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A Cost-Benefit Analysis of Tulsa's IDA Program:

Findings from a Long-Term Follow-Up of a Random Assignment Social Experiment

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A Cost-Benefit Analysis of Tulsa's IDA Program: Findings from a Long-Term Follow-Up of a Random Assignment Social Experiment

This report presents findings from a cost-benefit analysis of the Tulsa Individual Development Account (IDA) program, a demonstration program that was initiated in the late 1990s and is being evaluated through random assignment. The key follow-up data used in the evaluation was collected around 10 years after random assignment, about 6 years after the program ended. The results imply that, during this 10-year observation period, program participants gained from the program and that the program resulted in net costs to the government and private donors, and that society as a whole was probably worse off as a consequence of the program. The report examines in some detail whether these findings are robust to a number of different considerations, including the assumptions upon which the results depend, uncertainly reflected by the standard errors of the impact estimates used to derive the benefits and costs, and omitted benefits and costs, and concludes that they are essentially robust. For example, a Monte Carlo analysis suggests that the probability that the societal net benefits of the Tulsa program were negative during the observation period is over 90% and that the probability that the loss to society exceeded $1,000 is 80%. Further analysis considered benefits and costs that might occur beyond the observation period. Based on this analysis, it appeared plausible, although far from certain, that the societal net benefits of the Tulsa program could eventually become positive. This would occur if the program's apparent positive net impact on educational attainment generates substantial positive effects on the earnings of program participants after the observation period ended. However, there was no evidence that the educational impacts had yet begun to produce positive effects on earnings by the end of the observation period.

Key words: *American Dream Demonstration (ADD), Community Action Project of Tulsa County (CAPTC), Individual Development Accounts (IDAs), Tulsa, OK*

This report presents a cost-benefit analysis of the Tulsa Individual Development Account (IDA) program, which was initiated in the late 1990s and is being evaluated through random assignment. The key follow-up data used in the evaluation was collected around 10 years after random assignment, about 6 years after the program ended. The IDA program, which was administered by the Community Action Project of Tulsa County (CAPTC), was intended to encourage households below 150% of the federal poverty guidelines (about $25,000 for a family of four in the late 1990s) to accumulate assets by providing subsidies to save to purchase a home, maintain a currently owned home, obtain post-secondary education, open or run a business, and save for retirement.

Because of their low incomes and lack of assets, poor people have little financial cushion in the event of job losses or other financial crises. Moreover, it is usually difficult for poor people to save and, hence, accumulate assets and the financial stability expected to accompany such wealth. To help overcome these barriers, those enrolled in the Tulsa program could open an IDA. Once they did so, contributions of up to $750 per year for 3 years were matched at $2 for each dollar in their account that participants used for home purchases and $1 for each dollar used for the other four designated purposes listed above. In addition, participants received 12 hours of general money-management

training; additional hours of training specific to the type of asset they intended to purchase;[1] and one-on-one case management services including phone and in-person advice. The administrative cost of operating the Tulsa program was funded by the federal government, which provided about two-thirds of the total (mostly through Community Service Block Grants and Community Development Block Grants); the Oklahoma state government and the Tulsa local government, which provided about 1% of the total; and by donations from the private sector, which provided about one-third of the total (Schreiner 2004). The matching funds were entirely paid for by the private sector donors. The major private sector donors were the Bank of Oklahoma and the Kaiser Foundation (Schreiner 2004). The Corporation for Enterprise Development transferred funds from the private foundations that funded the American Dream Demonstration.[2]

Although there have been over 1,000 IDA programs in the U.S. with over 85,000 account holders (CFED 2011), the Tulsa IDA is the only one that is being assessed by randomly assigning eligible persons to either a treatment group with access to an IDA account or a control group without such access.[3] Given this experimental design, program effects (which are often called "impacts") on various outcomes of interest (for example, home ownership or income) can be determined by comparing the outcomes for the two groups.[4] Recruitment into the experiment took place between October 1998 and December 1999, with 537 households randomly assigned to the treatment group and 566 household randomly assigned to the control group.

An Overview of the Cost-Benefit Analysis

The objective of the cost-benefit analysis of the Tulsa IDA is to determine whether the benefits from the program outweighed its monetary costs from a societal point of view and, hence, whether the program improved economical efficiency. In addition, the analysis assesses— from a point of view narrower than that of society as a whole—whether the well-being of program participants was improved and what the net effects of the program were on the government's budget and on the budgets of the private sector donors. Thus, it provides valuable information for establishing the overall usefulness of the program.

Table 1 indicates the direction of the effects of the Tulsa IDA on various benefits and costs, supposing that program's impacts were in the hypothesized direction. The table is limited to only those benefits and costs that were measured in financial units of dollars. Other possible program benefits and costs (for example, those resulting from impacts on psychological and health outcomes) will be considered later in the report. Plus signs in Table 1 indicate anticipated sources of economic gains from each perspective and minus signs indicate expected sources of losses from each

[1] For example, participants saving for a home attended classes on shopping in the real estate market and interacting with real estate agents and loan officers.

[2] The Tulsa IDA was one of 14 IDA demonstration programs in the American Dream Demonstration and the only one evaluated through random assignment.

[3] Although they did not test IDA programs, there have been at least two other field experiments that tested using matching contributions to encourage saving (see Duflo et al. (2006) and Engelhardt et al. (2011) for descriptions). Additional studies of savings behavior that rely on data from field experiments include Duflo and Saez (2003), Ashraf et al. (2006), and Saez (2009).

[4] Greater detail on the experimental design and the estimation of program impacts can be found in Grinstein-Weiss et al. (2012a), which also summarizes findings from previous research on IDAs.

Table 1. Cost-Benefit Accounting Framework

	Participants	Government	Private Donors	Society (Column Sum)
Benefits				
Impact on income, net of government transfers	+			+
Impact on government transfers payments	−	+		**0**
Rental value of house for months of impact on ownership	+			+
Impact on appreciation of home	+			+
Impact on equity in home	+			+
Impact on income taxes due to impact on home ownership	+	−		**0**
Impact on business equity	+			+
Costs				
Impact on taxes due to the impact on income	−	+		**0**
Impact on home purchase expenditures	−			−
Impact on property taxes	−	+		**0**
Impact on home repair and maintenance expenses	−			−
Impact on investments in business	−			−
Impact on investments in education	−			−
Impact on savings for retirement	−			−
Matching funds expended	+		−	**0**
IDA operating costs		−	−	−
Total net *monetary* benefits	**+**	**-**	**-**	**?**

perspective, supposing that the Tulsa IDA program had its intended effects. In reporting the actual findings from the cost-benefit analysis, the pluses and minuses are replaced by values estimated in dollars.

The four columns in Table 1 show benefits and costs from four different perspectives: that of participants who enrolled in the Tulsa IDA, that of the government, that of the private sector donors, and that of society as a whole. For purposes of the table, participants, the government, and private sector donors make up the whole of society. Thus, benefits for participants that are entirely offset by costs to the government or private sector donors or costs to participants that are exactly offset by benefits to the government have a neutral or zero effect on society as a whole. For example, reductions in income taxes (due to housing payment deductions resulting from a positive impact on home ownership) would make participants better off and the government worse off by equal amounts. Similarly, increases in income taxes (due to a positive impact on incomes) would make participants worse off and the government worse off by equal amounts.

Some of the individual items in Table 1 require brief explanations. First, it is anticipated that the Tulsa IDA will have a positive impact on the incomes of participants net of government transfer payments if the program increases investments in secondary education and in businesses and if those investments lead to an increase in income in the study period. Increases in non-transfer income could also possibly result from financial education and from home ownership—for example, by altering the outlooks and choices of IDA participants. As pointed out by Schreiner (2004), "IDA participants may think about their resources in ways that the recipients of cash transfers do not, and this may lead to non-economic changes in patterns of thought and behavior." Increases in incomes

would, in turn, increase the income taxes paid by participants and decrease the government transfer payments they receive.

Second, the Tulsa IDA was intended to encourage participants to invest in homes, businesses, and education and to save for retirement. Only part of this investment, as discussed earlier, resulted from out-of-pocket outlays made by participants; the remainder was obtained through the IDA matching funds.[5] The investments that appear in the participant column in Table 1 are intended to incorporate the *total* amounts invested—that is, the amounts directly invested by participants plus the amounts invested on their behalf through matching funds. Thus, from the participant perspective, the cost of the investments listed in Table 1 with negative signs in the participant column are presumed to be partially offset by matching funds, which appear in the participant column with a positive sign.

Third, to the extent the Tulsa IDA encouraged homeownership among participants, they received a benefit because they no longer had to pay rent. A further benefit was received from any appreciation of the homes they purchased.[6] These benefits are, of course, at least partially offset by the costs of purchasing and owning a home. These costs are also listed in Table 1.

