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A UNIFIED WELFARE ANALYSIS OF GOVERNMENT POLICIES*

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We conduct a comparative welfare analysis of 133 historical policy changes over the past half-century in the United States, focusing on policies in social insurance, education and job training, taxes and cash transfers, and in-kind transfers. For each policy, we use existing causal estimates to calculate the benefit that each policy provides its recipients (measured as their willingness to pay) and the policy's net cost, inclusive of long-term effects on the government's budget. We divide the willingness to pay by the net cost to the government to form each policy's Marginal Value of Public Funds, or its "MVPF". Comparing MVPFs across policies provides a unified method of assessing their effect on social welfare. Our results suggest that direct investments in low-income children's health and

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education have historically had the highest MVPFs, on average exceeding 5. Many such policies have paid for themselves as the government recouped the cost of their initial expenditures through additional taxes collected and reduced transfers. We find large MVPFs for education and health policies among children of all ages, rather than observing diminishing marginal returns throughout childhood. We find smaller MVPFs for policies targeting adults, generally between 0.5 and 2. Expenditures on adults have exceeded this MVPF range in particular if they induced large spillovers on children. We relate our estimates to existing theories of optimal government policy, and we discuss how the MVPF provides lessons for the design of future research. *JEL* Codes: H00, I00, J24.

I. Introduction

What government expenditures are most effective at improving social well-being? Are in-kind transfers preferable to cash transfers? Does government-provided social insurance efficiently address market failures? Should we invest more in low-income children? If so, at what age? Should they be direct investments or subsidies to parents?

A large empirical literature estimates the causal effects of historical government policies. These papers frequently conclude with a brief welfare analysis. The method of that analysis, however, often differs from paper to paper. When reporting the effects of health insurance expansions, it is common to report cost per life saved (e.g., Currie and Gruber 1996). Studies of tax policy changes often report the implied marginal excess burden or the marginal cost of funds (e.g., summarized in Saez, Slemrod, and Giertz 2012). Higher education analyses often report the cost per enrollment (e.g., Kane 1994; Dynarski 2000). The early childhood education literature often reports a social benefit-cost ratio (e.g., Heckman et al. 2010). These varying welfare measures make it difficult to compare policies, especially if one wishes to take a bird's-eye view and perform welfare analysis across policy categories.

This article conducts a comparative welfare analysis of 133 historical tax and expenditure policies implemented in the United States over the past half-century. We focus on policies in four domains: social insurance (e.g., health, unemployment, and disability insurance), education (e.g., preschool, K–12, college, job and vocational training), taxes and cash transfers (e.g., top tax rates, Earned Income Tax Credit (EITC), Aid to Families with Dependent Children (AFDC)), and in-kind transfers (e.g., housing

vouchers, food stamps). We draw on existing analyses of the impacts of these policies to construct the benefit that each policy provides to its recipients and the policy's net cost to the government. Benefits are captured by the willingness to pay of policy recipients. The net cost combines both initial program spending and the long-run effect of the policy on the government's budget (i.e., fiscal externalities). We then take the ratio of the benefits to net government costs to generate each policy's marginal value of public funds (MVPF).[1] Putting these components together allows us to measure each policy's "bang for the buck."[2]

The MVPF is useful because it measures the amount of welfare that can be delivered to policy beneficiaries per dollar of government spending on the policy. Equivalently, the MVPF measures the shadow price of raising revenue from the beneficiaries of the policy by reducing spending on the policy. For point of reference, a simple nondistortionary transfer from the government to an individual would have an MVPF of 1. The cost to the government would be exactly equal to the individual beneficiary's willingness to pay. The MVPF can differ from this benchmark value of 1 if individuals value an expenditure at more or less than its resource cost. For instance, if the government provides insurance, willingness to pay may be greater than the resource costs of provision to individuals if the insurance provides consumption-smoothing benefits. By contrast, willingness to pay may fall below resource costs if individuals distort their behavior to receive higher transfers.[3] The MVPF may also deviate from the benchmark value of 1 if the policy induces fiscal externalities. For example, if spending a dollar on a government policy caused individuals to work less, government tax revenue might fall slightly and then the net cost of the policy would rise above $1. By contrast, if spending that dollar caused them to get more schooling and consequently increased

1. See Mayshar (1990), Slemrod and Yitzhaki (1996, 2001), and Kleven and Kreiner (2006) for original definitions, and Hendren (2016) for a comparison of the MVPF to alternative measures of welfare.

2. In several cases where authors constructed their own MVPFs, we incorporate those estimates directly. Where applicable, we adjust these estimates to harmonize assumptions (e.g., discount rates). In cases where previous literature has conducted comprehensive cost-benefit analyses of a policy, we draw on the components of those analyses to reformulate them into their implied MVPF.

3. The intuition here comes from the envelope theorem. Willingness to pay for a government transfer is determined by the "mechanical cost" of that transfer. Additional costs due to behavioral responses are not valued dollar for dollar.

their income, government revenue would rise and the net cost of the policy would fall below $1. In some cases, positive fiscal externalities may be large enough to fully offset the initial cost of the policy. In that instance, the policy has an infinite MVPF, and consequently, spending on the policy results in a Pareto improvement.[4]

More generally, comparisons of MVPFs correspond to precise statements about social welfare using the intuition of Okun's leaky bucket experiment (Okun 1975). Given two policies, A and B, suppose $MVPF_A = 2$ and $MVPF_B = 1$. Then one prefers more spending on policy A financed by less spending on policy B if and only if one prefers giving $2 to policy A beneficiaries over giving $1 to policy B beneficiaries. Whether this is desirable ultimately depends on one's social preferences for the beneficiaries of policies A and B. MVPFs measure the feasible trade-offs to the government—in Okun's metaphor, the "leaks" in the bucket. By measuring these shadow prices of raising revenue from different groups, the MVPF provides a unified method of welfare analysis that can be applied both across and within diverse policy domains.

