	0.387 (0.317)	-0.068 (0.120)	0.101 (0.138)	-0.052 (0.271)	0.005 (0.057)	0.458 (0.679)	-0.066 (0.129)	0.014 (0.044)

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Household's Characteristics

Household size									
4	-0.000 (0.002)	-0.416* (0.195)	-0.176** (0.064)	-0.217* (0.097)	-0.580 (0.469)	-0.034 (0.047)	-0.462 (0.404)	-0.194* (0.076)	-0.083 (0.047)
5 or more	-0.003 (0.004)	-0.591 (0.357)	-0.109 (0.073)	-0.202 (0.139)	-0.900 (0.467)	-0.048 (0.040)	-0.889* (0.442)	-0.149 (0.080)	-0.084* (0.041)
Number of kids									
2	0.003 (0.003)	0.311 (0.192)	0.058 (0.056)	0.147 (0.091)	0.078 (0.456)	-0.064 (0.041)	-0.547 (0.416)	-0.005 (0.067)	-0.066 (0.036)
3 or more	-0.001 (0.002)	0.475 (0.374)	0.009 (0.077)	0.165 (0.148)	0.356 (0.455)	-0.050 (0.041)	0.050 (0.406)	-0.052 (0.085)	-0.045 (0.036)
missing	0.001 (0.004)	0.142 (0.564)	-0.046 (0.070)	-0.011 (0.145)		0.004 (0.033)	-0.477 (0.511)	-0.050 (0.076)	0.027 (0.034)
Income									
≥ \$43,500	0.004 (0.005)	0.270* (0.134)	0.165* (0.076)	0.193 (0.106)	0.362 (0.200)	0.092** (0.036)	0.375 (0.362)	0.234** (0.084)	0.071 (0.037)
missing	0.004 (0.006)	-0.713 (0.383)	-0.069 (0.061)	-0.178 (0.099)		-0.023 (0.018)	0.320 (0.399)	-0.084 (0.064)	-0.001 (0.021)
Home owner	-0.010 (0.010)	-0.027 (0.135)	0.045 (0.043)	0.037 (0.073)	-0.039 (0.194)	0.021 (0.019)	-0.531 (0.286)	0.062 (0.048)	-0.010 (0.026)
Financial assets	0.005 (0.005)	0.209 (0.121)	0.050 (0.035)	0.101 (0.059)	0.536 (0.277)	0.029* (0.014)	5.780** (0.883)	0.078* (0.038)	0.037* (0.014)
Internet at home	0.008 (0.007)	0.099 (0.131)	0.054 (0.034)	0.043 (0.061)	0.658 (0.337)	0.028* (0.014)	0.733 (0.377)	0.079* (0.037)	0.018 (0.023)
Language spoken at home									
Spanish	0.004 (0.005)	0.458 (0.453)	0.055 (0.107)	0.077 (0.143)	-0.530 (0.449)	-0.121 (0.087)	0.975 (0.628)	-0.085 (0.134)	-0.058 (0.066)
Other	0.006 (0.009)	1.207** (0.452)	0.393 (0.385)	0.510 (0.418)		-0.180* (0.070)	-1.177 (0.728)	0.237 (0.408)	-0.123 (0.086)
<i>Other factors</i>									
Unemployment rate	0.003 (0.004)	-0.141* (0.065)	-0.031 (0.024)	-0.060 (0.036)	0.103 (0.108)	0.018 (0.015)	0.123 (0.122)	0.005 (0.027)	0.013 (0.012)
Recruited at stage 2	0.005 (0.005)	0.182 (0.103)	-0.055 (0.049)	0.068 (0.063)	-0.386* (0.149)	-0.080* (0.035)	-0.277 (0.237)	-0.135* (0.057)	-0.065 (0.035)

Constant	0.022 (0.027)	-4.010** (0.523)	0.152 (0.203)	-0.325 (0.258)	-6.742** (0.650)	-0.047 (0.103)	-14.249** (1.814)	0.181 (0.221)	0.115 (0.095)
Observations	2,670	2,670	2,670	2,670	2,508	2,670	2,670	2,670	2,670
(Pseudo) R ² ++	0.999	0.339	0.108	0.178	0.292	0.053	0.954	0.136	0.957

**p<0.01, *p<0.05

Notes: Standard errors in parentheses. Account holding analyses use probit regressions, and individual savings and total assets analyses employ OLS.