Space is allotted in the bottom row of each column in Table 1 for total net benefits (or losses) resulting from the Tulsa IDA program. These values are computed as the algebraic sum of the individual benefit and cost amounts in that column. These "bottom line" estimates, which in principle can be either positive or negative, are intended to indicate whether the Tulsa IDA had positive net benefits from each perspective, at least in terms of *monetary* gains and losses. As shown in Table 1, in conducting the cost-benefit analysis, it was anticipated that participants in the Tulsa IDA enjoyed a payoff from their investments, and thus their total net benefits would be positive, if only because their investments were subsidized. On the other hand, it seemed likely that net losses occurred for the government and private sector donors. As indicated by Table 1, only increases in tax receipts and decreases in transfer payments were expected to counter the cost to the government of paying for operating the Tulsa IDA. Operating costs were expected to be much larger than any benefits the government accrues from increased tax receipts and reduced transfer payments. Private sector donors received no monetary benefits from the costs they incurred in paying for the investment subsidies and operating the IDA, and thus the net effect of the program for them was negative. The great unknown, as indicated by the question mark in Table 1, is whether the total net benefits accruing to IDA participants were greater or smaller than the total net costs borne by the government and private sector donors, and, consequently, whether society as a whole was better or worse off as a result of the Tulsa IDA. The empirical cost-benefit analysis attempts to resolve this issue.

The next section of this report, in combination with the Appendix, describes the methods used to place values on the benefits and costs listed in Table 1. The following section then reports initial cost-benefit findings from this effort. The next to the last section examines the robustness of these initial findings to changes in assumptions and to consideration of possible benefits and costs that are not included in Table 1. The final section presents conclusions.

[5] The matching funds were actually paid directly to the sellers, rather than passing through the participants, a point to which I return later.

[6] Costs and benefits are estimated over a period from 1999 through 2008 and thus should not be very much affected by the collapse of housing markets that began in mid-summer 2008. In addition, the housing market in Tulsa was relatively less affected than those elsewhere in the country (National Association of Realtors, 2012).

Valuing the Costs and Benefits

All the costs and benefits estimated in this study are measured on a per participant basis. In estimating each cost and benefit, all members of the treatment and control groups are included, regardless of whether they incurred the particular cost or enjoyed the particular benefit. For example, those not purchasing housing are included as zeros in estimating the impact of the Tulsa IDA on housing purchase expenditures. Only in this way, can the various cost and benefit estimates be appropriately compared to one another. The dates at which the data used to measure the different costs and benefits were collected differ. Hence, the Consumer Price Index was used to adjust these estimated values to 2010 prices.

Different costs and benefits resulting from the Tulsa IDA occurred at different points in time. For example, program operating costs and matching funds were expended during the first 3 or 4 years after random assignment, while benefits from home appreciation or equity in a house or a business do not accrue until the house or business is sold. Because benefits that are received or costs that are incurred earlier are of more value than those received or incurred later, a discount rate is used to convert each of the benefits and costs resulting from the Tulsa IDA program into what they were worth at the beginning of the program. Although there is considerable debate over the appropriate discount rate, several recent assessments recommend using an annual rate of 3.5% in discounting the values of the benefits from social programs such as the Tulsa IDA.[7] To take account of the debate and, hence, the uncertainty concerning the exact value of the discount rate, one of these assessments further suggests using an upper bound of six per cent and a lower bound of two per cent for sensitivity analysis.[8] Following these recommendations, the cost-benefit analysis uses 3.5 per cent for the central estimates of net benefits and tests the sensitivity of these estimates to using either two and six per cent instead.

Based on data collected at several points over a 10-year span, which begun around 1999 and ended in 2008, the benefits and costs of the Tulsa IDA program are estimated for a 10-year period.[9] This relatively long observation period is important to the analysis because although participants had only 3 years to save in their IDAs and up to another 6 months to use their IDA savings for matched investments, the effects of investments resulting from the IDA are likely to persist well beyond this 3 and a half year period. For example, investments in education may result in income improvements later in life and purchases of home improvements may cause the house to appreciate after the improvement is made. On the other hand, the effects of the IDA could shrink over time. Members of the IDA treatment group had incentives to invest during the 3 and a half years in which they could receive matching funds. The control group, in contrast, had no such incentives and, in fact, was suppose to be barred from a variety of CAPTC home-buyer assistance programs until 2004.[10] Thus, it is possible that by 2008, any early impacts of the Tulsa IDA might diminish as controls caught up to the treatment group. The 10-year observation period allows trends in impacts resulting

[7] See HM Treasury (2003); Boardman et al. (2011); Moore et al. (2004).
[8] Boardman et al. (2011).
[9] Because random assignment took place from October 1998 to December 1999, the exact calendar dates differ somewhat among members of the sample.
[10] However, they could potentially receive assistance from non-CAPTC sources such as the Housing Partners of Tulsa, which provided down-payment and closing-cost assistance equal to 5% of the purchase price of a home upon completion of a home buyer education program (Tulsa Housing Authority 2008). Moreover, as discussed later, the bar seems to have been breached in some instances.

from the Tulsa IDA program that persist beyond the 3 and a half years of program participation to be accounted for in the cost-benefit analysis.

The estimate of the costs of operating the Tulsa IDA (that is the costs of staff and materials) that is used in the cost-benefit analysis is taken from Schreiner (2004 and 2005). To obtain this cost estimate, Schreiner relied on CAPTC accountants and other staff and private sector donors who identified various cost items and provided information on their monetary values. As is appropriate to the needs of the cost-benefit analysis, Schreiner's estimates of program operating costs exclude costs resulting from the random assignment evaluation of the Tulsa IDA program, but include estimates of the value of the time that volunteers donated to operating the IDA.

The amount of the investment subsidies paid to participants was determined from CAPTC administrative records and is taken from Grinstein-Weiss et al. (2012a). As indicated by Table 1, while program operating costs were shared by the government and private sector donors, the matching funds were entirely paid by the private sector donors.

The remaining costs and benefits listed in Table 1 were measured as differences in outcomes between the Tulsa IDA treatment and control groups. These differences or impacts were estimated from survey data collected on members of both the Tulsa IDA treatment group and control group at around a year and a half, 4 years, and 10 years after they were randomly assigned. Estimates from the 10-year survey are especially important in valuing benefits and costs, but data from the two earlier surveys are used as well. Some of the estimates used in the cost-benefit analysis are taken from Grinstein-Weiss et al. (2012a), but others are from calculations made especially for purposes of the cost-benefit analysis.[11]

Because the 10-year survey plays a key role in the cost-benefit analysis, it is important that survey respondents in the treatment group are similar to those in the control group who responded to the survey, except for those differences resulting from the former group's participation in the Tulsa IDA program. Although random assignment was used to allocate respondents to the two groups, differences between the groups could result from chance alone. They could also result from differential attrition during the 10 years between random assignment and the survey, although attrition was, in fact, fairly low. Indeed, of the 1,103 individuals originally randomly assigned, 855 were included in the 10-year survey. One way to determine whether there are differences between respondents in the 10-year treatment and control groups that are not attributable to the Tulsa IDA is to compare their characteristics at the time of random assignment. When this is done, some small observed differences in the characteristics of treatment and control group 10-year respondents become apparent. For example, respondents in the control group were more likely to own homes at the time of random assignment than members of the treatment group, although this difference is not statistically significant at conventional levels. Thus, all the survey-based measures of costs and benefits that are used in this study have been regression adjusted for these differences (see Grinstein-Weiss et al., 2012a for details). Moreover, a few of the survey respondents reported extreme values for some of the financial measures such as the amount they spent on home repairs. In such cases, a winsorizing procedure, in which extremely high and low values were re-coded to a threshold value, was used in estimating the program impacts incorporated into the cost-benefit study.

[11] I am indebted to Clinton Key for providing these calculations.

The key impact estimates used in the cost-benefit analysis appear in Table 2. The most striking thing about these impact estimates is that most of them are not close to being statistically significant at conventional levels.[12] Given the sample size of 855, this lack of statistical significance occurs because the estimated impacts are typically small relative to their corresponding control group means.[13] For example, the mean ownership rate for controls is .516, but the estimated impact on ownership is only .029. Had the estimated impact been twice as large, it still would not have been statistically significant at conventional levels. Thus, unless the true impact was large, the estimated impact is unlikely to be statistically significant.