We outline the construction of the MVPF for six representative examples in Section III. At a high level, our construction of willingness to pay often relies on intuition provided by the envelope theorem. Our construction of net government costs involves calculating changes in taxes paid and transfers received, along with savings or additional costs from crowding out of other government spending. In Online Appendices A–F we also provide a detailed explanation of how each MVPF in our sample is calculated. As is common with any welfare analysis, the creation of our MVPFs requires various judgment calls. We conduct an extensive set of robustness analyses, examining our assumptions about interest rates, tax rates, and forecasting methods.[5] In

4. To align with terminology in existing literature, we use various terms interchangeably to refer to the same phenomenon. Any policy with a positive willingness to pay and negative net costs we define to have an infinite MVPF. Given the negative net costs, we also say that these policies "pay for themselves" or "recoup their initial costs." In the taxation literature, this is also known as a Laffer effect. We often note that spending on policies with infinite MVPFs results in a Pareto improvement. This is because the expenditure is valued by beneficiaries and has no net cost on the government. This final claim regarding Pareto improvement formally assumes that all beneficiaries have positive willingness to pay, which is natural in many of our contexts in which the policies expanded the choice sets of all beneficiaries.

5. We also provide a Stata do-file for each program that is available on GitHub (https://github.com/Opportunitylab/welfare_analysis). These programs allow

addition, many MVPF estimates for individual policies contain considerable sampling uncertainty. We address this by constructing category averages that pool across multiple policies and help improve the precision of our conclusions. We also test and correct for publication bias using the methods of Andrews and Kasy (2019). Given these potential sources of uncertainty, we also focus our results on broad patterns in the data, rather than conclusions about individual policies.

Our analysis is inevitably constrained by the scope of existing literature. Not all policies have been studied with the same degree of completeness. For each policy, we incorporate all effects that can reliably be translated into the MVPF, but an omitted impact could affect our welfare analysis. We therefore assess the robustness of our broad patterns to sample restrictions focused on more comprehensively studied policies. In addition, we discuss how the MVPF of each particular policy may vary with the addition (or removal) of certain effects.[6] For example, we find that our MVPF estimates are most sensitive to changes in the estimated earnings of beneficiaries—specifically dynamic effects within or across generations. In the results we discuss below, we focus our primary conclusions on the broad lessons that are robust to variations in the availability of estimates on underlying causal estimates.

I.A. Main Results

Our estimates reveal a stark pattern: MVPFs vary substantially based on the age of each policy's beneficiaries. We find the highest MVPFs for direct investments in the health and education of low-income children. This includes Medicaid expansions, childhood education spending, and expenditures on college. In many cases, these policies actually pay for themselves in the long run. Children pay back the initial cost as adults through additional tax revenue and reduced transfer payments. For example, we examine four major health insurance expansions to children over the past 50 years. We calculate an average across those policies and find that for each $1 of initial expenditure they repaid $1.78 back to the government in the long run. In particular, we find that three of four policies fully repaid their initial costs.

researchers to easily modify the set of input assumptions into each MVPF beyond the robustness we readily provide in the article and the Online Appendix.

6. We provide an extended discussion of these in the Online Appendix.

We find high MVPFs for policies targeting children throughout childhood. We do find high MVPFs for early childhood education programs, including an MVPF of roughly 44 for Perry Preschool and 12 for Abecedarian.[7] In addition, we find large MVPFs for policies targeting older children, such as historical equalizations in K–12 school financing (studied in Jackson, Persico, and Johnson 2016) and policies increasing college attainment. Our broad patterns contrast with the notion that opportunities for high-return investment in children decline rapidly with age (Heckman 2006).

Our results show lower MVPFs for policies targeted to adults. Most of these MVPFs lie between 0.5 and 2. For example, we find MVPFs ranging from 0.40–1.63 for health insurance expansions to adults, 0.65–1.04 for in-kind transfers such as housing vouchers and food stamps, and from negative values to 1.20 for tax credits and cash welfare programs to low-income households. These lower MVPFs reflect the fact that spending on many of these policies reduced labor earnings. This stands in contrast to our finding that many policies spending on children increased later-life earnings.

It is important to note that these differences in returns by age represent general patterns but do not hold uniformly. There are a number of exceptions. For child policies, we find large variation in MVPFs across policies, with some estimates relatively close to 1. In particular, we find lower MVPFs for job training programs and for college subsidies that do not lead to increases in attainment. We also find lower MVPFs for transfers to disabled children and their families. This latter case illustrates that policies with lower MVPFs are not necessarily "undesirable"—they can be welfare enhancing depending on one's social preferences. Unlike expenditures with infinite MVPFs, policies with low MVPFs involve a budgetary trade-off that should be weighed against one's preference for redistribution.

Among expenditures on adults, we find relatively large MVPFs for reductions in top marginal tax rates, with estimates

7. In our baseline specifications that harmonize government revenue components across policies, we estimate that the government recoups 92% of the up-front cost of Perry Preschool and 78% of the cost of Abecedarian. Because the cost of crime impacts are often difficult to quantify, they are not included in our baseline analyses (when crime estimates are available, we we incorporate them in alternative specifications discussed in the Online Appendix for each policy). In this case, if one includes additional estimated effects such as the cost of crime, we estimate that Perry Preschool does pay for itself and Abecedarian pays for 92% of the up-front cost.

from 1.16 to infinity. There is, however, substantial sampling uncertainty in these estimates.[8] We also find high MVPFs for spending on adults that generates spillover effects on children. For example, providing vouchers with counseling services to families residing in high-poverty public housing (as part of the Moving to Opportunity Experiment) helped these families move to lower-poverty neighborhoods. This led to large increases in children's earnings in adulthood that generated sufficient tax revenue to pay for the program cost. Our results highlight the value of further work to uncover when such spillovers are likely to occur.