+ The marginal effect of the treatment for a continuous dependent variable (individual savings and total assets) is calculated as the exponential of the treatment status coefficient since we log-transformed the dependent variable before running OLS regression. Each marginal effect in the table indicates the ratio of savings/assets amount of the treatment group to that of the control group (denoted with ^a). The marginal effect for a dichotomous dependent variable (account holding) is calculated by subtracting predicted probability of the control group from that of the treatment group with comparable characteristics. The treatment effect of account holding is estimated with percentage-points (denoted with ^b).

++ R² values are presented for the OLS regressions and Pseudo-R² values are presented for the probit regression analyses.

SEED OK treatment effects on participant-owned accounts by income

Table 5 presents analysis results from two sets of regressions with two different subsamples on participant-owned accounts: One subsample consists of those participants whose household income is within the match eligibility and another with those whose income exceeds this level. These analyses test whether the savings match incentives in SEED OK increase savings in participant-owned accounts. If the SEED OK treatment effect is estimated to be larger among those eligible for the savings match vs. those ineligible, we may conclude that the savings match has positive effects on participant-owned accounts.

Table 5. SEED OK Treatment Effects on Participant-Owned Accounts by Household Income: Regression Analyses

Savings Outcome	Income Eligible for Savings Match	Income Ineligible for Savings Match
529 Account Holding	2.094 *** (0.392)	1.764 *** (0.217)
Log 529 Individual Savings ^a	0.106 *** (0.027)	0.917 *** (0.175)
Log 529 Total Assets ^a	0.422 *** (0.055)	1.709 *** (0.186)
Observations	1,854	713

**p<0.01, *p<0.05

^a A difference in coefficient sizes of treatment indicator is statistically significant between eligible and ineligible participants at the 0.05 level.

Notes: Standard errors in parentheses. Account holding analysis uses probit regressions, and individual savings and total assets analyses employ OLS. Regression analyses include control variables included in Table 4: infant characteristics (race and gender); caregiver's characteristics (age, education, marital status, and nativity); household's characteristics (household size, number of kids, homeownership, financial asset ownership, internet at home, and language spoken home), other factors (unemployment rate and recruited at stage 2). We do not run analyses with a sample consisting of those missing household income information (n=103).

Table 5 presents only the main results: coefficients and standard errors of the treatment indicator. Other variables not reported in Table 5 have expected results, such as positive relationships between education and savings.¹⁸ Table 5 shows that the SEED OK treatment has positive effects on savings outcomes among both match-eligible and ineligible groups for all three outcome measures: account holding, individual savings, and total assets. As mentioned in the Methods section, we can assess the impacts of matches by comparing the coefficient sizes of the treatment indicator between the two regressions groups: one with the income-eligible group and the other with the income-ineligible group. The first row summarizes results on account holding; the coefficient size of the treatment indicator is larger for the eligible group than the ineligible group. An adjusted Wald-test, however, shows that the difference between the two coefficients is not statistically significant. Analyses on individual savings and total assets produce contrasting results. The treatment indicator has a

¹⁸ Results on other variables in these analyses are available upon request.

significantly larger coefficient among the ineligible group than the eligible group. These results suggest that the SEED OK treatment has increased individual savings and total assets among the ineligible group to a significantly larger extent than among the eligible group. These findings are the opposite of what was expected under the assumption that the savings match has positive impacts on savings outcomes.

Discussion

As noted, the SEED OK experiment is a policy test of a universal and progressive Child Development Account (CDA) that gives every child an account at birth, with automatic account opening and an initial deposit. This paper examines impacts of SEED OK on savings in a CDA for college, using data from a state-wide experiment. SEED OK opened a state-owned account with a \$1,000 seed deposit on behalf of every infant in the treatment group. In addition, SEED OK encouraged treatment participants to open their own OK 529 accounts by providing information about accounts, a \$100 opening incentive, and the possibility of savings matches (for low- and moderate-income caregivers).

The design of the SEED OK experiment provides exceptionally good data for evaluating the impacts of CDAs on account holding and savings for college. The SEED OK sample was randomly selected from birth records of all infants born in Oklahoma in certain time periods. As an experiment, SEED OK has created a condition where the treatment and control groups are equivalent to each other except for their access to the SEED OK intervention and sampling variability. As the first experimental study of CDAs, SEED OK will continue to provide empirical evidence that can inform the development of CDA policy in the future.