Given this lack of statistical significance, it is perhaps not surprising that some of the impact estimates are in the opposite direction from what was anticipated. For example, the Tulsa IDA was expected to increase business equity, expenditures on home repairs and maintenance, and savings for retirement; but the estimated impacts are negative for these outcomes. Moreover, monthly income, exclusive of government transfer payments, was expected to increase as a result of the program, but the estimated impact on this outcome is negative in year10. Government transfer payments were expected to decrease, but two of the three estimated impacts are positive.

Still, the estimates of impacts that appear in Table 2 provide the best quantitative information available about the true financial impacts of the Tulsa IDA program. For example, the positive estimates imply that the true impacts are more likely to be positive than negative, while the negative estimates imply the opposite. They do not indicate that the true impact *is* zero, although a value of zero is a possibility. Thus, the estimates that appear in Table 2 are the ones used in the cost-benefit analysis to measure the costs and benefits attributable to the Tulsa program. Nonetheless, the fact that none of these are statistically significant implies that there is great uncertainty concerning the true values of the program's costs and benefits. As explained later, I attempt to address this uncertainty through a Monte Carlo analysis.

To construct the measures of the costs and benefits resulting from the Tulsa IDA program, the impact estimates in Table 2 all had to be modified in various ways. As a consequence, none of the estimated costs and benefits is the same as the impacts in the table. For example, the impact estimates were all adjusted for inflation and discounted. Furthermore, some of the cost and benefit measures required further computations based on information in addition to that reported in Table 2. The construction of each of the cost and benefit measures is described in the Appendix.

Base-Case Cost-Benefit Findings

Table 3 presents "base-case" findings from the cost-benefit analysis of the Tulsa IDA program—that is, it reports findings based on the set of assumptions that were judged to be most plausible and,

[12] The estimated impact on home appreciation is statistically significant at the 10% level if a one-tail test is used and the impact on investment in business barely misses statistical significance at this level with a one-tail test. A one-tail test is arguably the appropriate test because both of these the estimated impacts are expected to be positive.

[13] For instance, at an alpha of 0.100 and a 5 percentage point (or 10%) impact at a control mean of .5, the power is about 0.4. Thus, the ability of the data to detect even a moderate true impact is very weak at even a very low level of statistical significance of 10%.

Table 2. Key Impact Estimates Used in the Cost-Benefit Analysis

Impact on—	Control Means	Impact Estimate	Standard Error	t-value	Source
Monthly income, exclusive of gov't transfers	$1,693	$12	80	0.15	18-month survey
Monthly income, exclusive of gov't transfers	$1,928	$62	97	0.64	4-year survey
Monthly income, exclusive of gov't transfers	$2,525	-$130	105	-1.24	10-year survey
Monthly government transfer payments	$92	$22	20	1.10	18-month survey
Monthly government transfer payments	$122	-$5	19	-0.26	4-year survey
Monthly government transfer payments	$156	$26	26	1.01	10-year survey
Appreciation on home per year owned	$1,531	$478	340	1.41	10-year survey
Business equity	$822	-$96	252	-0.38	10-year survey
Home repair and maintenance expenditures	$2,312	-$77	249	-0.31	10-year survey
Investments in business	$404	$219	177	1.24	10-year survey
Savings for retirement	$3,795	-$346	504	-0.69	10-year survey
Home ownership rate	.516	0.029	0.033	0.88	10-year survey
Duration of home ownership in months	54	2.16	2.724	0.79	10-year survey

hence, produce what arguably might be called the "best estimates." The following section examines the robustness of these base-case findings. Table 3 is similar in format to Table 1, but differs in that it reports estimates of the values of the benefit and cost components. These estimates, most of which are based on the estimated impacts appearing in Table 2, have all been discounted to the time of random assignment by using a 3.5% discount rate. They have also all been adjusted to 2010 prices.

Table 3 indicates that the Tulsa IDA program resulted in an average net gain of a little under $2,000 for participants in the program, but in net losses of almost $2,600 for the government and about $1,500 for private sector donors. This yields a net loss of over $2,000 for society as a whole. Viewed somewhat differently, the government and private donors can be viewed as investing a total of $3,010 in the program in terms of expenditures on operating costs and matching funds. For each of these invested dollars, participants reaped only 65 cents and society received only 4 cents.[14]

Other than the unexpected increase in transfer payments received by Tulsa program participants, the net gains for participants occurred mainly because their benefits from home purchases (mostly from the rental value of and appreciation on purchased homes) more than offset the cost of purchasing a home. Moreover, the cost of purchasing a home was partially subsidized through the IDA matching funds. Unfortunately, the matching funds and increases in transfer payments had to be paid for by the government and private sector donors and thus did not result in gains to society as a whole. Moreover, from a societal perspective, the net gains to participants were largely offset by the cost of operating the Tulsa IDA. Hence, Table 3 implies society as a whole was made worse off by the

[14] The returns per dollar invested were calculated as follows: $1,950/3,105 for participants and -$2,126-(-$2,236)/$3,105 for society. Note that because a negative value for the $2,236 in operating cost is included in computing the net loss to society, it was necessary to net it out of the numerator of the ratio; otherwise, it would be included in both the numerator and the denominator.

Tulsa IDA program. Viewed differently, according to the table, the costs to one part of society (the government and private donors) were considerably larger than the gains by another part (IDA participants). Consequently, there was a net societal loss.

The substantial costs of operating the Tulsa IDA are attributable to the program's provision of financial courses and generous case services, which resulted in what Schreiner (2004) terms a "high touch" IDA. In addition, as one of the first systematic tests of matched savings with a low-income population, the Tulsa IDA was subject to start-up costs.[15] Unfortunately, Schreiner did not have the information required to determine what a "low touch" IDA would cost or to eliminate start-up costs from his estimates of operating costs. However, according the findings presented in Table 3, the net societal loss would be eliminated only if the operating cost of the Tulsa IDA could be reduced to almost zero, without at the same time reducing the program's benefits to participants. This seems unlikely.

Despite the program's operating cost and the subsidies it offered, the Tulsa IDA appears to have had no more than nominal effects on investments in businesses, education, home repairs, and retirement. Although program participants made substantial investments in each of these areas, controls seem to have made investments of roughly similar size, suggesting that these investments would have been made even in the absence of the program. However, it should be borne in mind that the estimates of the program's effects on investment are based on impact measures that are imprecisely estimated.

One possible explanation for why the matching funds did not seem to evoke larger effects on investment is that program participants were simply not very responsive to the investment subsidies offered. Another possible explanation is that some controls may have been able to find financial help outside the program (for example, secondary education scholarships). However, members of the treatment group could also receive such aid. In addition, restrictions on receiving program services, which existed during the first 3 and a half years after random assignment, may not have been strictly enforced. For instance, 20 controls self-reported IDA participation during the 3 and a half years they were restricted from receiving CAPTC services; an additional eight reported IDA participation after this restriction ended; and an additional 25 controls reported receiving CAPTC assistance in making a down payment on a home purchased while the restriction still held.

Program participants may have also substituted matching funds for their own resources.[16] For example, if an individual's home needed $1,000 of repairs, he or she might have saved all $1,000 in the absence of the IDA in order to make the repair; but with a one-to-one sharing rate under the Tulsa IDA, it would have been necessary to save only $500. Under such circumstances, investment in home repairs would not increase as a result of the sharing fund.

As previously discussed, Table 3 implies that combined losses to the government and private donors resulting from the Tulsa IDA exceed gains made by program participants, and, as a consequence, society as a whole is worse off. However, because those who participated in the IDA claimants have

[15] Possible start-up costs include: figuring out how to do an IDAs with some trial and error; putting the program infrastructure in place; and IDA policy engagement by CAPTC in Oklahoma and beyond.

[16] Engelhardt et al. (2011) found that a matching plan intended to encourage parents to save for their children's college "crowded out" 55% of other types of savings for children's college.

