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Abstract

Our paper utilizes variation across the 50 U.S. states to examine the relationship between public expenditures on children and child outcomes. We find that public expenditures on children are related to better child outcomes across a wide range of indicators including measures of child mortality, elementary-school test scores, and adolescent behavioral outcomes. States that spend more on children have better child outcomes even after taking into account potential confounding influences. Our results are robust to numerous variations in model specifications and to the inclusion of proxies for unobserved characteristics of states. Our sensitivity analyses suggest that the results we present may be conservative, yet our findings show that public investments in children yield broad short-term returns in the form of improved child outcomes.

I. Introduction

The government spends approximately $6,000 per child each year on education, social programs, and tax exemptions for parents. Two-thirds of this amount is determined at the state and local level, suggesting that expenditures on children vary widely across the 50 states. In the tradition of cross-national research, we use this state-level variation to examine the relationship between public expenditures and child outcomes.

Understanding how variations in state expenditures affect child outcomes is particularly important in the current policy and fiscal contexts. In recent years, more policymaking authority has devolved from the federal to the state level. The 1996 welfare reform legislation transferred greater autonomy to states, leading to increases in policy variation. The impending reauthorization of the welfare reform act, recent changes in state education policies and different approaches to Children's Health Insurance Programs (CHIPs) promise even greater variation in coming years. Added to this, many states are facing their worst budget deficits in 50 years and may be forced to cut social programs (Lav and Johnson 2003; National Governors Association 2002).

A leading rationale for public expenditures on children is that today's investments will yield future returns by producing a healthy and productive workforce (Blank 1997). This paper examines the short-term returns on public investments in children. If investments have a positive short-term impact, they are also likely to yield longer-term returns such as increased earnings, reduced crime and imprisonment, and reduced welfare dependence. We analyze child outcomes in several domains: child health and mortality, standardized test scores, child poverty, and adolescent behavior.

Our measures of public expenditures are uniquely comprehensive and detailed. We build upon work by Bainbridge (2002), which estimates public expenditures on children across more than thirty social programs and tax credits in 1996. Our expenditure data allow us to estimate the

effects of specific types of expenditures on child outcomes, such as Medicaid and spending on public education. In addition, we estimate the relationship between child outcomes and a broad measure of public expenditures that represents the sum total of what children receive from public sources. We compare our measure of 'dollars spent' on children to two alternative measures of public investment: AFDC benefits levels and a five-category classification scheme of welfare generosity developed by Meyers, Gornick, and Peck (2001).

The next section reviews prior research. Section III describes our data and methods. Sections IV and V present the descriptive and regression results, then Section VI discusses our findings.

II. Prior Research

Compared with other industrialized countries, welfare state spending in the United States is relatively low and child poverty rates are relatively high (Smeeding, Rainwater, and Burtless 2002; Kamerman and Kahn 1997; Cornia 1997; Bradbury and Jantti 1999, 2001; McLanahan and Garfinkel 1994; Phipps 1999a; 1999b; Smeeding, Danziger, and Rainwater 1997; Kenworthy 1999). Many studies suggest that meager benefits and high rates of child poverty in the United States are causally linked. Blank and Hanratty (1993), for example, report that child poverty would be dramatically reduced if the United States were to adopt the Canadian welfare state programs. Other research has shown that the introduction and expansion of social programs as part of the War on Poverty coupled with the strong economy of the late 1960s led to a large decline in child poverty between 1960 and 1970 (Seccombe 2000; Danziger, Haveman, and Plotnick 1986; Haveman 1994; U.S. Census Bureau 2002). Similarly, the strong economy of the late 1990s and the large expansion of the Earned Income Tax Credit (EITC) in the middle of the decade are credited with further reductions in child poverty (Burtless and Smeeding 2002).

The full effects of social spending on child well-being are not captured by the official United States poverty rate however. Spending on in-kind programs, such as Medicaid, food stamps, and housing has increased rapidly since the mid-1960s, yet these expenditures are not reflected in the United States poverty rate (Burtless 1986, 1994). For this reason, we must look beyond the poverty rate to capture the total benefits of social spending on children.

A review of evidence from intensive early childhood interventions indicates that investments in children can be associated with reductions in crime and welfare dependence, increased earnings, and increased IQ scores (Karoly et al. 1998). Other studies show that social programs improve some birth outcomes. The introduction of Medicaid in 1965 and expansions of eligibility and services in the 1980s and 1990s, for example, are associated with a decline in infant and child mortality and improvements in child health. No relationship was found, however, between Medicaid and low birth weight (Lykens and Jargowsky 2002; Currie and Gruber 1996; see Meara et al. 2002 for a review).

The evidence is mixed on the relationship between expenditures on education and child outcomes such as standardized test scores. On one side of the debate, Hanushek argues that expenditures are not associated with improvements in test scores (Hanushek and Luque 2002; Hanushek 2001; Hoxby 2002; Hanushek and Somers 2001). On the other side, Krueger presents evidence that educational investments yield positive returns (Krueger and Whitmore 2001). A related body of research links educational spending to longer-term outcomes and finds that educational expenditures are associated with greater future earnings (Akin and Garfinkel 1977; Card and Krueger 1992).

The generally mixed evidence on the relationship between expenditures and child outcomes in prior research means that it is unclear whether to expect government expenditures to be associated with better child outcomes at the state level. Furthermore, parental investments of time or money and other environmental influences on child well-being are likely to vary across

states and may overwhelm the effects of public expenditures. Our analysis provides new evidence on the relationship between public expenditures and child outcomes and takes into account potential confounding influences.

III. Data and Methods

Public Expenditures. Our data on public expenditures on children were collected by Bainbridge (2002) from a variety of sources that include over 30 types of social programs and tax credits. All of the expenditure data pertain to 1996. In our analysis, we estimate the relationship between aggregate public expenditures and a range of child outcomes. In addition, we estimate relationships between education and Medicaid expenditures and related outcomes. Expenditure amounts are divided by the number of children in the state to make investment measures comparable across states.