I.B. Relation to Previous Theories

The ratio of MVPFs measures the extent to which the government can transfer welfare across individuals in society. For this reason, it relates to the literature on optimal government policy and redistribution (e.g., Mirrlees 1971, 1976). After presenting our results, we interpret them in light of this theory. For example, we tend to find tax cuts to top earners have higher MVPFs than cuts targeted to low-income households, a result consistent with the behavior of a progressive planner setting the tax rate in a Mirrleesian optimal tax model (Mirrlees 1971, 1976). We also compare the MVPFs of cash transfers to those of in-kind transfers, testing the applicability of the Atkinson-Stiglitz theorem (Atkinson and Stiglitz 1976; Hylland and Zeckhauser 1981).

I.C. Implications for Future Research

We conclude by providing three lessons for future research. First, we show how the MVPF framework allows us to quantify the value of such research. Because the MVPF is a shadow price, one can use a standard decision-theoretic framework to quantify the value of reducing uncertainty in our MVPF estimates. Just as a consumer would be willing to pay to learn the true value of the products he or she buys, a welfare-maximizing government should be willing to pay to reduce uncertainty in the cost of redistribution. Using this approach, we show that a welfare-maximizing government deciding whether to raise taxes to spend an additional \$1 on the Supplemental Nutrition Assistance Program (SNAP) would be willing to pay \$0.24 to make this decision using a more precise causal estimate of the long-run

8. For example, we estimate an infinite MVPF for the 1981 reduction in the top marginal income tax rate from 70% to 50%. Our confidence interval, however, includes both 1 and infinity.

impact of SNAP using administrative data (as in Bailey et al. 2019) as opposed to survey data (as in Hoynes, Schanzenbach, and Almond 2016). This highlights the value of expanding the access to, and use of, large administrative linked datasets for the study of long-run policy impacts on children.

Second, we show the added insights that come using the MVPF framework as opposed to traditional cost-benefit analysis.[9] It turns out that our general findings would be very similar in a traditional cost-benefit framework, but the MVPF leads to different conclusions in certain key instances. This is because the MVPF and traditional benefit-cost analysis rely on similar inputs, but the MVPF is unique in incorporating all fiscal externalities in its denominator.[10] For example, when taxes are at the top of the Laffer curve, the social benefit of reducing taxes by \$1 is \$2,[11] but the MVPF of that policy is infinite because the benefits to the individual are \$1 and the net cost of the policy is \$0. More generally, our results suggest there is value in calculating the MVPF in other settings, such as crime policy or tax enforcement, where the causal effects of the policy have clear effects on the government's budget.

Last, we discuss the implications of the MVPF framework for future empirical designs. In particular, we highlight the importance of determining whether willingness to pay is positive or negative. In this article, we sought to analyze state-level welfare reforms from the 1980s and 1990s. There were 27 large-scale state-level randomized controlled trials (RCTs) analyzing welfare reform. These studies increased our understanding of the employment and revenue impacts of welfare policy. They demonstrated that these welfare reforms had low net costs. That said, while the treated participants in these studies often received additional services such as job search assistance, these policies also cut benefits for those who did not comply with program requirements. As

9. The edited volume from Weimer (2009) provides a discussion of cost-benefit analyses from different researchers in a range of different domains. The Washington State Institute for Public Policy (WSIPP 2019) conducts ongoing cost-benefit analyses to assess policies relevant to state legislatures. See also Rea and Burton (2020) for an application of the WSIPP data to comparative welfare analysis.

10. Traditional cost-benefit approaches include fiscal externalities in the numerator (see Greenberg, Deitch, and Hamilton 2010).

11. The individual is willing to pay \$1 for the tax cut and the government receives a \$1 benefit from increased tax revenue from the behavioral response to the tax. In traditional cost-benefit analysis, increases in government tax revenue are included in the numerator of the expression.

a result, it is unclear whether willingness to pay for these reforms was positive or negative. Despite randomizing more than 100,000 families into 27 large-scale RCTs, we are unable to reach any reliable estimates of the MVPFs of these policies. The evaluations of welfare reform may have led to more valuable information if the RCT designs had been created with a social welfare framework in mind.

I.D. Relationship to Existing Literature

In constructing our MVPFs and presenting evidence for high returns to investment in low-income children, we build on a substantial line of existing research making the argument for investment in children.[12] Our work is also related to recent research on the long-run effect of safety net protections for children reviewed by Hoynes and Schanzenbach (2018). In light of the evidence, they conclude that "reallocation of investments over the life course to earlier periods can be efficiency-enhancing," which aligns with our conclusions.

There are also analyses—many of which we draw on in this article—in which researchers have previously argued that some government expenditures largely pay for themselves. This argument is particularly prominent in discussion of early education (e.g., Heckman et al. 2010; García et al. 2017) and child health care expenditures (e.g., Brown, Kowalski, and Lurie 2015; Wherry et al. 2018).[13] The argument also appears in the tax literature, where some have argued that reducing top marginal tax rates produces a "Laffer effect," raising total revenue.[14] Our analysis builds on that work by evaluating policies at scale and searching for the presence of high-return policies across a wide range of policy domains. We find the most robust evidence for Laffer effects for policies investing directly in children.

12. For example, foreshadowing many of our conclusions, Currie (1994) writes, "Although the evidence is incomplete, it suggests that in-kind programs have stronger effects on children than cash transfers, and that programs that target specific benefits directly to children have the largest positive effects."