Table 3. Base-Case Findings: Ten-Year Estimated Benefits and Costs, by Accounting Perspective (in 2010 dollars)

	Participants	Government	Private Donors	Society (Column Sum)
Benefits				
Impact on income, net of government transfers	-$146			-$146
Impact on government transfers payments	1,076	-1,076		0
Rental value of house for months of impact on ownership	881			881
Impact on appreciation of home	1,138			1,138
Impact on equity in home	195			195
Impact in income taxes due to impact on home ownership	8	-8		0
Impact on business equity	-49			-49
Costs				
Taxes on the impact on income	44	-44		0
Impact on home purchase expenditures	-1,962			-1,962
Impact on property taxes	-62	62		0
Impact on home repair and maintenance expenses	70			70
Impact on investments in business	-244			-244
Impact on investments in education	-89			-89
Impact on savings for retirement	316			316
Matching funds expended	774		-774	0
IDA operating costs		-1,509	-727	-2,236
Net monetary benefits	1,950	-2,575	-1,501	-2,126

lower incomes than the private sector donors or taxpayers funding the government (after all, their incomes had to be below 150% of the federal poverty line in order to qualify for the program), they are likely to value a given change in income more highly. A considerable literature exists in economics suggesting that this difference in marginal utility should be dealt with in cost-benefit analysis by giving each dollar of gain or loss by individuals with relatively low incomes greater weight, often called a "distributional weight," than each dollar of gain or loss by persons with relatively high incomes (see Boardman et al. 2011, Chapter 19 for a summary). For example, after examining the relevant literature, a recent analysis by Fujiwara (2010) provisionally suggests that the estimated "value for net economic benefit per individual should be multiplied by a weight of 2.5."[17] If this distributional weight is applied to the net gains of Tulsa IDA participants, they increase from $1,950 to $4,875, an amount that exceeds the total net losses to the government and private donors of $4,076 by $799. Hence, the estimated effect of the program on society becomes positive. Indeed, it would be positive if the weight was just a little over 2. However, the value of the appropriate distributional weight, and even whether the dollars of low-income people should be weighted at all in cost-benefit analysis, is very controversial. Thus, cost-benefit findings that rely on weighting

[17] The 2.5 weight suggested by Fujiwara is applicable to typical low income participants in government transfer programs. Of course, participants in an IDA program may well differ from participants in government transfer programs and thus a higher or lower weight may be appropriate for them.

should be treated with great caution. Distributional weights are further considered in the following section.

The Robustness of the Base-Case Cost-Benefit Findings

The robustness of the cost-benefit finding is assessed in three different ways. First, the base-case cost-benefit analysis required that certain assumptions be made—for example, in discounting benefits and costs, it was assumed that the value of the discount rate is 3.5%. Thus, we present findings that are based on alternatives to these assumptions to determine how robust the conclusions are that rely on the base-case results. Second, Monte Carlo analysis is used to address sampling variability that causes the estimates of the benefit and cost components to be subject to uncertainty.[18] This uncertainty is implied by the standard errors of the impact estimates used in deriving the benefit and cost measures—the larger the standard error relative to the estimate, the greater the uncertainty. In the Monte Carlo analysis of the ERA cost-benefit findings, estimates of benefit and cost components about which there is uncertainty due to sampling variability were replaced with 2,000 random draws from an appropriate range implied by the standard errors of the underlying impact estimates in order to generate a large number of estimates of net gains (or losses). Although the Monte Carlo approach has seldom been previously used in cost-benefit studies of social programs,[19] it has been applied to cost-benefit analyses of programs and policies in other areas.[20] Use of Monte Carlo is especially important in the case of cost-benefit analysis of the Tulsa IDA program because of the lack of statistical significance of the impact estimates upon which the measures of costs and benefits are based. Third, the cost-benefit analysis has so-far focused on only those benefits and costs that can readily be measured in dollars. Other potential benefits and costs, such as psychological and health outcomes, have thus far not been considered. I attempt to determine whether consideration of the omitted items implies that conclusions based on the base-case analysis should be modified.

Sensitivity to Alternative Assumptions

The discount rate

As previously discussed, a 3.5% rate was used in discounting the base-case benefits and costs appearing in Table 3. Because there is considerable controversy about the precise value of the appropriate rate to use in cost-benefit analysis, two alternative discount rates, 2% and 6%, were used to re-compute net total gains (or losses). The resulting sensitivity findings appear in Table 4.

Table 4 indicates that the estimated net gains for participants and the estimated net losses for the government and private donors become smaller in absolute magnitude as the discount rate becomes

[18] For greater detail about Monte Carlo analysis in cost-benefit studies, see Boardman et al. (2011, pp. 183–187).
[19] One recent exception is Hendra et al. (2011).
[20] For example, see Nichols (2001); Weimer and Sager (2009); and Whittington et al. (2004).

Table 4. Sensitivity of Total Net Benefits to Alternative Discount Rates (in 2010 dollars)

Assumption	Participants	Government	Private Donors	Society (Column Sum)
3.5% discount rate (base-case)	$1,950	-$2,575	-$1,501	-$2,126
2% discount rate	2,365	-2,781	-1,572	-1,988
6% discount rate	1,481	-2,285	-1,394	-2,198

larger.[21] These changes are fairly modest, however. Moreover, the changes for program participants and those for the government and private donors tend to be offsetting and, hence, the estimated loss for society is little changed as the discount rate changes. Thus, the story told by Table 4 remains similar to the one suggested by Table 3: participants enjoy net gains and the government, private donors, and society as a whole suffer net losses regardless of the discount rate.

Self-reporting of total investments by survey respondents

As discussed in the Appendix, the estimates of expenditures on housing repairs and maintenance, investments in business, and savings for retirement that appear in Table 3 (but not home purchase expenditures or educational expenditures) are all based on self-reported information by respondents to the 10-year survey. In calculating total net benefits in Table 3, it is assumed that in answering questions about the size of their investments respondents in the IDA treatment group included the amounts of whatever matching funds they received in making these purchases, as well as their own out-of-pocket expenditures. However, respondents were not explicitly asked to include matching funds in their answers. Moreover, the matching funds were usually paid directly to the sellers (for example, home repairmen or persons selling a business), rather passing through the IDA participants. Therefore, at least some matching funds may not have been included in participant responses about their expenditures on housing repairs, their business investments, and their retirement savings. If so, these cost amounts are understated in Table 3. At maximum, however, these understatements can be no larger than the average amount IRA participants received in matching funds for these items, $383,[22] and are probably considerably smaller. If they were as large as $383, the net gain of participants would fall from $1,950 to $1,567 and the net loss to society would increase from $2,126 to $2,509. Thus, net program benefits would remain positive from a participant perspective and negative from the societal perspective. Indeed, this would be the case regardless of the actual size of the understatement.

[21] In percentage terms, a given change in the discount rate has a larger effect on the gains of program participants than the losses of the government and private donors because expenditures by the latter on operating costs and matching funds occurred within a few years of random assignment, but many participant benefits were not received until considerably later.

[22] According to Grinstein-Weiss et al. (2012a), of the total of $774 in matching funds per IDA participant reported in Table 3 of this report, 49.5%, or $383, subsidized participant expenditures on housing repairs and maintenance, investments in business, and savings for retirement and 50.5% subsidized participant home purchase and educational expenditures.

A Monte Carlo Analysis of the Base-Case Cost-Benefit Findings

In applying Monte Carlo analysis to the cost-benefit findings for the Tulsa IDA program, 2,000 separate trials (in essence, 2,000 separate cost-benefit analyses) were conducted. In each of these trials, the estimates of program's impacts on the impact estimates listed in Table 2 were replaced by random draws based on the normal distribution and within the range implied by the 95% confidence intervals of each of these estimates, as determined by their standard errors.[23] For each trial, each of the benefit and cost components listed in Table 3 were re-computed. This was not done in the case of the estimates of IDA's operating costs and matching funds expended, however, because the standard errors for these estimates are unknown. Hence, the identical estimate of operating costs and matching funds expended is used in each of the 2,000 trials. However, it was done for all of the Tulsa program's remaining benefit and cost components.[24]

Once the random draws were made, total net gains (or losses) from the participant, government, private donor, and social perspectives were then computed 2,000 times, once for each trial. The means of the resulting 2,000 estimates of total net gains (or losses) and their standard deviations were then calculated. The standard deviations of these means indicate the uncertainty concerning the estimates of net gains,[25] much as the standard error of an individual impact estimate indicates the uncertainty pertaining to that estimate. Thus, they can be used to estimate the confidence intervals surrounding the means. The proportions of the 2,000 estimates of net gains that are positive provide measures of the probability that the Tulsa IDA program was cost-beneficial, while the proportions that are negative indicates the probability that the program resulted in net losses.

Results from Monte Carlo analyses from each of the four perspectives appear in Table 5. The top row shows the base-case estimates of net gains or losses resulting from the Tulsa IDA program, which are reported in Table 3, while the remaining rows are derived from the Monte Carlo analysis. As discussed earlier, estimates of total net benefits for society as a whole are highly sensitive to assumptions concerning distributional weights. For that reason, findings from the societal perspective are presented using alternative distributional weights of 1.5, 2.0, and 3.0, as well as using no weights.

Table 5 indicates that the original estimates of total net benefits and those derived by averaging the net gain values over the 2,000 Monte Carlo trials are very similar. This is unsurprising because each Monte Carlo trial is based on random deviations from the original individual impact estimates. More

[23] It is possible that some of these estimates are correlated. For example, the Tulsa program's impact on income could have affected its impact on saving for retirement or making home repairs. Unfortunately, although these correlations are unlikely to be strong, it was not possible to estimate them in conducting the Monte Carlo analysis. Thus, for purposes of the Monte Carlo analysis, it was necessary to treat the impact estimates *as if* they are independent from one another.