Findings of this study show positive impacts of the SEED OK intervention on savings outcomes in 529 accounts. Due to automatic (“default”) account opening and SEED OK incentives, nearly 100 percent of the treatment group had a 529 account, compared to 2.3 percent of the control group. In addition, bivariate and multivariate analyses find significant differences between the treatment and control groups in all three outcome measures in the two targeted accounts: state-owned and participant-owned 529 accounts. 529 account-holding rates, 529 individual savings, and total 529 assets are significantly higher for the treatment group than the control group. There are no significant differences in savings outcomes in other private 529 accounts (opened for the infant by other family members and friends), but this finding is expected because SEED OK did not provide any incentives for these accounts. This finding may also suggest that families and friends of treatment participants did not reshuffle resources among 529 accounts. The SEED OK intervention improved savings outcomes in the accounts targeted by the program, while not significantly decreasing savings in the non-targeted accounts.

Turning to the effect of offering a savings match, the SEED OK treatment effect on account holding is larger among the income-eligible group than the ineligible group, but the difference is not statistically significant. At the same time, SEED OK treatment effects on individual saving and total asset amounts are significantly larger among the ineligible group rather than the eligible group. This finding is opposite of what would be expected under the assumption that offering a savings match would improve savings outcomes among the low- and moderate-income participants who are eligible for the match. These results suggest that comparison of treatment effects by income

eligibility may not be an effective method for assessing the impact of match. Income groups differ not only in terms of their eligibility to receive the savings match, but also in other unobserved aspects. For example, the high-income group is likely to have more economic resources for saving (other than those included in the analysis), may have better financial management skills, and very likely have more advantageous tax treatment of their savings in a 529 plan. SEED OK participants are responding to this full set of conditions. Further research will be required to assess the effects of the match on savings outcomes.

This study is not free from limitations. First, the sample is limited to infants born in Oklahoma. Therefore, findings of this study may not be generalizable to infants in other states or to the United States as a whole. However, Oklahoma was selected for SEED OK in part because of substantial subpopulations of African Americans, Hispanics, and American Indians, so there is racial and ethnic diversity in SEED OK. Second, data limitations do not allow us to examine SEED OK's impacts on overall household assets and liabilities. Therefore, this study is unable to tell whether increased individual savings in 529 accounts are net savings encouraged by the SEED OK intervention or savings transferred from other types of assets. Third, the SEED OK study participation rate is 38 percent. Although a low participation rate does not necessarily generate bias (Groves, 2006), it may raise the issue of external validity because we cannot fully test whether study participants' propensity to save for their children's future differs from that of non-participants. Last, this study used account data collected between January 1, 2008, and June 30, 2009, when the United States experienced one of the worst economic downturns in its modern history. Although Oklahoma's unemployment rates were much lower than the national average, weak national economic conditions and uncertainty during the observation period may have affected savings outcomes in SEED OK. Further research with data from longer observation periods that cover both weak and robust macroeconomic conditions will help determine whether and how macroeconomic conditions might affect long-term impacts on savings outcomes.

Findings of this study may have several policy implications. First, by demonstrating an acceptance rate of nearly 100 percent of automatically-opened state-owned accounts, this study suggests that it may be possible to put in place a CDA policy that reaches nearly all children. As stated previously, only one member of the treatment group opted out of the SEED OK state-owned account.

Second, findings support the use of a centralized savings plan, such as a College Savings (529) Plan, as an institutional structure for achieving near-universal participation. The centralized structure enables identification, outreach, and implementation of highly paternalistic CDA features, such as automatic opening, subsidies, and restrictions on access and use of funds. In this regard, note again the effectiveness of automatic 529 account opening. The account-holding rate 18 months after the SEED OK intervention is much higher for state-owned accounts than participant-owned accounts among the treatment group: It is almost 100 percent for the state-owned account, but only 16 percent for participant-owned accounts. This large difference is almost certainly due to program (policy) structure: State-owned accounts are opened automatically with the ability to opt out, but participant-owned accounts require participants' own action to be opened. A lower account-opening rate for participant-owned 529 accounts, despite the \$100 opening incentive, suggests the effectiveness of automatic program enrollment for a universal program. Although the difference in incentive amounts (\$1,000 in state-owned 529 accounts vs. \$100 in participant-owned 529 accounts) may also explain the huge gap in account-holding rates between the two types of accounts,

automatic account opening seems a more plausible explanation. The account-holding rate in SEED OK is much higher than in MI SEED, another CDA program with comparable financial incentives (\$800 initial deposit and saving match) but without automatic account opening. The account-holding rate in the MI SEED program was only 62 percent in the treatment group (Marks et al., 2009). In addition, this interpretation is more consistent with results from studies on retirement savings, where automatic account opening in a 401(k) plan has increased program participation rates among eligible individuals (Choi, Laibson, & Madrian, 2004; Madrian & Shea, 2001). Considering that one of the most common reasons for non-enrollment is procrastination (e.g., “too busy,” see Choi, Laibson, & Madrian, 2004; Huang, Beverly, Clancy, Lassar, & Sherraden, 2011), automatic account opening seems a reasonable solution to low participation rates.