13. Outside the scope of this article, some suggest certain macroeconomic policies can pay for themselves, such as fiscal expansions during deep recessions (DeLong et al. 2012). More generally, we omit many potentially relevant categories of policies, such as macroeconomic stabilization, infrastructure investment, and environmental policies.

14. In this sense, testing whether the MVPF of a policy change is infinite is a generalization of Werning (2007)'s proposed test for identifying local Laffer effects in the income tax schedule.

I.E. Roadmap

The rest of this article proceeds as follows. Section II presents the general social welfare framework that motivates the construction of the MVPF. Section III discusses the sample and presents six example constructions of the MVPF. Section IV discusses our main results and the distinction between MVPFs of policies targeting children versus adults. Section V places the MVPF estimates in the context of existing theories of optimal government policy. Section VI presents lessons for future work. Section VII concludes. As noted already, Online Appendices A–F provide step-by-step details for constructing each MVPF, and all Stata do-files for the construction of each MVPF are available on GitHub.

II. MVPF Framework

This section presents a general framework to measure the welfare impact of changes in government policies. The framework illustrates how the marginal value of public funds provides natural guidance on the social welfare impact of economic policies.

Consider a government seeking to measure the welfare impact of a government policy change under consideration. We define social welfare, W, by the weighted sum of individual utilities,

$$W = \sum_i \psi_i U_i,$$

where U_i is individual i's utility function and ψ_i is their social welfare weight. The latter measures how much a 1-unit increase in utility corresponds to an impact on social welfare, W.[15] The utility function, U_i, measures both current and future well-being of the individual. For example, if utility were additive over time, one could nest uncertainty about future outcomes within this framework, letting $U_i = E[\sum_{t \geq 0} \beta^t u_{it}]$ where u_{it} is the individual's utility t periods from today.

Because the utility function is allowed to vary arbitrarily across individuals, it will be helpful to normalize units across individuals. To that aim, let λ_i denote individual i's marginal utility of income at the time the policy is under consideration.

15. For now, we do not place any assumption on these weights, and therefore they can result from any particular social welfare function. We also assume the weights do not change in response to the policy, but this is without loss of generality because we focus on small policy changes below.

This is equal to the effect on individual utility of providing \$1 to that individual. Let $\eta_i = \psi_i \lambda_i$ denote the individual's social marginal utility of income at the time of the policy. The value of η_i measures the impact on social welfare, W, of an additional \$1 placed in individual i's budget today.

The government is considering a set of policy changes indexed by $j = 1, ..., J$ that change the economic environment (e.g., prices, public goods) by a small amount. We parameterize the up-front initial spending on policy j by dp_j (which can either be an increase or decrease). The net impact on social welfare of the policy is

$$\frac{dW}{dp_j} = \sum_i \psi_i \frac{dU_i}{dp_j} = \sum_i \eta_i WTP_i^j = \bar{\eta}_j \sum_i WTP_i^j, \tag{1}$$

where $\sum_i WTP_i^j$ is the sum of individuals' willingness to pay for policy j out of their own income, $WTP_i^j = \frac{dU_i}{dpj}\frac{1}{\lambda_i}$, and $\bar{\eta}_j$ is the average social marginal utility of the beneficiaries of the policy,

$$\bar{\eta}_j = \sum_i \eta_i \frac{WTP_i^j}{\sum_i WTP_i^j}$$

with weights given by the economic incidence of the policy, $\frac{WTP_i^j}{\sum_i WTP_i^j}$. The values $\bar{\eta}_j$ measure how much social welfare increases if one were to provide an average of \$1 to the beneficiaries of policy j. Each individual is willing to pay WTP_i^j for the expansion by dp_j of policy j.[16] Therefore, multiplying $\bar{\eta}_j$ by $\sum_i WTP_i^j$ measures the impact on social welfare of an expansion of the policy by dp_j. This means that the welfare effect depends on the effect of providing \$1 to a policy's beneficiaries, $\bar{\eta}_j$, and the beneficiaries' willingnesses to pay for the policy relative to cash, $\sum_i WTP_i^j$.

In accounting for costs, we let R denote the present discounted value of the government budget, and let $G_j = \frac{dR}{dp_j}$ denote the net impact of the policy on the government budget.[17] This net cost is

16. In the derivation of the MVPF, we remain fully general about each individual's utility function. We abstract from any behavioral biases in the utility function that might cause willingness to pay to be incongruent with choices that maximize well-being. Moreover, in practice, our approaches to inferring willingness to pay often require assumptions of rationality in individual utility that do not account for the potential presence of behavioral biases.

17. In practice, the dp_j variations that are identified in an empiricist's regressions will not, in general, correspond to budget-neutral policies. Traditional

inclusive both of the initial cost of the program and all other effects of behavioral responses on the government budget. For example, if spending $1 on preschool increases wages in the future, G_j should incorporate the effect of those increases in future tax receipts. Crucially, both the willingness to pay measures, WTP_i^j, and the net cost, G_j, should include effects on both parents and children. Policies that directly affect children should include willingness to pay by parents and the impacts of their behavioral responses on the cost of the policy. Conversely, policies that directly affect parents should include any spillovers onto children.[18]

The MVPF of policy j is given by the aggregate willingness to pay, $WTP^j = \sum_i WTP_i^j$, for the policy divided by the net cost to the government, G_j:

$$MVPF_j = \frac{\sum_i WTP_i^j}{G_j} = \frac{WTP^j}{Net\ Cost}. \tag{2}$$

The MVPF is previously defined in Mayshar (1990), where it is referred to as the marginal excess burden (MEB); in Slemrod and Yitzhaki (1996), where it is referred to as both the marginal cost of funds and the marginal benefit of projects, depending on the policy in question; and in Kleven and Kreiner (2006), where it is referred to as the marginal cost of funds (MCPF). However, the MVPF formally differs from both the traditional definition of the marginal excess burden in Auerbach (1985), Auerbach and Hines (2002), and the marginal cost of funds in Stiglitz and Dasgupta (1971), Atkinson and Stern (1974). Because of this, Hendren (2016) defines this quantity as the MVPF to contrast it with the MEB and MCPF.