[24] For reasons discussed in the Appendix, there is no standard error for the Tulsa IDA's impact on investment in education. Thus, in conducting the Monte Carlo, it was (somewhat arbitrarily) assumed the investments in education could have been as much as $20 higher or lower than the $89 value appearing in Table 3. It was further assumed that it is appropriate to specify a uniform distribution over this range. Because the impact on investments in education was so small, these assumptions have little influence over results from the Monte Carlo analysis.

[25] As mentioned in the footnote prior to the previous one, it was necessary to treat the estimates of the benefit and cost components *as if* they are independent from one another. As a result, to the extent the benefit and cost components are correlated, the estimates of the standard deviations of the means will be biased. Unfortunately, because the size and direction of these biases will depend on the size and direction of the correlations, which are unknown, they cannot be predicted.

Table 5. Summary Statistics from the Monte Carlo Analysis: Total Net Benefits

	Participants	Govt.	Donors	Society			
		Unweighted			Wt = 1.5	Wt = 2	Wt = 3
Original estimates of net benefits ($)	$1,951	-$2,575	-$1,501	-$2,125	-$1,150	-$175	$1,776
Mean net benefits from 2,000 trials ($)	2,037	-2,595	-1,501	-2,153	-1,040	-21	2,016
Standard deviation of mean ($)	2,055	1,522	0	1,394	2,218	3,164	5,150
Probability of net benefits being above 0 (%)	83.6	4.6	0.0	5.8	32.3	50.4	66.5
Probability of net benefits being below 0 (%)	16.5	95.5	100.0	94.2	67.7	49.6	33.6
Probability of net benefits being above $1,000 (%)	70.6	1.1	0.0	0.9	17.0	38.0	58.9
Probability of net benefits being below -$1,000 (%)	7.5	85.4	100.0	80.3	49.6	36.8	27.1
Probability of net benefits being above $3,000 (%)	32.7	0.0	0.0	0.0	3.3	16.6	42.7
Probability of net benefits being below -$3,000 (%)	0.8	39.9	0.0	26.0	18.2	17.2	16.7

importantly, the standard deviations of the average total net benefit estimates from the participant and societal perspectives are large relative to the averages themselves and, consequently, these estimates are surrounded by rather large 95-percent, or even 90-percent, confidence intervals. Indeed, these confidence intervals typically include a zero value, implying that, when assessed at the 5% or 10% level, they are statistically insignificant. This reflects the highly statistically imprecise nature of the program impact estimates upon which the net benefit values are based. Regression analyses indicated that 80% of the variation in the societal net benefit estimates is due to the relatively large standard errors associated with the impact estimates for home appreciation and home ownership duration, and 92% of the variation in the total net benefit estimates for participants is attributable to these two impact estimates and the impact estimates for monthly government transfer payments. These two impact estimates play a major role in determining total net benefits.

Because operating costs account for much of the total net costs from the government perspective and operating costs and matching fund expenditures account for all the total net costs from the private donor perspective, and random draws were not made for these expenditure items in conducting the Monte Carlo, the standard deviation is fairly small from the government perspective and zero from the donor perspective.

A closer look at the findings reported in Table 5 suggests that the probability that the net benefits from the Tulsa IDA were positive is well above 80% from the participant perspective. Indeed, the findings suggest that there is a strong likelihood that they were above $1,000 per program participant, although there is only about a 33% probability that they were above $3,000. The Monte Carlo findings indicate, in contrast, that it is a near certainty that net benefits are negative from the government and private donor perspectives. In fact, these costs probably exceeded $1,000 per IDA participant from each of these perspectives.

Table 5 implies that in the absence of using distributional weights, the probability that societal net benefits are negative would be well over 90% and that the probability that the loss to society exceeds $1,000 would be 80%. The probability that the loss exceeds $3,000 is only 26%, however. It is only when distributional weights are used in computing societal net benefits that it appears that there is some possibility that net societal benefits are positive. For example, Table 5 indicates that societal net benefits are about as likely to be positive as negative with a distributional weight of 2, a weight that implies that every dollar received by the low-income participants in the Tulsa IDA program should be valued at twice every dollar paid by the government and private donors to support the program. Indeed, the table suggests that at a weight of 2 there is a 38% probability that they exceed $1,000.

The distributional weight of 2 is smaller than the 2.5 value provisionally suggested by by Fujiwara (2010), which was mentioned earlier. However, despite the fact that Fujiwara's figure is based on a review of the literature, there is, in fact, great uncertainty concerning the appropriate value to use in cost-benefit analysis. Given the fact that transfer programs aimed at the poor do exist, it seems reasonable to expect that the distributional weight exceeds 1, but a value of 2 or more could nonetheless be too high.

One possible way of resolving this issue was suggested a number of years ago by Edward Gramlich (1990) who argued that if a program such as the Tulsa IDA results in a social loss when distributional weights are *not* used, then it is inferior to a simple transfer program such as TANF or

Food Stamps *if* that program can (potentially) redistribute the same amount of income to low-income persons at a lower social costs.[26] Using his own "simple analysis" and a general equilibrium analysis conducted by other researchers, Gramlich (1990) tentatively estimated that it costs taxpayers roughly around $1.50 to $2.00 to transfer a dollar to a recipient under a transfer program. Table 3 suggests that it cost taxpayers and private donors about $2.09 to transfer $1.00 to participants in the Tulsa IDA program. Consequently, according to Gramlich's estimates, the Tulsa program would appear inferior to a simple transfer program (although not by much) because a transfer program could, in principle, be used to make low-income persons as well off as the Tulsa IDA, but at a bit lower cost. However, this might not be true under a low-touch IDA with lower operating costs.

Assessing the Omitted Benefits and Costs

So far, the cost-benefit analysis has focused on only those benefits and costs that can be estimated and measured in dollars. Those that have so-far been omitted from the analysis and seem potentially important are considered next.

Impacts on psychological and health outcomes

It is possible that the Tulsa IDA program had effects on the psychological and health outcomes of some participants, although this was not a direct motivation for the program. These effects could be either negative (for example, if purchasing a home or investing in a business causes stress or aggravates a health problem) or positive (for example, if the accumulation of assets increases independence or improves life satisfaction or self-esteem).

The 10-year survey included a number of questions on psychological and health outcomes. Table 6 reports the mean value for these outcomes for respondents from the control group and the estimated impacts of the Tulsa IDA on these outcomes for respondents from the treatment group.

Most of the estimated impacts that appear in Table 6 are small and none are close to being statistically significant at conventional levels. Moreover, they do not consistently point in the same direction. Specifically, taken at face value, seven of the 18 estimated impacts appeared to imply improvements in psychological and health outcomes, while the remainder suggest these outcomes were either unchanged or moved in a negative direction. For example, the estimated impacts imply that detrimental drinking became less likely, but that smoking increased. Overall, it seems reasonable, to conclude that to the extent the Tulsa IDA had any effects on psychological and health outcomes, these effects were probably small, mixed, and offsetting. Hence, such effects are unlikely to change the conclusions from the cost-benefit analysis.

Deadweight cost of taxation

Table 3 indicates that the Tulsa IDA program worsened the government's budgetary position, both because of the cost of operating the program and because the program seems to have increased

[26] This statement is only valid to the extent the Tulsa IDA program did not result in non-financial benefits that exceed those resulting from simple transfer programs. As indicated in the following section, the available evidence suggests that it did not.

Table 6. Regression-Adjusted Estimates of Impacts on Psychological, Health, and Substance Use Outcomes

	Control Mean	Impact	Standard Error	p-value	Impact Implies Improvement
Psychological[#]					
CES-D 10-item depressive symptom score (higher scores indicate more depression)	6.69	0.62	0.44	0.16	
Zimbardo future orientation scale	1.18	0.00	0.03	0.91	
Stress (higher scores indicate greater stress)	23.25	0.22	0.54	0.68	
Health					
Body mass index	30.34	0.00	0.54	0.99	
Health relative to others your age (higher scores indicate poorer health)	1.69	0.02	0.07	0.78	
Health is poor or fair relative to others respondent's age (dichotomous)*	0.19	1.19	0.23	0.36	
Pain interferes with normal work (higher scores indicate more interference)	1.07	0.10	0.08	0.23	
Pain interferes with work not at all (dichotomous)*	0.40	0.98	0.15	0.77	
Pain interferes with work quite a bit or extremely (dichotomous)*	0.13	1.34	0.29	0.18	
Health limits moderate activities a lot*	0.10	0.90	0.24	0.68	√
Health limits ability to climb stairs a lot*	0.15	0.78	0.18	0.29	√
Medical expenses in the past year ($)	877.57	-25.25	72.66	0.73	√
Drinking behavior					
Drinks 2–3 times per week or more*	0.111	0.94	0.24	0.81	√
Binge drinks monthly or more*	0.089	0.76	0.23	0.36	√
Alcohol screen score (range 0–12)	1.576	-0.12	0.14	0.42	√
Meets alcohol screen threshold for brief intervention*	0.134	0.99	0.23	0.96	√
Smoking behavior					
Smoked in the last 30 days*	0.315	1.17	0.19	0.35	
Number of cigarettes smoked in past week	23.078	0.22	3.24	0.95	

Source: Adapted from Grinstein-Weiss et al. (2012a, Tables 4.17, 4.18, 4.19, and 4.20).