The aggregate public expenditure measure is a comprehensive measure of what children receive in public investments.[1] Most of the programs and tax credits included in our measure do not benefit children exclusively. Bainbridge (2002) used USDA estimates of the proportion of family consumption by children to estimate the proportion of public expenditures that go to children. Generally, the rules for allocating public expenditures to children are that money directly spent on children (e.g., expenditures on education or nutrition programs such as school lunch or breakfast) is counted in total, while money spent on families (e.g., Medicaid, Food Stamps, AFDC, EITC) is allocated to children based on USDA estimates of the proportion of family consumption by children (Lino 1997). For example, according to our formulas 16 percent of Medicaid expenditures and 35 percent of food stamp expenditures, on average, went to children.

We compare our new measures of public investments with two other approaches to measuring public investments in children. First, we compare our measure of public investments

with a welfare state classification scheme developed by Meyers, Gornick, and Peck (2001). Instead of measuring programs in terms of dollars spent, these authors group U.S. states into five categories that describe the extent of their welfare state provisions. Their five categories—minimal, limited, conservative, generous, and integrated—were based on 11 social programs that overlap with the programs encompassed by our aggregate expenditure measure. Notably, education expenditures are excluded from their classification scheme but included in our aggregate investment measure. Although their categories are intended to be qualitative, they do to some extent correspond to a continuum of welfare generosity. Second, we compare our measures of public investments to welfare benefit levels in 1996, which are often used as a proxy for welfare state generosity.

Appendix Table A compares the categorization of state generosity according to the Meyers, Gornick, and Peck scheme, our measure of aggregate expenditure measures, and AFDC benefit levels. In this table we group states into five categories based on public expenditures on children and five categories based on AFDC benefit levels. The correlation between state groupings based on the three measures of public investment are high. The correlation between rankings based on public expenditures and the MGP rankings is 0.59, and the correlation between rankings based on public expenditures and AFDC benefit levels is 0.54.

Child Outcomes. Our outcome data are measured at the state level and come from the Kids Count data and the National Center for Education Statistics. As shown in Table 1, the indicators span the age range from birth to adolescence as well as a range of domains. Indicators pertain to 1996 except where otherwise noted.

The health and mortality indicators come from data from the Center for Disease Control and Prevention and the National Center for Health Statistics, compiled in the Kids Count database. The test score data were available for between 35 and 43 states from the National Assessment of Educational Progress (NAEP) reports (U.S. Department of Education 2001,

1999a, 1999b). The math scores were measured in 1996, but the reading and writing scores were measured in 1998. Because the expenditure data cover 1996, expenditure levels do not correspond precisely to reading and writing score outcomes.

The teen birth rate and young teen birth rate were compiled by the Kids Count project from data from the Center for Disease Control and Prevention and the National Center for Health Statistics. The high school dropout and idleness measures were estimated from the Current Population Survey for the Kids Count project and represent an average for 1995-1997. Crime arrest rates were compiled by Kids Count from the National Archive of Criminal Justice Data at the University of Michigan. Arrest rates are an indicator not only of juvenile delinquency but also of the vigor of enforcement of property and violent crime laws. Our last indicator is the child poverty rate, defined as the percent of children 0-18 years old who fell below the United States poverty line in 1996. The child poverty data come from the U.S. Census Bureau, Small Area Income and Poverty Estimates Program, and were compiled as part of the Kids Count data collection project.

Control Variables. In our analysis we include controls for parental (monetary) investments in children, parents' education, family structure, and racial and ethnic composition at the state level. We test the sensitivity of our results to the inclusion of additional control variables or to the exclusion of some of the control variables in Section V.

States may vary systematically in private resources invested in children. States with wealthier citizens have a greater capacity to invest in social programs because of the richer tax base. Therefore, the effect of public investments on outcomes may actually reflect the effect of parents' income on both public investments and outcomes. To control for this confounding influence, we include a measure of "parental investments" in children. Our measure of parental investments is derived using USDA estimates of expenditures on children (Lino 1997). The USDA calculates average per-child outlays based on family structure (one- or two-parent),

family income group (low, medium, or high), family size, age of child, and region of the country.[2] To obtain state estimates of expenditures on children, we multiplied each cell in the USDA table by the number of children in the March Current Population Survey that match that cell and summed the results. Public cash programs are then subtracted from the parental investments to avoid double-counting. In our sensitivity analysis we substitute median income in a state for the consumption based measure of parental investments.

Parents' education is likely to be related to child outcomes and may influence public expenditures on children. We control for the proportion of adults in a state with a high school degree and proportion of adults with a college degree, which we obtained from U.S. Census Bureau estimates. Because the level of public investment in a state is likely to have influenced the educational attainment of the adult population, controlling for adult educational attainment may lead us to underestimate the effects of investments on child outcomes. To gauge the extent of this potential underestimation, we test the sensitivity of our results to the exclusion of the adult educational attainment control variables.

Prior research has found that children growing up with a single parent tend to fare worse on a broad range of indicators compared with children who grow up with two biological parents (McLanahan and Sandefur 1994). States that have a high proportion of children living with single parents will be likely to have worse child outcomes, on average; therefore, we control for the proportion of families in a state that are headed by a single parent. The estimates are averages from the 1995-1997 Current Population Surveys.

Prior research has also documented the greater incidence of negative outcomes for African-American and Hispanic children compared with white children. The worse outcomes for African-American and Hispanic children are likely to be related to poverty, residential segregation, discrimination, and family structure. We control for the proportion of children who are African-American and the proportion of children who are Hispanic in a state.