approaches would attempt to account for government spending by modifying the observed policy into a different policy that raised revenues via lump-sum taxation. This would then require the researcher to observe not the causal effect of the policy, but the "compensated effect" of the policy to identify the welfare effect. In contrast, our approach hypothetically closes the budget constraint by comparing two MVPFs: one that involves an increase in spending and another that involves a reduction in spending or increase in revenue. Hence, welfare analysis can be done with two sets of causal effects (one for the two policies under consideration) as opposed to attempting to measure the compensated effect of a policy.

18. We sum the benefits accruing to both parents and children, but we do not include any willingness to pay that arises because of parental altruism toward their children (or children's altruism toward their parents). This means that a child's willingness to pay for a policy is only counted once. Including willingness to pay from parental altruism would only reinforce our central results. Similarly, we do not incorporate individual willingness to pay for redistribution to others.

Combining equations (1) and (2), the effect on social welfare per dollar of government expenditure on policy j is

$$\frac{\frac{dW_t}{dp_j}}{\frac{dR}{dp_j}} = \bar{\eta}_j MVPF_j.$$

Given the MVPF for any two policy changes, one can construct hypothetical budget-neutral policy changes. For example, consider increasing spending on policy 1 by a net amount G_1, financed by reducing spending (or increasing revenue) from policy 2 by the same amount. Pursuing this combined policy, dp, increases social welfare if and only if

$$\bar{\eta}_1 MVPF_1 > \bar{\eta}_2 MVPF_2. \tag{3}$$

Welfare increases if and only if the welfare gains from increasing spending on policy 1, $\bar{\eta}_1 MVPF_1$, exceed the welfare loss from reducing spending on policy 2, $\bar{\eta}_2 MVPF_2$. The MVPFs of the two policies characterize the cost of moving welfare between the two groups of beneficiaries. One prefers the policy if and only if $\frac{\bar{\eta}_1}{\bar{\eta}_2} > \frac{MVPF_2}{MVPF_1}$. If $MVPF_1 = 1$ and $MVPF_2 = 2$, then an individual prefers spending on policy 1 financed by policy 2 if and only if providing \$1 to beneficiaries of policy 1 is valued more than providing \$2 to beneficiaries of policy 2.

As this example illustrates, welfare statements that compare policies generally require comparisons of their MVPFs. The MVPFs allows the researcher to form hypothetical budget-neutral policies and assess their welfare implications using equation (3). To reduce the role of social preferences in driving conclusions, one can compare policies with the same beneficiary group. In this case, one would expect that $\bar{\eta}_1 \approx \bar{\eta}_2$ so that comparisons of the MVPFs correspond to statements about social welfare. For example, Hendren (2017a) suggests comparing the MVPF of a particular policy to the MVPF of a tax cut with similar distributional incidence. More generally, one can compare different redistributive policies, such as food stamps and housing vouchers, among each other to evaluate the most effective method of redistribution.

In some cases, one does not need to compare an MVPF to another policy to reach a welfare conclusion. This occurs when the MVPF is infinite. Mathematically, this happens when a policy has positive willingness to pay by its beneficiaries and the behavioral response to the policy generates fiscal externalities

that are sufficient to cover the cost of the program, $G_j < 0$. The textbook example of such a case is lowering taxes when they are beyond the peak of the Laffer curve. In this case, lowering taxes increases government revenue, and so these policies represent a Pareto improvement for any positive welfare weights assigned to the recipients.[19] More generally, the MVPF framework facilitates a search for other cases where policies have positive willingness to pay and negative net costs, such as investment in kids.

The definition of the MVPF is theoretically motivated using small (marginal) changes in government expenditures. Although some empirical variation we use has marginal effects on individuals' budget constraints, one can also continue to construct the MVPF as the ratio of willingness to pay to net government cost for nonmarginal policy changes. This approach uses the actual empirical variation in existing literature to estimate the return on the observed nonmarginal expenditure. Future work could explore how the MVPF for a given policy change varies within a program's size of spending. This would facilitate improved welfare comparison for policies that were evaluated at different scales.[20]

II.A. Comparison to Social Cost-Benefit Analysis

The MVPF approach builds on a large literature on social cost-benefit analysis (see the edited volume Weimer and Vining 2009 and Boardman et al. 2017, and the cost-benefit estimates provided by WSIPP 2019). The MVPF uses many of the same underlying estimates used to create benefit-cost ratios, but combines them in a different way. A comparison with cost-benefit analysis from Heckman et al. (2010) helps illustrate the importance of

19. In practice an expenditure policy may have been combined with a separate tax policy to raise revenue at the time the policy is implemented. In this case, the combined expenditure and tax policy would not deliver a Pareto improvement, as some current taxpayers would be made worse off. However, the infinite MVPF corresponds to a case where the government need not raise revenue to implement a policy that does not cost money in the long-run. The government could have borrowed against the future returns on the policy and generated a Pareto improvement.