* Mean is a proportion; hence, impact is estimated as an odds ratio.

[#] Depressive symptoms were measured with the Center for Epidemiological Studies Depression 10-item scale (CES-D-10), stress was measured with questions developed by Cohen, Kamarck, and Mermelstein (1983), and future orientation was measured with the Zimbardo scale (Andresen, Malmgren, Carter, & Patrick, 1994; Cohen, Kamarck, & Mermelstein, 1983; Zimbardo & Boyd, 2003).

transfer payments. If this meant that taxes were higher than they otherwise would be (or equivalently, that valued public spending on other things is lower than it otherwise would be) economic distortions that are caused by taxes would rise. For instance, taxes on earnings reduce incentives to work, and taxes on investment reduce incentives to invest. These distortions (usually called 'deadweight losses' or 'excess burden' by economists) result in losses in economic efficiency. Thus, the possibility of increased deadweight losses because of increases in distortionary taxes (or, equivalently, declines in valuable public spending instead of additional taxes) is another potential cost of the Tulsa program, one that is imposed on the public at large.

Determining the size of the effect of the Tulsa IDA program on deadweight losses requires an estimate of the efficiency savings if taxes are reduced by $1, an estimate that is sometimes referred to

as the 'marginal excess tax burden' (METB). The value of this variable can be multiplied by the government's net losses to determine the social cost of an increase in deadweight losses. Based on a recent review of the relevant literature, one author suggests that .2 is a reasonable value to use for the METB.[27] Using this value and the base-case estimates reported in Tables 3 implies that the increase in deadweight loss resulting from the Tulsa program is $515. This increases the estimated social net loss of the program that is reported in Table 3 from $2,126 to $2,641.

Retirement benefits

It was anticipated that the one-to-one matching rate provided by the Tulsa IDA would induce program participants to increase their retirement savings. Had it happened, this would have resulted in a cost to participants because, as implied by positive discount rates, increased savings means that current consumption is reduced. Nonetheless, as a result of their increased savings, it was expected that program participants would reap benefits at retirement for at least three reasons:

1. Because the matching funds would cause their receipts at retirement to exceed the amount they saved out-of-pocket;
2. Because they would have earned interest on their savings;
3. Because their incomes would have presumably been lower and, given the diminishing marginal utility of income, a dollar would have greater value at retirement than earlier in life.

The first of the items listed above, participant receipts of matching funds, is included in the cost-benefit analysis. However, there has been no attempt to estimate the second and third of the items listed above nor to estimate the cost of postponing consumption. These omitted effects are difficult to determine, but they work in opposing directions, and there is reason to suspect that they are small. As shown in Table 2, the estimated impact of the Tulsa program's on savings for retirement is small, given the 10 years over which savings for retirement could potentially accumulate.[28] The estimated impact is also unexpectedly negative, albeit statistically insignificant.

Possible future benefits and costs

As previously mentioned, benefits and costs have been estimated for a 10-year period, which began at random assignment and ended with the 10-year survey because this is the period over which program effects could be directly observed. Thus, any benefits and costs that persist beyond this 10-year observation period have so-far been omitted from the cost-benefit analysis. It is obviously very difficult to predict the values of the benefits and costs of the Tulsa IDA program beyond the period over which they can be observed, particularly given the low levels of statistical significance of the estimates of the program's impacts. Nonetheless, it is important to make some attempt to assess these future benefits and costs.

Before beginning, it may be useful to point out that benefits and costs that occur beyond the observation period would be heavily discounted in estimating their value at the beginning of the Tulsa IDA program. For example, with a 3.5% discount rate, a benefit or cost that was received or

[27] Fujiwara (2010).

[28] The estimated impact is based on self-reported data about dedicated retirement accounts and, therefore, does not reflect savings intended for retirement, but saved in other ways, such as in general savings accounts.

incurred in year 11 would be multiplied by .68 and one that was received or incurred in year 20 would be multiplied by .5.

There are four benefits and costs that Table 3 suggests are sufficiently large to potentially affect conclusions from the cost-benefit analysis were they to persist beyond the 10-year observation period:[29]

- The program's impact on government transfer payments
- The rental value of housing received due to the program's impact on home ownership
- The program's impact on home purchase expenditures
- The program's impact on home appreciation

The following discussion focuses on these four cost-benefit components and, in addition, considers possible future benefits resulting from the Tulsa IDA program's impact on education.

Transfer payments. Table 2 implies that at the end of the 10-year observation period government transfer payments received by Tulsa IDA program participants were $130 larger as a result of the program. This finding is suspect because it is statistically insignificant and there is little theoretical reason to expect that an IDA would cause an increase in transfer receipts. Nonetheless, if it is valid, one would expect the effect to continue beyond the observation period, and the cumulative amount of money could be appreciable. The result would be that net benefits from the participant perspective would be larger than estimated in Table 3 and net benefits from the government perspective would be more negative. Hence, net benefits from the society perspective would be unchanged. Thus, the key conclusions based on Table 3—that net benefits for participants are positive and net benefits for the government and society are negative—do not change.

Rental value of home ownership and home purchase expenditures. An impact estimate in Table 2 implies that home ownership among the Tulsa IDA program participants was about 3 percentage points higher at the end of the observation period as a result of the program. This estimate is statistically insignificant and therefore is imprecise. However, *if* there was a positive effect on home ownership, it is reasonable to expect that it would persist beyond the observation period. If it did persist, both the benefits from owning a home and not having to pay rent and the costs from making mortgage payments would be larger as a result.[30] According to the 10-year survey, monthly payments on home mortgages among the survey respondents who owned a home exceeded monthly rental payments among respondents who rented by several hundred dollars (see the Appendix). This gap would be at least partially filled by the part of the monthly mortgage payments that accrue to equity, an amount that grows larger the longer a house is owned. Nonetheless, to the extent there is a gap, taking account of these post-observation period benefits and costs would reduce total net benefits from the participant perspective to less than the amount estimated in Table 3 and cause total net benefits from the societal perspective to be more negative than the figure appearing in Table 3 suggest.

[29] Program operating costs and matching fund expenditures are also relatively large. However, these costs obviously would not persist beyond the observation period.

[30] The estimate that appears in Table 3 of Tulsa program's impact on home purchasing costs includes estimates of the program's impact on down payments and closing costs, as well as its impact on monthly payments. Obviously, only the latter are likely to persist beyond the 10-year observation period.

Home appreciation. As implied by Table 3, there is some evidence that the Tulsa IDA benefited homeowners among program participants because their homes appreciated at a greater rate than they otherwise would have during the 10-year observation period. Perhaps, this impact on appreciation persisted beyond the end of the of the observation period. Given the collapse of the housing market that begin just as the observation period was ending, however, it is not clear that it did. Nonetheless, housing prices do not seem to have diminished as much in the Tulsa area as they did nationally (National Association of Realtors (2012). Thus, the overall evidence about whether future benefits from housing appreciation resulted from the Tulsa program is inconclusive.

Education. Grinstein-Weiss (2012b) found evidence that the Tulsa IDA increased the level of education among the treatment group by about 5 percentage points, although this estimate is not statistically significant (SE = .042, p = .236). This increase appears almost entirely attributable to the program's large (over 25 percentage points) and statistically significant impact on the educational attainment of males, who comprised slightly less than 20% of the sample. As mentioned earlier, the financial benefits from this impact during the 10-year observation period should, in principle, be captured in the cost-benefit analysis by the program's impact on income, net of transfer payment, as this measure incorporates the effects of education on earnings. However, Table 3 indicates that the impact on income, net of transfer payments, was slightly negative during the observation period. This estimate, however, is probably not just affected by education. For example, it could be also be influenced by the IDA's impact on investments in business or by the financial education courses. In addition, earnings are well known to diminish while individuals are in school. Still, there is no indication that earnings increased during the observation period as a result of the IDA program's impact on the level of education. Indeed, at the end of the observation period, the estimated impact on monthly income from work was -$145 ($p$ = .17; Grinstein-Weiss 2012a, Table 4.22). Nevertheless, it is still possible that earnings increased after the observation period ended. An absence of a program impact on earnings during the observation period but its later presence is especially likely if much of the investment in education occurred in the later half of the observation period, and there is evidence that it did (Grinstein-Weiss 2012b, p. 5).