We intentionally omit some state characteristics that warrant discussion. State characteristics such as political party leadership and age structure may be related to the level of public investments in children but will not affect the estimated relationship between investments and outcomes. For example, the proportion of democratic representatives and the age structure of a state may affect the level of public expenditures, but these state characteristics do not have any clear direct effects on child outcomes. Rather, any effects of the political party of representatives or the age structure of a state on child outcomes are likely to result from their effects on public investments.

Methods. In our analysis, we use ordinary least squares regressions to estimate the relationship between public investments in children and child outcomes across the 50 states, controlling for potential confounding variables. In most cases, we analyze 50 observations, one for each of the U.S. states. In some cases, data were not available in every state. We analyzed dfbeta statistics (a measure of the difference in the beta value if a particular observation is omitted) to ensure that no individual states were overly influential in any of our models. Despite wide variation across the 50 states in expenditures and outcomes, with rare exceptions no state had undue influence on the regression estimates. In fact, some of the results reported below would have been strengthened by omitting one or two states with the most influence on our estimates.

Omitted variable bias is an obvious danger in our cross-sectional analysis. Unobserved characteristics of states may be related to both public investments in children and to child outcomes. Unobserved characteristics such as a strong commitment to child well-being on the part of average citizens may be associated with increased public investments in children and better child outcomes, which would bias our estimates of the effects of public investments upwards. On the other hand, public investments may be a response to the extent of disadvantage

faced by children in the state, which would bias our estimates toward downwards. On balance, the direction of the bias is unclear.

Our analysis takes several approaches to strengthen confidence in the observed relationships between public investments and child outcomes. First, we control for the most important observed state characteristics: parental investments in children, family structure, parents' education, and racial and ethnic composition. Second, when we find that expenditures are associated with better child outcomes, we compare the effects of expenditures that are theoretically linked to outcomes alongside the effects of expenditures that we do not expect to be related to outcomes. Third, we estimate the effects of expenditures that we expect to be linked to outcomes while controlling for expenditures that should not be related to outcomes. The unrelated expenditures serve as a proxy for state generosity toward children. Fourth, we test the sensitivity of our estimates to the inclusion of additional control variables such as child poverty, the exclusion of control variables, and adjustments for the cost of living. Fifth, we use elderly poverty as a dependent variable as a specification test. None of these strategies fully addresses omitted variable bias, but together they strengthen our confidence in the reported results.

IV. Descriptive Results

Table 2 shows wide variation across states in the range of child outcomes. The infant mortality rate in the worst state (Mississippi) is 2.5 times as high as the rate in the best state (Maine). This range between the best and worst states is typical. For most indicators the worst state is 2 to 3 times higher than the best state. The range between best and worst is even larger for high school dropout, idleness, teen birth rates, and crime arrest rates. The same states tend to cluster at the two ends of the continuum. The southern states, particularly Louisiana and Mississippi, are consistently among the worst states with respect to child outcomes, whereas the New England states—Connecticut, Maine, New Hampshire, and Vermont—are consistently

among the best. Race and ethnicity are strongly correlated with child outcomes. The greater the proportions of a state's children who are African-American or Hispanic, the worse the child outcomes tend to be.

Table 2 shows that public investments in children also vary widely across states. Aggregate expenditures range from $3,881 per child in Utah to $8,500 per child in New York. Almost two-thirds of these expenditures are for education. Yet even when education expenditures are omitted, the highest state still spends about twice as much as the lowest state and Utah and New York remain the lowest and highest spenders.

Prior research suggests that welfare state spending is less generous in states with a greater proportion of minorities; however, there is no relationship between racial composition and overall levels of public expenditures. As in prior research, we do find a strong negative relationship between AFDC benefit levels and the proportion of children who are African-American.

We have seen that expenditures on children and child outcomes vary widely across the U.S. states. In the next section, we estimate the relationship between various measures of public investment and child outcomes across the states to garner evidence on the magnitude of "returns" on public investments in children.

V. Regression Results

The Relationship between Investments and Outcomes

Table 3 shows regression estimates from a model in which child health and mortality indicators are regressed on Medicaid expenditures and controls for parental investments in children, family structure, adult educational attainment, and racial and ethnic composition. Medicaid expenditures range from a low of $133 per child in Idaho to a high of $752 per child in New York. Medicaid expenditures are not related to the infant mortality rate or the percent of

babies born with low birth weight. However, a $100 increase in Medicaid expenditures (per child) is associated with a 1.9 percentage point decrease in the child death rate, which represents a 7 percent decrease relative to the U.S. state average.

For the most part, the relationship between the control variables and the child outcomes conform to our expectations. Parental investments in children are associated with reduced infant mortality and child death rates, although not to reductions in low birth weights. The proportion of families headed by a single parent is positively associated with low birth weight and mortality in a bivariate model but not in the multivariate model in Table 3 because of the high correlation between family structure and racial composition. We would expect greater levels of adult educational attainment in a state (a proxy for parents' education) to be associated with better child health and mortality outcomes, and the results for college education follow our expectations. Adult high school education, however, is positively related to infant and child mortality, which is not expected. Consistent with prior research, states with a greater proportion of African-American children have higher rates of low birth weight and infant and child mortality.

Table 4 shows the relationships between five different measures of public investment and child health and mortality. This table compares the effects of Medicaid expenditures (Model 1) with the effects of non-education expenditures (Model 2), the broader measure of public expenditures (Model 3), the Meyers-Gornick-Peck (MGP) classification scheme (Model 4), and AFDC benefit levels (Model 5). In each model, control variables are included that hold constant differences in parental investments in children, family structure, adult education levels, and racial and ethnic composition across states.