20. Consider the case where policy 1 was a \$1M government expenditure and policy 2 was a \$2M government expenditure. Comparing policy 1 and policy 2 would require the MVPF for a version of Policy 1 that is scaled up to cost \$2M. This same logic would also apply if considering a large-scale expenditure on a policy that had previously been analyzed with a narrower RCT—one would have to make the additional assumption that the average treatment effect of this expanded policy is given by the effect identified in the RCT.

these differences. Heckman et al. (2010) compare the net social benefits of the policy, inclusive of benefits that accrue back to the government, against the up-front budgetary spending on the policy, C_j. They use the following formula:

$$BCR_j = \frac{\text{Social Benefits}}{\text{Social Costs}} = \frac{WTP^j + FE_j}{(1+\phi)C_j}, \tag{4}$$

where $FE_j = G_j - C_j$ are the benefits accruing to the government budget from the behavioral responses to the policy. The initial program outlays in the denominator are often multiplied by $1 + \phi$, where ϕ is the marginal deadweight loss of raising government revenue. This is thought to translate the up-front costs into social costs by accounting for the welfare impact of an implicit tax policy that raises the needed funds. Often, ϕ is taken to be 0.3 or 0.5 (Heckman et al. 2010). Policies are then deemed to pass the cost-benefit test if the BCR exceeds 1.

In contrast to the BCR, the MVPF is given by $MVPF_j = \frac{WTP^j}{C_j + FE_j}$. It differs in two primary ways. First, the impact of behavioral responses on the government budget is counted in the denominator, not the numerator. For example, consider a tax cut of \$1 for which the behavioral response increases tax revenue by \$1. In this case, the policy perfectly pays for itself, and so the MVPF is infinite. Expenditures on the policy represent a Pareto improvement. In a BCR framework, however, that \$1 in increased tax revenue is considered social benefit and counted in the numerator. That leaves a BCR estimate of $(\frac{2}{1+\phi})$. This illustrates why the BCR may be a particularly misleading guide to optimal policy when policies have strong impacts on the government budget. We found a policy with a BCR of $(\frac{2}{1+\phi})$ that was a Pareto improvement, but we could find a different policy with a BCR above 2 that does not deliver a Pareto improvement. For example, if we compare this hypothetical tax cut to government-provided insurance with willingness to pay of \$2 for each \$1 of insurance, the traditional cost-benefit framework cannot distinguish between these policies.

Second, the MVPF approach does not require the government to close the budget constraint through an increase in taxation. Therefore, one does not adjust for the "deadweight cost of taxation" based on this particular assumed method of government finance. Rather, the MVPF directly measures the amount of welfare delivered to beneficiaries per dollar of government

expenditure. One closes the budget constraint by comparing the MVPF of a given policy to the MVPF of other policies. This allows the researcher to think through the library of feasible levers available to the government. In contrast to the cost-benefit framework, this approach reinforces the idea that incidence matters: a policy that provides benefits to the poor cannot be readily compared to the raising of revenue on the rich without thinking about Okun's bucket and the social welfare weights placed on the beneficiaries (i.e., the values of $\bar{\eta}_j$ for the policies).

Despite our advocacy for the value of the MVPF over a traditional cost-benefit analysis, it is perhaps reassuring to note that, in most cases, these two approaches generate similar conclusions. So although we argue that the MVPF is more appropriate for measuring welfare, and consequently more informative in cases where these two welfare measures diverge, the broad pattern of our results remain the same under either framework.

III. Calculating MVPFs: Examples

We estimate the MVPF for 133 policies spanning social insurance (e.g., health, unemployment, and disability insurance), education (e.g., preschool, K–12, college, job and vocational training), taxes and cash transfers (e.g., top tax rates, EITC, AFDC), and in-kind transfers (e.g., housing vouchers, food stamps). Our focus here is on policies, rather than papers. In many cases we combine estimates from multiple different papers, putting together the puzzle pieces to build the full picture.[21]

We form a sample of policies in each domain by drawing on survey and summary articles from each field. We supplement this initial set of estimates with recent work in each area not captured in the survey or summary articles. We restrict our attention to policies in which there is an experimental or quasi-experimental identification strategy used to estimate the policy's impact.[22] Formally, such papers identify causal effects using variations dp_j in the economic environment. We form our baseline sample with

21. If multiple papers analyze the same causal effect, we generally focus on the most recent published estimates unless otherwise noted. We provide a detailed discussion of the alternative specifications in the Online Appendix.

22. We exclude purely cross-sectional identification using controls for observables in our baseline sample. Within the set of experimental and quasi-experimental studies, we do not impose our own filter on the quality or validity of these empirical designs.

policies where one observes effects of the policy that are sufficient to form a reasonably comprehensive view of both the WTP and net cost of the policy. We discuss in Online Appendices A–F the standard for policy inclusion in our categories and the set of causal effects used in each case. Because this process involves judgment calls, we also assess robustness of our conclusions to an expanded sample (e.g., that expands the set of identification and forecasting methods) and a more restricted sample (e.g., that requires direct observation of causal effects on income).

Table I lists the set of policies studied, along with the empirical papers used to form each policy's MVPF. Column (9) denotes the set of papers used to construct the MVPF. In many cases, we draw from multiple papers to form a single MVPF. For example, some publications might estimate the impact of the policy on adults, while other papers focus on longer-run effects on children.

In this section, we illustrate the construction of these estimates using six examples spanning the domains we consider. We attempt here to provide a diverse set of examples to demonstrate the range of approaches used to create our estimates. Online Appendices A–F provides a detailed step-by-step discussion of the construction of each MVPF. In Section IV.C, we assess robustness of our primary conclusions to alternative assumptions (e.g., different interest rates and tax rate imputations) and alternative samples.

III.A. Admission to Florida International University

We begin by constructing the MVPF of admitting an additional student into Florida International University (FIU). This example illustrates the construction of the MVPF for a policy targeting youth with effects on later-life earnings. We use similar methods for other child policies.