Third, program features other than automatic account opening also affect the account-holding rate. Findings show that the state-owned account-holding rate in SEED OK is much higher than that of 401(k) plans with automatic account opening. Madrian and her colleagues (2001) estimated a 401(k) participation rate of 86 percent even when enrollment was automatic. Differences in participation rates between SEED OK and 401(k) plans with automatic account opening may be explained by different program requirements. Although saving is encouraged, SEED OK does not require participants to save their own money, while 401(k) participation mandates that employees contribute a certain percentage of their wages. SEED OK provides a \$1,000 deposit to state-owned accounts, so those who opt out forfeit the assets deposited by SEED OK for their child. In addition, there is a difference in information regarding opt-out procedures. Potential participants in automatic 401(k) plans are usually informed by their employer of their right to opt out and the procedure to do so (Internal Revenue Service, 2000). However, SEED OK participants, after accepting participation into the study and agreeing that if selected into the treatment group a 529 account would be opened for them, are not informed of a procedure to opt out. Therefore, SEED OK participants must actively refuse the \$1,000 state-owned account.

Fourth, this study also demonstrates that saving incentives and information increased participants' own savings for college. Treatment participants are significantly more likely to have participant-owned accounts and save significantly larger amounts in their accounts than control participants, suggesting positive impacts of SEED OK on participant savings. One recent empirical study using a longitudinal data set suggests that holding a savings account in a child's name, controlling for many other factors including savings amount, is associated positively with later educational outcomes (Elliott & Beverly, 2011). If this effect pertains in the future, then results of SEED OK may turn out to be promising. However, the amounts of participant savings in SEED OK, although statistically significant, are quite modest at this stage. If amounts of participant saving are the key factor in determining later child outcomes, then there is reason to be very cautious. We cannot know if participant savings rates in SEED OK will become greater or smaller over time.

Also of relevance in this discussion, savings in SEED OK are in restricted 529 accounts. Restricted access protects savings from unplanned (and perhaps undesirable) withdrawals caused by hyperbolic discounting, which can overcome commitment to save for the long term (Laibson 1998). Therefore, SEED OK savings may increase the probability for savings being used for the intended purpose (development of children) in the future.

Overall, these initial results from the SEED OK policy experiment can be understood as positive in some ways, and perhaps disappointing in others. On the positive side, the impact of automatic account opening suggests that nearly every child may be able to have a savings account under a universal CDA policy. In addition, there is a significant difference in opening rates for participant-owned 529 accounts (16 percent for treatments vs. one percent for controls). The 16 percent account-holding rate also compares favorably to 529 account-holding rates among all children in Oklahoma; less than four percent of all Oklahoma children under age 18 are named as the beneficiary of an OK 529 account (personal communications with Tim Allen, Deputy Treasurer, on June 24, 2011). Those participants that hold 529s are now “in the game” with accounts that may be used for postsecondary saving going forward.

On the disappointing side, the mean difference in amount of individual savings is not very high. This study uses early savings outcome data measured only 18 months after the program began, and the account-holding period coincided with an economic downturn. Still, the engagement of SEED OK treatment group members in saving their own money can fairly be called a slow start. Considering that its cost is substantial (e.g., financial incentives including the \$1,000 initial deposit and savings matches, as well as program operation costs), SEED OK may not be an economically feasible program if its aim were solely to increase individual savings.

The central question going forward is whether and how SEED OK overall (including subsidies and restrictions) might influence parents' and children's attitudes and final developmental outcomes. If SEED OK improves parenting practice and financial management skills, motivates parents and children to plan and prepare for college education, or increases high school graduation and college attendance rates among children, a universal and progressive CDA policy may be worth the investment. Because SEED OK has used random assignment successfully, it will be possible to have rigorous experimental data to address these important questions.

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