As shown previously, Medicaid expenditures are related to the child death rate but not to birth outcomes. In Models 2 and 3, we find that broader measures of public investments are not significantly related to birth outcomes or the child death rate. According to Model 4, none of the

MGP categories affect infant mortality, but states categorized as more generous (in the "generous" or "integrated" categories) in the MGP scheme have a lower rate of low birth weight than states categorized as "minimal." States categorized as more generous ("limited," "generous," or "integrated" categories) have lower rates of child death than "minimal" states. Finally, AFDC generosity is associated with a lower incidence of low birth weight and a lower child death rate. AFDC benefit level is the only measure of public investment that is related to low birth weight. The relationship between AFDC benefit levels and the child death rate is slightly weaker than the relationship between Medicaid expenditures and the child death rate.

Table 5 shows the relationships between public investments and better scores on math tests in fourth and eighth grade and on reading tests in fourth grade. Education expenditures range from a low of $2,516 per child (not per pupil) in Utah to a high of $5,654 per child in New Jersey. An extra $1,000 expenditure on education is associated with a 3.4 to 4.0 percentage point reduction in low scores on math or reading tests. In percentage terms, these reductions are about 10 percent relative to the U.S. state mean on these indicators.

Most of the control variables are not significantly related to test score outcomes, but the exceptions conform to expectations. A higher proportion of high school graduates in a state is associated with better eighth grade math scores. A higher proportion of African-American children is associated with lower fourth grade math scores. A higher proportion of Hispanic children in a state is associated with lower fourth grade reading scores.

Table 6 shows the relationship between five different measures of public investment and standardized test scores. Model 1 repeats results from Table 5. Model 2 uses non-education expenditures as the measure of public investment. As we would expect, education expenditures are more strongly related to test score outcomes than non-education expenditures. Non-education expenditures are positively related to low test scores, but the effect is not statistically significant. Model 3 combines education and non-education expenditures together and finds that this

aggregate measure of investments in children has a weaker effect on test scores than education expenditures alone.

Although the MGP classification scheme does not incorporate education spending, Model 4 finds that states with more extensive welfare provisions, according to the MGP scheme, tend to have better math test score outcomes (especially in eighth grade) than states with minimal provisions. The MGP categories are not predictive of reading or writing scores however. The relationship between AFDC benefit levels and test scores are the opposite of what we might expect: higher AFDC benefits are associated with lower test scores but the effects are not statistically significant.

Table 7 shows that larger investments in education are associated with lower rates of high school dropout and teen birth. An extra $1,000 public investment per child is associated with a 1.4 percentage point decrease in the high school dropout rate, a 3.1 percentage point drop in the birth rate of young teens (15-17 years), and a 5.5 percentage point drop in the birth rate of teens (15-19 years). In percentage terms, the $1,000 investment is associated with a 10-15 percent reduction relative to the state average for each of these indicators. Education expenditures are not associated with the teen idleness rate, the property crime arrest rate, the violent crime arrest rate, or child poverty.

For the most part the control variables in Tables 5 and 7 have the expected effects. However, parental investments are positively associated with the high school dropout rate. This relationship is surprising and is partially driven by an outlier. Nevada, which has the highest rate of high school dropout, also has a relatively high level of parental investment in children. When Nevada is excluded, the coefficient on parental investments drops to 1.07 and becomes insignificant.

Table 8 shows the relationship between 5 different measures of public investment and adolescent outcomes and child poverty. Model 1 repeats the results from Table 7. Model 2 shows

that non-education expenditures are associated with an *increase* in teen idleness and violent crime arrest rates but not significantly related to other adolescent outcomes or to child poverty. Model 3 shows that total public expenditures on children have a similar but weaker relationship to adolescent outcomes and child poverty as education expenditures. Model 4, which includes the MGP classification scheme, shows that more extensive welfare state provisions are associated with improved teen outcomes: lower high school dropout, idleness, and teen birth rates. And Model 5 shows that AFDC generosity is associated with lower rates of high school dropout and teen birth rates, although the effects are only marginally significant.

Sensitivity Analysis

In order to increase our confidence in the relationships estimated in Tables 3, 5, and 7, we tested the sensitivity of our results to several different model specifications. The conclusions from the results presented above were largely unchanged by the variations on the model and in some cases were strengthened. The rest of the significant relationships between public expenditures and child outcomes were robust. In several of the model variations, new effects emerged: education expenditures, for example, became significantly related to reading and writing test scores.

We tested the sensitivity of our results to the inclusion of controls for the percent foreign born or the child poverty rate; to the substitution of median income for our measure of parental investments; and to the application of a cost-of-living adjustment to expenditure measures. [3] Each of these modifications yielded results that were as strong as or stronger than those presented previously. In some of these modified models, new effects emerged. In models that controlled for foreign born or median income and in the model that applied a cost-of-living adjustment, education expenditures were related to better reading and writing test scores.

We also tested the sensitivity of our results to the omission of controls for adult educational attainment in the state, which are likely to be endogenous. As we would expect,

some of the relationships between expenditures on children and child outcomes were strengthened when these control variables were omitted. In particular, the relationships between educational expenditures and test scores, high school completion, and teen birth rates were stronger when adult education controls were omitted.

We saw previously that education expenditures were significantly related to math test scores, high school dropout rates, and teen birth rates. We tested the sensitivity of these results to the inclusion of a control variable that measures non-education public expenditures. If the generosity of non-education expenditures was a reflection of a state's commitment to children, controlling for these expenditures should to some extent account for unobserved state characteristics. Controlling for non-education expenditures did not alter the previously observed relationships between education expenditures and math test scores, high school dropout rates, and teen birth rates. Moreover, when non-education expenditures were controlled for, significant relationships emerge between education expenditures and improvements in reading and writing test scores, rates of teen idleness, and the property crime arrest rate. We found similar results when we used AFDC benefit levels in place of non-education expenditures as a proxy for state commitment to children.

Lastly, as a specification test we estimated the relationship between elderly poverty in a state and public investments in children. If investments in children are associated with improved outcomes for the elderly, this would suggest that the relationship between investments in children and child outcomes may be spurious. The elderly poverty rate was not significantly related to public investments in children. We tried a number of alternative specifications, and public expenditures on children were not related to elderly poverty in any model.