We draw on the work of Zimmerman (2014). He uses an RD design at the school's academic performance cutoff for applicants to measure the effect of FIU admission on state university system enrollment and medium-term earnings outcomes. We translate his estimates into an MVPF, incorporating the net cost of the policy and the beneficiaries' willingness to pay. Throughout, we construct confidence intervals for our estimates using a

TABLE I

DETAILS OF ALL PROGRAMS STUDIED

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Panel A: Education and job training								
Child education								
Carolina Abecedarian Study	Abecedarian	1975	3	x	x	x		Barnett and Masse (2007) Campbell et al. (2012) Helburn (1995) Masse and Barnett (2002) Masse (2003)
Chicago Child-Parent Centers, Extended Program	CPC Extended	1985	6			x		Reynolds et al. (2002) Reynolds et al. (2011)
Chicago Child-Parent Centers, Preschool Program	CPC Preschool	1983	4			x		Reynolds et al. (2002) Reynolds et al. (2011)
Chicago Child-Parent Centers, School Age Program	CPC School	1986	8			x		Reynolds et al. (2002) Reynolds et al. (2011)

(Table 1 is continued at the end of Section VII, before the Appendix.)

semiparametric bootstrap procedure discussed in detail in Online Appendix H.[23]

1. Costs. Figure I, Panel A shows how we calculate the net cost of FIU admission. We start with initial costs of $11,403, which represents the state university system's educational expenditures on each marginal admit to FIU.[24] Students pay some fraction of those educational expenses, so we subtract $3,184 to account for private student contributions. Next we account for the fact that some new admits would have attended a state community college if they had not enrolled in FIU. We subtract $5,601, Zimmerman's estimate of the amount the government would have paid to support their education at those community colleges. Taken together, that leaves us with an up-front government cost of $2,617 per admitted student.

The remaining cost considerations all stem from earnings changes caused by FIU admission.[25] Zimmerman (2014) calculates that in the first seven years after admission, earnings fall by $10,942.[26] We use estimates from the Congressional Budget Office to estimate that the tax and transfer rate on these earnings is 18.6%. This suggests the earnings change reduces government revenue by $2,035.[27] Next, Zimmerman (2014) estimates that FIU

23. In particular, we conservatively account for correlations across estimates in a given policy, and we develop a method to adjust for the uncertainty in the denominator (with many thanks to conversations with Isaiah Andrews). We provide the intuition for the approach and Monte Carlo simulations with appropriate coverage. In fact, the coverage is sometimes overly conservative, especially when costs approach 0.

24. Zimmerman (2014) calculates costs and student contributions using the data on educational expenditures from the Delta Cost Project (American Institutes for Research 2017). We adopt this approach for other college policies analyzed in our sample. Online Appendix B explains the details of our approach.

25. Zimmerman (2014) does not include any information on attendance of federally supported graduate schools among marginal FIU enrollees. If that information were available, it could be incorporated as an additional fiscal cost.

26. All earnings changes are discounted back to the time of the initial expenditure using a 3% discount rate. We toggle these discount rates in our robustness discussion in Section IV.C. We also use CPI-U-RS when we need to deflate from nominal dollar values to real ones.

27. To be conservative, we exclude payroll taxes because individuals may benefit from a portion of these contributions. More detail on our calculations can be found in Online Appendix G. The tax and transfer rate includes federal and state income taxes along with food stamps, but excludes housing vouchers and other welfare programs. We use the income-specific rate from the 2016 CBO estimates,

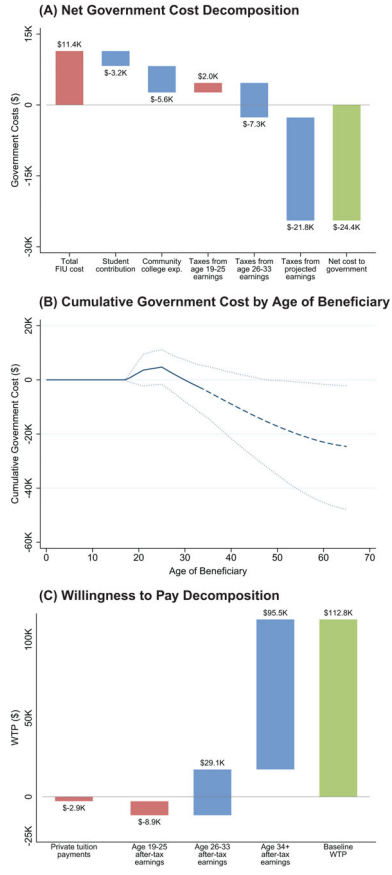

FIGURE I

WTP and Cost Components for Admission to Florida International University

This figure illustrates the cost and willingness to pay components for admission to Florida International University as studied in Zimmerman (2014). Panel A breaks the total cost down into its various components, including increased student payments on tuition, reduced government spending on community colleges, and the changes in tax revenue from earnings. Panel B shows the cumulative discounted cost of the policy over the lifetime of the beneficiary. The solid line represents cumulative costs for ages up until 33, the oldest age at which incomes are observed in Zimmerman (2014). The dotted lines provide the 95% bootstrap (pointwise) confidence intervals with adjustments discussed in Online Appendix H. The dashed line shows total costs inclusive of projected costs at subsequent ages. The projection method is detailed in Section III and in Online Appendix I. Panel C reports the components of our WTP calculations. The point estimate measures WTP as the change in incomes after taxes and expenses on tuition. All numbers are in 2005 dollars deflated using the CPI-U-RS and discounted using a 3% real interest rate.

admission causes earnings to rise by $36,369 in years 8–14. Once again, we apply a tax and transfer rate and determine that the government's revenue rises by $7,274. At this point our net costs are −$2,622, as shown in Figure I, Panel B. This suggests the expenditure has paid for itself within 14 years of the initial outlay.