Because no information exists about the earnings of the research sample after the end of the observation period, it is not possible to do more than suggest the possible order of magnitude of possible future benefits that could result from increases in educational attainment attributable to the Tulsa IDA program. To do this, I rely on a recent study by Orr and Patrabansh (2010). This study is among the very few to attempt to estimate the effect of increased education on the earnings middle-aged persons who returned to school. In this sense, it matches up well with participants in the Tulsa IDA who returned to school. The average age of the sample used by Orr and Patrabansh (2010) at entry into schooling was 39, while the average age of the sample in the Tulsa IDA experiment was 36 at the time of random assignment and 46 at the end of the 10-year observation period. Moreover, the members of both samples attended a mix of 2- and 4-year schools. However, Orr and Patrabansh ((2010) drew their sample from Baltimore and five contiguous counties, not Tulsa. Moreover, the mix of courses taken and degrees and certificates achieved undoubtedly differed between the two samples, but, unfortunately, the information to make a comparison does not exist.

For purposes of the current analysis, Orr and Patrabansh's key finding is that 5 years after the completion of schooling, men who returned to school were earning 20.6% more as a result and women were earning 11.7% more. These estimates are both statistically significant at the 1% level. Because most of the educational impact of the Tulsa IDA was apparently on men, this analysis relies

on the 20.6% estimate for males. Multiplying this estimate by $27,282, which is the Tulsa control group's average annual income from work at the end of the observation period, and then by .05, the estimate impact of the Tulsa program on educational attainment, implies that the average annual income from work of the treatment group was $281 higher as a result of the program's increase in the education level (.05 × .206 × $27,282). If the treatment group worked until they were 65, they could then potentially earn $281 in each of 19 years during the post-observation period (65–46). Assuming this to be the case and discounting the $281 received each year at 3.5% to the point of random assignment implies that the future benefit from the Tulsa IDA's impact on education will be $2,731, with $1,884 accruing to participants as earnings and $847 received by the government as taxes.

If these estimates are accepted at face value, they imply that the estimated net gain of $1,950 shown for participants in Table 3 would increase to $3,834, the government's net loss of $2,575 would fall to $1,728, and society's net loss of $2,126 would turn into a net gain of $605. However, for a number of reasons, these estimates are highly problematic; the actual returns to the Tulsa IDA's impact on education could be either substantially higher or lower. First, at a discount rate of 6%, rather than 3.5%, the estimated returns to education fall from $2,731 to $2,223, but at a discount rate of 2%, they increase to $3,123. Second, there is a wide confidence ban around the estimated 5 percentage point increase in education, which includes zero. The actual impact could be considerably larger or smaller. Third, as previously mentioned, Orr and Patrabansh (2010) used data from greater Baltimore, not Tulsa; and, perhaps more importantly, the mix of courses taken and degrees and certificates achieved by their study sample probably differ from the Tulsa IDA sample as well. There is no way to know how applicable Orr and Patrabansh's estimates of the returns to education are to the Tulsa sample. Finally, the absence of a positive impact of the Tulsa program on income from work at the end of the observation period would seem to suggest that it is unlikely that later effects on earnings will result from the program's impact on education. Thus, the estimate of the post-observation period earnings gains from the Tulsa IDA's impact on education should be viewed as no more that illustrative. The estimate suggests that it is certainly possible that the net gains to society from the program could eventually become positive, but it remains highly uncertain that this will actually occur.

Conclusions

This report presents findings from a cost-benefit analysis of the Tulsa IDA program. The base-case results, which appear in Table 3, imply that program participants gained from the program, that the program resulted in net costs to the government and private donors, and that society as a whole was worse off as a consequence of the program. The preceding section of the report examines whether these initial conclusions are robust to a number of different considerations including the assumptions upon which the base-case results depend, uncertainly reflected by the standard errors of the impact estimates used to derive the benefits, and costs, and omitted benefits and costs. Factoring in these concerns, it appears virtually certain that that the Tulsa IDA program resulted in net costs to the government and private donors and that it is highly probable that program participants were better off. The major open question concerns the conclusion that society as a whole suffered net losses. The remainder of this section focuses on this issue.

Table 7 summarizes various factors that were not considered in deriving the base-case estimates presented in Table 3, but were discussed in the previous section, and indicates how consideration of each affects the base-case societal net loss estimate. In other words, the table asks how the base-case societal net loss estimate in Table 3 would be changed if each of the listed considerations could be incorporated into it. As indicated by the table, incorporation of some of the listed items would make it even more negative. Others would make it less negative, but not by much. Only four considerations could potentially make a major difference in a positive direction. First, as previously discussed, the Tulsa IDA program was "high touch." Less could have spent in operating the program by, for example, providing less financial education. However, doing this might have reduced benefits resulting from the program and, even if it did not, the cost savings would not have been sufficient to eliminate the net loss to society as a whole. Second, it is possible that the impact of the Tulsa IDA on home appreciation continued beyond the observation period. However, as discussed earlier, it is not possible to draw any firm conclusions about this. Moreover, to eliminate the estimated net loss to society shown in Table 3, the program's impact on appreciation would have to be almost double the estimated amount during the 10-year observation period. This seems unlikely. Third, net societal losses are diminished if dollars received by low-income persons are viewed as of more social value than dollars paid by higher income persons and, consequently, societal net benefits are computed using distributional weights. Indeed, with sufficiently large weights, estimated societal net benefits turn positive. However, as discussed previously, such weights appear near, and possibly above, the high end of the plausible range. Fourth, the Tulsa IDA program appears to have had a positive impact on educational attainment, at least for male participants. It appears plausible, although far from certain, that the societal net benefits of the Tulsa program could eventually become positive. This would occur if the program's positive impact on educational attainment generates substantial positive effects on the earnings of program participants after the observation period ended. However, there was no evidence that they had yet begun to produce positive effects on earnings by the end of the observation period.

Table 7. Effect of Considering Factors Not Incorporated into the Base-Case Estimate of the Societal Net Loss

Additional Considerations	**Effect on Societal Net Loss**
Reducing operating costs	Probably positive
Higher discount rate	Negative, but small
Lower discount rate	Positive, but small
Accounting for survey respondent's understatements of investment expenditure*	Negative, but probably modest
Inclusion of impacts on—	
Psychological and health outcome	Direction uncertain, but effect probably small
Deadweight loss	Negative and probably moderate
Retirement benefits	Direction unclear, but effect probably negligible
Inclusion of post-observation period impacts on—	
Transfer payment receipts	None
Benefits from rental value of owning home	Positive
Costs of monthly mortgage payments	Negative, and likely larger than rental value of ownership
Home appreciation	Possibly positive, but very uncertain
Earnings as a result of increased education	Positive, and possibly large, but magnitude problematic
Using distributional weights	Positive, and large if weight is large

*Pertains to expenditures for home repairs and on businesses and savings for retirement.

Appendix

This appendix describes how each of the measures of costs and benefits that were used in the cost-benefit analysis, other than operating costs and matching fund expenditures, was constructed. The sources of the estimates of expenditures on operating costs and matching funds are discussed in the main text.

1. Impact on Income

Winsorized impact estimates of total monthly money income net of government transfer payments and of total monthly government transfer payments are available from the 18-month survey, the 4-year survey, and the 10-year survey. Thus, for each type of income, estimates are available for only three widely separated months. To obtain impacts for the remaining 117 months during the 10-year span covered by the cost-benefit analysis, it was necessary to interpolate between the 3 months for which estimates exist. In doing this, it was assumed the impact was zero during the month prior to random assignment. The 120 estimates that were available once the interpolation was completed were summed in order to obtain single measures of the impact on total monthly money income net of government transfer payments and the impact on total monthly government transfer payments.

2. Rental Value of House for Months of Impact on Ownership

This benefit is estimated as the product of the impact on the duration of homeownership and monthly rental value. Estimates of these two values are described next.

The estimated program impact on the duration of homeownership over the entire 10-year observation period is .180 years or 2.16 months (.180 × 12).

Among the 184 control group members who were renters and who provided information on their monthly rent on the 10-year survey, the reported mean monthly rent was $484.13 per month.