In sum, we tested a number of variations to our regression models and the estimated relationships between public expenditures on children and child outcomes were found to be quite robust and perhaps conservative. These results provide some evidence that the observed

relationships between our measures of public expenditures on children and child outcomes are not explained by unobserved characteristics of states.

Summary

Table 9 summarizes the relationships between public expenditures and child outcomes that were significant at the 95 percent confidence level. The table expresses the relationship between expenditures and outcomes in terms of the percent reduction in the child indicator (relative to the mean across states) associated with a $100 or $1,000 outlay per child. Approximately half of the child outcomes we analyzed are significantly related to public spending. Medicaid and education spending are the most strongly related to outcomes. Broader measures that combined spending on a wide range of programs and tax benefits have weaker effects than Medicaid or education expenditures.

The improvements in child outcomes associated with spending are sizeable in percentage terms. An extra $100 spent on Medicaid is associated with a 7 percent reduction in the child death rate. Spending an extra $100 dollars per child on Medicaid is not unfeasible: the range between the lowest and highest spending state is several hundred dollars. Education expenditures are associated with improvements in a wide range of outcomes. An extra $1,000 spent on education is associated with a 10 percent reduction in low math and reading scores, a 15 percent reduction in the high school dropout rate, and a 10 percent reduction in the teen birth rate.

V. Discussion

Our analysis shows wide variation in public expenditures on children and in child outcomes across the 50 U.S. states. We also find that public expenditures on children are related to better child outcomes. Approximately half of the indicators we analyzed—measures of child health and mortality, test scores, and a range of adolescent outcomes—are significantly related to public investments. Child poverty is not affected by public expenditures, which is not surprising

given that poverty rates do not depend directly on education, nutrition, or health care expenditures. Our results demonstrate the necessity of looking beyond poverty statistics to gauge the effects of public expenditures on children.

Our expenditure data is uniquely comprehensive in covering education, health, nutrition, cash assistance, and many other types of expenditures. Our results show that education expenditures have particularly strong and positive effects on child outcomes, especially test scores and adolescent behavior. Our broad measure of aggregate expenditures on children does not predict outcomes better than more specific expenditure measures such as Medicaid (for the child death rate) and education (for test scores and adolescent outcomes). In addition to these positive effects, we find a perverse relationship between non-education expenditures and higher rates of teen idleness and violent crime arrest rates.

We compared three measures of public investments in children: our monetary measures of aggregate public investments in children, a welfare state classification scheme developed by Meyers, Gornick, and Peck (MGP), and AFDC benefit levels. The two broad measures of public investments—our expenditures measure and the MGP classification scheme were related to a broad range of measures of child well-being including the child death rate, the high school dropout rate, and the teen birth rate. The MGP scheme did not include education expenditures and was not as strongly related to better test scores as were education expenditures. AFDC benefit levels were related to better child health outcomes, but did not affect adolescent outcomes or test scores.

Omitted variables are an obvious concern in a cross-sectional analysis, but a combination of analytic strategies increases our confidence in the reported results. In the results we present, we control for parental expenditures on children, adult educational attainment, proportion of families headed by a single parent, and racial and ethnic composition in the state. Our results are also robust to several variations in model specifications, and robustness checks suggest that the

results we present may actually be conservative estimates. By comparing investments that are theoretically more closely linked to particular outcomes with investments that are less closely linked, we garner more evidence that the relationship between expenditures and outcomes is causal. The relationship between education expenditures and tests scores or adolescent outcomes is robust in models that use non-education expenditures or AFDC benefit levels as a proxy for state commitment to child well-being. We find no evidence from a specification test (using elderly poverty as the outcome) that the relationships between expenditures and child outcomes are spurious.

In sum, our findings suggest that the returns on investments in children are both broad and impressive. Moreover, they suggest that a true cost-benefit analysis of returns in investments would likely show returns to child investments accruing over the longer-term.

Endnotes

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1. The programs and tax credits covered include: old-age, survivor's, disability, and social security benefits; public assistance (AFDC, emergency assistance, general assistance); Supplemental Security Income (SSI); federal tax deductions/credits (interest paid deduction, EITC, child care tax credit); food stamps; other nutrition programs (school lunch/breakfast, WIC, child and adult care food program, summer food service program); child care and early education programs (child care development block grant); Title IV at-risk child care and AFDC/transitional child care); Head Start and pre-K (federal and state); Social Services Block Grant/Title XX (total and child care portions); Community Services Block Grant; Medicaid for children; Maternal and Child Health Block Grant; Unemployment Insurance; Worker's Compensation and Black Lung; Child Welfare/foster care; LIHEAP (energy assistance); veterans' benefits; and child support enforcement. The most noteworthy omissions from our comprehensive expenditure measure are housing subsidies, which were not available by state, and state EITCs, which were also not estimated.

2. A common critique of the USDA method is that it overestimates housing costs. Here, housing costs are reduced using Lino and Johnson's (1995) Engel marginal cost method.

3. One-third of the public expenditure amount was adjusted to account for variations in housing costs across states. The cost-of-living adjustment was calculated as ((1/3 * state public expenditure)/(state fair market rent/average fair market rent across states)) + (2/3 * state public expenditure). A similar adjustment was applied to parental investments in children in this model.

Table 1. Definitions of Child Outcomes

Domains:	Child outcomes:
Health and mortality	Infant mortality (deaths to infants less than 1 year old per 1,000 live births)
	Low birth weight (percent of babies born < 2500 grams (5.5 pounds))
	Child death rate (deaths per 100,000 children aged 1-14)
Standardized test scores	Low 4th grade math scores (percent of 4th graders with low math scores)
	Low 8th grade math scores (percent of 8th graders with low math scores)
	Low 4th grade reading scores (percent of 4th graders with low reading scores)
	Low 8th grade reading scores (percent of 8th graders with low reading scores)
	Low 8th grade writing scores (percent of 8th graders with low writing scores)
Adolescent indicators	High school dropout rate (percent of teens 16-19 years)
	Idleness rate (percent of teens 16-19 years not in school or working)
	Young teen birth rate (births per 1,000 females ages 15-17)
	Teen birth rate (births per 1,000 females ages 15-19)
	Property crime arrest rate (arrests per 100,000 youths ages 10-17)
	Violent crime arrest rate (arrests per 100,000 youths ages 10-17)
Child poverty	Child poverty rate (percent)

Table 2. Descriptive Statistics

	Mean	Min	Max	N
Dependent variables				
Infant mortality rate, 1996 (deaths per 1000 live births)	7.3	4.4	11.0	50
Low birth weight, 1996 (percent)	7.3	4.8	9.9	50
Child death rate (deaths per 100,000 kids 1-14 years)	27.4	16.0	41.0	50
Low 4th grade math scores (percent)	37.5	24.0	58.0	43
Low 8th grade math scores (percent)	38.7	22.0	64.0	40
Low 4th grade reading scores (percent)	38.3	22.0	55.0	39
Low 8th grade reading scores (percent)	26.6	16.0	40.0	36
Low 8th grade writing scores (percent)	17.8	9.0	28.0	35
High school dropout rate (percent)	9.3	4.0	17.0	50
Teen idleness (percent)	8.7	4.0	14.0	50
Young teen birth rate (births per 1000 females 15-17 years)	31.0	15.0	52.0	50
Teen birth rate (births per 1000 females 15-19 years)	50.9	29.0	76.0	50
Juvenile violent crime arrest rate (arrests per 100,000 youths 10-17)	308	50	691	46
Juvenile property crime arrest rate (arrests per 100,000 youths 10-17)	2146	822	4095	46
Child poverty rate (percent)	19.0	8.0	32.0	50
Independent variables				
Public expenditures per child (in $1000s)	5.913	3.881	8.500	50
Non-education public expenditures per child (in $1000s)	2.199	1.364	3.306	50
Education expenditures per child($1000s)	3.713	2.516	5.654	50
Medicaid expenditures per child ($1000s)	0.336	0.133	0.752	50
AFDC benefit level 1996 ($100s)	3.99	1.20	9.23	50
Minimal on Meyers-Gornick-Peck welfare generosity scale	0.19	0.00	1.00	48
Limited on Meyers-Gornick-Peck welfare generosity scale	0.21	0.00	1.00	48
Conservative on Meyers-Gornick-Peck welfare generosity scale	0.19	0.00	1.00	48
Generous on Meyers-Gornick-Peck welfare generosity scale	0.27	0.00	1.00	48
Integrated on Meyers-Gornick-Peck welfare generosity scale	0.15	0.00	1.00	48
Control variables				
Private expenditures per child ($1000s)	6.202	5.096	7.428	50
Families headed by single parent (%)	26.1	14.0	35.0	50
Adults with high school degree (%)	82.9	73.8	91.4	50
Adults with college degree (%)	23.0	14.2	32.5	50
Children who are African American (%)	12.6	4.4	45.4	50
Children who are Hispanic (%)	8.0	6.5	46.2	50
Foreign born (%)	6.2	1.0	24.4	50
Child poverty rate (percent)	19.0	8.0	32.0	50
Median income, 1996 ($1000s)	35.0	25.4	51.1	50
Fair market rent 1 bedroom apartment ($100s)	4.63	3.30	8.26	50

Table 3: Public Investments as Predictors of Child Health and Mortality across 50 U.S. States

PREDICTORS	Infant mortality rate (deaths per 1000 live births)	Low birth weight (percent)	Child death rate (per 100,000 kids 1-14 years old)
PUBLIC INVESTMENTS			
Medical expenditures per child ($1000s)	-1.650 (1.390)	-0.245 (0.230)	-18.951 ** (3.680)
CONTROLS			
Parental investments per child ($1000s)	-0.674 * (2.240)	-0.087 (0.320)	-3.055 * (2.330)
One parent families (%)	-0.055 (0.990)	0.000 (0.000)	0.287 (1.190)
Adults with a high school diploma[1] (%)	0.113 * (2.690)	-0.009 (0.230)	0.456 * (2.490)
Adults with a college degree[1] (%)	-0.102 * (2.540)	-0.034 (0.950)	-0.705 ** (4.040)
African-American children (%)	0.128 ** (6.370)	0.082 ** (4.530)	0.234 * (2.670)
Hispanic children (%)	0.001 (0.060)	0.010 (0.770)	0.088 (1.470)
Intercept	4.746 (1.310)	8.330 (2.550)	19.958 (1.260)
N	50	50	50

Note: t-values are in parentheses. p<.01=**, p<.05=*

[1] Adults aged 25 and over.

Table 4: Five Measures of Public Investment as Predictors of Child Health and Mortality across 50 U.S. States

PREDICTORS	Infant mortality rate (per 1000 live births)	Low birth weight (percent)	Child death rate (per 100,000 kids 1-14 years old)
1) Medical expenditures per child ($1000s)	-1.650 (1.390)	-0.245 (0.230)	-18.951 ** (3.680)
2) Non-education public expenditures per child ($1000s)	-0.532 (1.190)	0.610 (1.570)	-3.753 (1.750)
3) Total public expenditures per child ($1000s)	-0.112 (0.720)	0.068 (0.490)	-1.260 (1.680)
4) MGP classifications (Minimal is the omitted category)[1]			
Limited	-0.095 (0.190)	-0.632 (1.540)	-4.283 * (2.230)
Conservative	-0.112 (0.160)	-0.849 (1.480)	0.681 (0.250)
Generous	-0.557 (0.910)	-1.048 * (2.080)	-6.816 ** (2.900)
Integrated	-0.312 (0.430)	-1.379 * (2.310)	-6.466 * (2.320)
5) AFDC benefit level ($100s)	-0.194 (1.500)	-0.295 ** (2.740)	-1.340 * (2.180)

Note: t-values are in parentheses. Models control for parental expenditures on children, single-parent families, adult education, and racial and ethnic composition.
p<.01=**, p<.05=*

[1] Meyers, Gornick, and Peck (2001) categories describe the extent of welfare provisions in a state.