3. Impact on Appreciation on Home

As shown in Table 2, the estimated winsorized impact on the appreciation rate (i.e., appreciation per year of homeownership) is $477.64. For many homeowners, appreciation of the home is a *potential* benefit; that is, it is not realized until the home is sold. According to the 2007 American Community Survey, the median single family home in the Midwest is owned for 17 years (Emrath 2009). If the impact on homeownership occurred during the experimental period, 1999–2003, this would imply that the median home will not be sold until around 2018. This was taken into account in discounting.

The control group averaged 4.5 years or 54 months of homeownership between 1999 and 2009. Thus, the treatment group averaged 54 + 2.16 = 56.16 months (see item 2) or 4.68 years. This implies that the impact on appreciation over the observation period was $2,235.35 (4.68 × $477.64).

4. Impact on Equity in Home

This benefit is computed as the sum of the Tulsa IDA program's impact on down payments and its impact on the part of monthly home payments that accrues to principle. For many homeowners, this is a *potential* benefit; that is, it is not realized until the home is sold. Like appreciation on the home (see item 3), this was taken into account in discounting.

As reported in Table 2, the estimate of the treatment impact on homeownership is 2.9%. The product of this figure and the estimate of the average down payment amount provides an estimate of the treatment impact on down payments. For those in the treatment group purchasing a home, including those not making a down payment, the winsorized mean down payment is $3,192. Therefore, the estimated impact on the down payment is $92.57 (.029 × $3,192).

According to the 10-year survey, the average loan amount for homes purchased since random assignment was $72,620 for the treatment group and $73,802 for the control group. The mean length of the time the loan had existed at the time of the 10-year survey was 5.2 years for the treatment group and 4.7 years for the control group. The mean interest rate on the loan at the time of the 10-year survey was 6.51% for the treatment group and 6.36 for the control group. The mean length of the mortgage at the time of the 4-year survey (this information was not collected on the 10-year survey) was 25.4 years. Year 4 of the loan seems a reasonable point at which to compute the amount going to principal. That amount would be $1,497 per year, or $125 per month, for a fixed interest 25-year loan of $72,620 at an interest rate of 6.51%. The part of the monthly payment that goes towards the principle is then multiplied by the Tulsa program's estimated impact on housing ownership duration, 2.16 months (see Table 2) to derive the Tulsa program's impact on the part of monthly home payments that accrues to principle. (This probably results in a small overstatement because about 75% of the respondents to the 10-year survey indicated that their mortgage amount included property taxes and insurance costs.)

5. Impact on Income Taxes Due to Impact on Home Ownership

This benefit, which is due to the property tax deduction, is very small given the Tulsa program's small impact on the duration of homeownership and the low percentage of taxpayers who itemize. According to Gerald Prante of the Tax Foundation ("Fiscal Fact No. 95," July 2007) only 16% of Oklahoma taxpayers with incomes under $50,000 in the 2005 tax year itemized (the average over all income groups in Oklahoma was 31%). The combined marginal federal, state, and local tax rate faced by the treatment group in 2004 was about 31%.[31] The product of these two figures is

[31] This was computed using the National Bureau of Economic Research's Internet TAXSIM Model Version 9.0. Also see Marginal Tax Rate Calculator-Smart Money.com (2011), "What's Your Marginal Tax Rate?" and The Tax Foundation (2011), "Marginal Tax Rates Calculator" for the marginal federal income tax faced by low-income

multiplied by the impact on property taxes (see item 9) in order to determine amount of the deduction.

6. Impact on Business Equity

As indicated in Table 2, the estimated winsorized impact on the change in business equity is -$95.83. For many business owners, this is a *potential* (negative) benefit; that is, it is not realized until the business is sold (see item 3).

7. Taxes on the Impact on Income

This can be determined as product of the impact on income and the combined federal, state, and local marginal tax rate on income faced by the treatment group, which was about 31% (see item 5).[32]

8. Impact on Home Purchase Expenditures

This cost is computed by summing *program impacts* on (a) down payments, (b) payments on the home loan, and (c) closing costs. The computation of each of these items is described next.

a. Down payments

As shown in Table 2, the estimate of the treatment impact on homeownership is .029. The product of this figure and the estimate of the average down payment amount provides an estimate of the treatment impact on down payments. For those in the treatment group purchasing a home, including those not making a down payment, the winsorized mean is $3,192. Therefore, the estimated impact on the down payment is $92.6 (.029 × $3,192).

b. Payments on the home loan

Payments on the loan are estimated as the product of the average amount of the monthly payment on the loan and the Tulsa program's impact on housing ownership duration. According to the 10-year survey, the average amount of the monthly payment on the loan for currently outstanding mortgages on homes purchased during the program period at the time of the 10-year survey was $878. However, about 75% of the survey respondents included property taxes as part of their loan payment. Thus, I reduced the $878 amount by three-quarters of the amount computed under item (9) to prevent double counting.[33]

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households; and Government of the District of Columbia (2009), "Tax Rates and Tax Burdens in the District of Columbia – A Nationwide Comparison" for the state and local tax rate faced by low-income residents of Tulsa.

[32] See the previous footnote.

[33] A possibly superior measure is the impact on total payments over the entire observation period, but this measure is not available.

c. Closing costs

Total closing costs in Oklahoma in 2010 on a loan amount of $200,000 were $4,254 or 2.1% (http://www.bankrate.com/finance/mortgages/2010-closing-costs/oklahoma-closing-costs.aspx). This is probably higher than the downpayment for the IDA experiment sample because the experiment was run earlier than 2010 and the loan amounts were less than $200,000. Indeed, the 10-year survey found that the average loan amount for homes purchased since random assignment was $72,620 for the treatment group and $73,802 for the control group. Therefore, I assumed that closing costs were around $2,000 for the treatment group. As shown in Table 2, the estimate of the treatment impact on homeownership is .029. Using the $2,000 estimate for closing costs, this would imply that the Tulsa program's impact on closing costs was $58 ($2,000 × .029).

9. Impact on Property Taxes

This cost can be estimated as the product of the annual amount of property taxes paid by homeowners and the Tulsa program's impact on housing ownership duration. However, the effect of purchasing a home on property taxes depends on the tax's incidence on renters. To the extent renters pay property taxes as part of their rent, the amount of property taxes they pay when they purchase a home will not result in an increase in taxes. Studies of the incidence of property taxes vary considerably. However, a careful study by Carroll and Yinger (1994) on property taxes in communities in the Boston area found that landlords pay 85–90% of an increase in property taxes, but only 45% of existing property taxes. Renters pay the remainder. The latter figure is the relevant one for the cost-benefit analysis. However, estimates for the Boston area do not necessarily apply to Tulsa. Nonetheless, the 45% estimate is used for purposes of the cost-benefit study. However, the estimate of the impact on property taxes is sufficiently small that findings from the analysis would be little affected by an alternative value.

The annual amount of property taxes paid by homeowners at the time of the 10-year survey was $912. This figure is based on the 81 respondents to the 10-year survey who had non-zero values for the amount of property tax they paid at the time of the survey. The number of respondents is small because only current mortgage holders were asked the amount of their property tax (for instance, an owner with no outstanding mortgage was not asked).

10. Impact on Home Repair and Maintenance Expenses

As shown in Table 2, the estimated impact on the winsorized expense amount is -$77.04. This estimate pertains to the entire observation period, which is what is needed for the cost-benefit analysis. The negative point estimate implies that the Tulsa program's substantial positive impact on home appreciation (see item 3) was not due to investments in home repairs and maintenance.

11. Impact on Investments in Business

As shown in Table 2, the estimated impact on initial investments in business is $219.34. Because only initial investments were asked about in the surveys, ongoing capital infusions were not captured.

12. Impact on Investments in Education

The survey data needed to estimate this impact do not exist. However, only 6.6% of the matching funds, an average of $48 per treatment group member ($721 × .066), were used for education. Given the 1:1 matching rate, if the product of $48 is multiplied by 2, this provides an *upper bound* estimate of the impact on positive impact on education. The resulting $96 figure is too large because some of it would have been invested even in the absence of the IDA. However, most of the subsidy amount of $48 probably would not have been invested in the absence of the IDA. Therefore, $48 is a reasonable lower bound. The true figure may be closer to the upper than the lower bound because there is some evidence that the treatment had a non-trivial impact on educational investment, especially at the college level (see Grinstein-Weiss et al. 2012a, Table 4.9). Consequently, in the cost-benefit analysis, I use $80 as the Tulsa program's impact on educational investment. Even if the lower bound (or the upper bound) is the correct figure, the difference from $80 is so small that this would have a trivial effect on the cost-benefit findings.

13. Impact on Savings for Retirement

As shown in Table 2, the estimated impact of the Tulsa IDA program on the winsorized mean value of retirement savings is -$346. This unexpected negative, albeit statistically insignificant, estimate implies that the Tulsa program was unlikely to result in benefits at the time of retirement.

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