Table 5: Public Investments as Predictors of Standardized Test Scores across 50 U.S. States

PREDICTORS	Low math scores, 4th grade (%)	Low math scores, 8th grade (%)	Low reading scores, 4th grade (%)	Low reading scores, 8th grade (%)	Low writing scores, 8th grade (%)
PUBLIC INVESTMENTS					
Education expenditures per child ($1000)	-3.441 * (2.580)	-3.818 * (2.500)	-4.041 * (2.340)	-2.400 (1.380)	-2.324 (1.610)
CONTROLS					
Parental investments per child ($1000s)	-3.999 (1.910)	-2.608 (1.220)	-2.641 (1.190)	-2.677 (1.230)	-3.376 (1.890)
One parent families (%)	0.591 (1.560)	0.787 (1.930)	0.174 (0.400)	-0.021 (0.050)	-0.050 (0.140)
Adults with a high school diploma[1] (%)	-0.020 (0.070)	-0.587 * (2.160)	0.202 (0.660)	0.018 (0.060)	0.336 (1.340)
Adults with a college degree[1] (%)	0.140 (0.490)	0.281 (0.950)	-0.314 (0.960)	-0.029 (0.090)	-0.097 (0.360)
African-American children (%)	0.338 * (2.270)	0.285 (1.830)	0.314 (1.970)	0.306 (1.840)	0.152 (1.110)
Hispanic children (%)	0.189 (1.850)	0.111 (1.040)	0.288 * (2.640)	0.158 (1.450)	0.083 (0.910)
Intercept	51.990 (2.190)	85.342 (3.540)	48.412 (1.830)	45.696 (1.850)	20.145 (0.990)
N	43	40	39	36	35

Note: t-values are in parentheses. p<.01=**, p<.05=*

[1] Adults aged 25 and older.

Table 6: Five Measures of Public Investment as Predictors of Standardized Test Scores across 50 U.S. States

PREDICTORS	Low math scores, 4th grade (%)	Low math scores, 8th grade (%)	Low reading scores, 4th grade (%)	Low reading scores, 8th grade (%)	Low writing scores, 8th grade (%)
1) Education expenditures per child ($1000s)	-3.441 *	-3.818 *	-4.041 *	-2.400	-2.324
	(2.580)	(2.500)	(2.340)	(1.380)	(1.610)
2) Non-education public expenditures per child ($1000s)	2.206	5.124	5.017	5.197	3.661
	(0.610)	(1.370)	(1.470)	(1.730)	(1.220)
3) Total public expenditures per child ($1000s)	-2.056	-2.014	-1.590	-0.417	-0.934
	(1.810)	(1.480)	(1.110)	(0.310)	(0.780)
4) MGP classification (Minimal is the omitted category)[1]					
Limited	-2.130	-5.184	1.243	-1.135	0.510
	(0.630)	(1.860)	(0.410)	(0.420)	(0.200)
Conservative	-3.425	-7.865	0.643	-1.967	3.436
	(0.690)	(1.950)	(0.120)	(0.400)	(0.720)
Generous	-4.617	-8.774 *	0.054	-1.005	2.017
	(1.090)	(2.430)	(0.010)	(0.250)	(0.540)
Integrated	-4.781	-9.150 *	-0.393	-1.926	1.582
	(0.920)	(2.070)	(0.080)	(0.420)	(0.370)
5) AFDC benefit ($100s)	0.635	0.389	2.036	1.802	1.530
	(0.690)	(0.440)	(1.920)	(1.900)	(1.930)

Note: t-values are in parentheses. Models control for private expenditures on children, single-parent families, fair market rent, and parents' education. p<.01=**, p<.05=*

[1] Meyers, Gornick, and Peck (2001) categories describe the extent of welfare provisions in a state.

Table 7: Public Investments as Predictors of Adolescent Outcomes across 50 U.S. states

PREDICTORS	High school dropout rate (%)	Teen Idleness rate (%)	Young teen birth rate (%)	Teen birth rate (%)	Property crime arrests per 100,000 youths 10-17	Violent crime arrests per 100,000 youths 10-17	Child poverty rate
PUBLIC INVESTMENTS							
Education expenditures per child ($1000)	-1.371 **	-0.209	-3.132 **	-5.474 **	-257.294	42.058	-0.047
	(2.970)	(0.480)	(3.150)	(3.730)	(1.830)	(1.420)	(0.080)
CONTROLS							
Parental investments per child ($1000s)	1.659 *	0.076	-0.105	-0.065	-119.181	-10.770	-2.758 **
	(2.350)	(0.110)	(0.070)	(0.030)	(0.550)	(0.240)	(2.970)
One parent families (%)	0.432 **	0.274 *	0.444	0.673	5.460	3.403	0.220
	(3.400)	(2.270)	(1.620)	(1.660)	(0.140)	(0.420)	(1.320)
Adults with a high school diploma[1] (%)	-0.104	-0.070	0.101	0.276	143.414 **	10.895	-0.420 **
	(1.060)	(0.750)	(0.480)	(0.880)	(4.330)	(1.560)	(3.250)
Adults with a college degree[1] (%)	-0.188	-0.182	-0.675 **	-1.200 **	-48.268	5.393	-0.388 **
	(1.860)	(1.900)	(3.110)	(3.740)	(1.560)	(0.830)	(2.920)
African-American children (%)	-0.065	-0.023	0.440 **	0.498 **	15.466	9.094 **	0.082
	(1.340)	(0.490)	(4.180)	(3.210)	(0.980)	(2.750)	(1.280)
Hispanic children (%)	0.075 *	0.074 *	0.453 **	0.584 **	19.883	7.329 **	0.171 **
	(2.170)	(2.270)	(6.100)	(5.330)	(1.840)	(3.230)	(3.770)
Intercept	5.918	11.452	29.696	47.893	-7429.805	-1073.005	71.880
	(0.700)	(1.420)	(1.630)	(1.780)	(2.720)	(1.870)	(6.450)
N	50	50	50	50	46	46	46

Note: t-values are in parentheses. p<.01=**, p<.05=*

[1] Adults aged 25 and older.

Table 8: Five Measures of Public Investment as Predictors of Adolescent Outcomes across 50 U.S. States

PREDICTORS	High school dropout rate (%)	Idleness rate (%)	Young teen birth rate (%)	Teen birth rate (%)	Property crime arrests per 100,000 youths 10-17	Violent crime arrests per 100,000 youths 10-17	Child poverty rate (%)
1) Education expenditures per child ($1000s)	-1.371 **	-0.209	-3.132 **	-5.474 **	-257.294	42.058	-0.047
	(2.970)	(0.480)	(3.150)	(3.730)	(1.830)	(1.420)	(0.080)
2) Non-education public expend per child ($1000s)	-0.522	2.270 *	-1.985	-4.876	-57.954	221.959 **	0.243
	(0.460)	(2.450)	(0.800)	(1.300)	(0.160)	(3.350)	(0.180)
3) Total public expenditures per child ($1000s)	-0.903 *	0.146	-2.158 *	-3.942 **	-169.067	49.559 *	0.000
	(2.430)	(0.420)	(2.700)	(3.350)	(1.490)	(2.170)	(0.000)
4) MGP classifications (Minimal is the omitted category)[1]							
Limited	0.420	-2.396 *	-2.399	-4.371	123.479	129.506	-2.113
	(0.390)	(2.530)	(1.080)	(1.300)	(0.340)	(1.740)	(1.540)
Conservative	-3.078 *	-4.038 **	-9.745 **	-14.503 **	261.341	113.940	-3.553
	(2.050)	(3.050)	(3.150)	(3.090)	(0.510)	(1.080)	(1.850)
Generous	-2.528	-2.885 *	-10.056 **	-15.837 **	-200.783	180.270	-2.438
	(1.930)	(2.490)	(3.710)	(3.860)	(0.440)	(1.920)	(1.450)
Integrated	-3.746 *	-4.216 **	-12.100 **	-19.333 **	-414.345	121.114	-3.421
	(2.410)	(3.070)	(3.770)	(3.970)	(0.780)	(1.110)	(1.720)
5) AFDC benefit level ($1000s)	-0.635	-0.096	-1.392	-1.941	-25.846	30.518	-0.650
	(1.990)	(0.330)	(2.000)	(1.810)	(0.270)	(1.560)	(1.680)

Note: t-values are in parentheses. Models control for parental expenditures on children, single-parent families, adult education, and racial and ethnic composition. p<.01=**, p<.05=*

[1] Meyers, Gornick, and Peck (2001) categories describe the extent of welfare provisions in a state.

Table 9. Improvements in Child Outcomes associated with Public expenditures

Public expenditure	Child outcome	Percent reduction in child outcome associated with public expenditure
$100 Medicaid	Child death rate	-6.9
$1,000 Education	Low 4th grade math score	-9.2
	Low 8th grade math score	-9.9
	Low 4th grade reading score	-10.5
	High school dropout rate	-14.8
	Young teen birth rate	-10.1
	Teen birth rate	-10.8

Notes:
Percent reduction is the Beta coefficient on public expenditure divided by the mean value for the child outcome. Beta coefficients are based on models that regress child outcome on public expenditure amount controlling for parental expenditures, one-parent families, adult education, and racial and ethnic composition.

Appendix Table A. State Rankings based on Meyers-Gornick-Peck (MGP) Classification Scheme, Total Public Expenditures, and AFDC Benefit Levels in 1996

State	MGP	Public Expenditure	AFDC benefit
Arkansas	1	1	1
Alabama	1	1	1
Mississippi	1	1	1
Louisiana	1	2	1
Texas	1	2	1
South Carolina	1	2	1
Tennessee	1	3	1
Kentucky	1	3	1
Arizona	2	1	2
Missouri	2	1	2
West Virginia	1	4	1
Nevada	2	1	3
Georgia	2	2	2
North Carolina	2	2	2
Oklahoma	2	2	2
Idaho	3	1	2
Florida	2	3	2
Virginia	2	2	3
Indiana	3	2	2
South Dakota	3	1	4
Utah	3	1	4
New Mexico	2	4	3
Delaware	2	5	2
North Dakota	3	2	4
Kansas	3	2	4
Nebraska	3	3	3
Wyoming	3	4	3
Colorado	4	3	3
Ohio	5	3	2
Montana	3	4	4
Iowa	4	3	4
Maine	4	4	3
Illinois	4	4	3
Michigan	4	4	4
Pennsylvania	4	4	4
California	4	3	5
Washington	4	4	4
Oregon	4	4	4
Maryland	5	4	3
Minnesota	5	4	4
Wisconsin	5	4	4
New Hampshire	5	3	5
Rhode Island	4	5	5
Massachusetts	4	5	5
Connecticut	4	5	5
New York	4	5	5
New Jersey	5	5	4
Vermont	5	5	5

Note: Alaska, Hawaii, and Washington D.C. were not classified. MGP rankings are: 1=minimal, 2=limited, 3=conservative, 4=generous; 5=integrated. Public expenditure and AFDC rankings range from 1=lowest amount to 5=highest amount.

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