Finally, Zimmerman's earnings data extend 14 years, but we can extrapolate from the observed effects to estimate earnings changes over the full life cycle. Online Appendix I describes this procedure in detail, and Appendix Figure I provides a graphical illustration of the approach. We use ACS data to estimate life cycle earnings trajectories and then map the control group in Zimmerman (2014) onto those trajectories. In particular, we observe an average earnings for the control group of $28,964, which we estimate to be 113% of mean earnings for this cohort in the ACS. In contrast, the treated group earns $6,372 more during these ages, or 22% more than the control group. We assume that the control group earnings remain constant as a fraction of average ACS earnings throughout the life cycle. We also assume that the percentage earnings increase for the treatment group also remains constant throughout the life cycle. These assumptions mean that we assume the trajectories for the treatment and control groups differ by a constant percentage throughout the life cycle.[28] This yields an estimated discounted earnings increase of $117,330 through age 65. We subsequently calculate that the associated fiscal externality reduces government costs by $21,823. When combined with our previous cost components, we find that each marginal FIU admission has a net cost of −$24,445. The expenditure pays for itself.

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and we apply this rate uniformly across years for simplicity. With more reliable historical information on marginal tax and transfer rates across the income distribution, one could perform the analysis separately by year. We are not aware of any comprehensive historical source on the distribution of those rates. For this reason, we take the simpler approach of using a consistent 2016 tax and transfer rate and then assessing the robustness of all our results to alternative rate assumptions. We present robustness to alternative tax and transfer rate assumptions in Section IV.C.

28. Although this is a strong assumption, we show in the robustness analysis that our results are actually not very sensitive to the method we use to construct these forecasts. For example, we conduct a conservative forecast that assumes zero income growth over the life cycle. This yields similar results (see Figure VI, Panel B).

2. Willingness to Pay. Having established that the initial costs of increasing admission at FIU leads to long-run net savings to the government, the policy has an infinite MVPF as long as $WTP > 0$. That said, constructing a measure of willingness to pay remains useful in making our confidence intervals and evaluating alternate specifications. The components of our baseline estimate of WTP are illustrated in Figure I, Panel C.

Throughout, our approaches to estimating WTP rely heavily on the logic of the envelope theorem and revealed preference. For the baseline estimate, we assume that increases in income among the college educated stem from returns to human capital, not from higher levels of effort.[29] In this case, the envelope theorem implies that we can form an estimate of WTP using the policy's impact on net income after taxes and other expenses (and ignore the composition of individuals' spending).[30] We begin by noting that those who are admitted to FIU have an increase in private costs associated with additional tuition and fee payments at the four-year school. This leads to a negative WTP component of $2,851. Next, the earnings fall in the first seven years after admission leads to a further negative WTP of $8,907. The earnings gains in years 8–14 yield a positive WTP of $29,095. Projecting through the rest of the life cycle yields an additional WTP of $95,507. Combined, this yields a total willingness to pay of $112,844.[31]

29. We refrain from incorporating general equilibrium effects in our willingness to pay due to a lack of evidence on this point. If higher educational attainment produced positive spillovers on others, aggregate willingness to pay would rise. If the college earnings premium were driven by signaling effects, then we would expect other individuals to have a negative willingness to pay.

30. To see this, consider the decision problem of choosing a vector of consumption goods x to maximize $u(x; p)$ subject to $q \cdot x \leqslant y(p)$ where q is the price of goods and $y(p)$ is after-tax income. In principle, the government's policy choices, p, can directly affect utility and the budget constraint. For the baseline WTP measure for FIU, we assume admission to FIU only affects $y(p)$ so that $\frac{\partial u}{\partial p} = 0$, which means willingness to pay is given by $\frac{dy}{dp}$ (the impact on the vector x can be ignored by the envelope theorem). However, if effects on income of admission to FIU is the result of higher levels of effort, that would require an adjustment for the disutility of labor and our baseline approach would overstate WTP; conversely, if individuals derive additional utility from attending college that is not captured in their earnings, the baseline approach would understate willingness to pay.

31. We also form a "conservative WTP" of $1 that relies on the logic of revealed preference that individuals are willing to pay a nonnegative amount for admission into FIU.

III.B. Medicaid Expansion to Pregnant Women and Infants

Now, we consider a Medicaid expansion to pregnant women and children in the United States that occurred across states between 1979–1992. This example illustrates a case where we construct the MVPF using examples from several papers using the same identification strategy but focusing on different outcomes.

We construct our MVPF using several different analyses of these reforms, each of which use the differential timing of the reforms across states to measure their impacts.[32] Currie and Gruber (1996) document a significant increase in health insurance coverage for pregnant women, along with a corresponding reduction in infant mortality and low birth weight. Cutler and Gruber (1996) find significant crowd-out of private insurance policies. Dave et al. (2015) find reductions in labor supply of eligible women. Miller and Wherry (2019) find positive effects on children's future earnings and health for those whose parents obtained Medicaid eligibility. We translate these estimates into their implied MVPF, beginning with costs and then turning to willingness to pay.

1. Costs. The bar chart in Figure II, Panel A illustrates the translation of estimates from the literature into their implied costs to the government. Currie and Gruber (1996) estimate that the cost of insuring an additional pregnant woman through the Medicaid expansion was $3,473.[33] In addition to the direct Medicaid costs, Dave et al. (2015) estimate that Medicaid eligibility leads to a 21.9% reduction in female labor force participation, which corresponds to an earnings impact of roughly $2,834. We estimate that these individuals face a tax-and-transfer rate of 18.9% from the CBO using our procedure discussed in Online Appendix G. This means that the earnings effect implies an additional cost to the government of $564 per eligible child. As a result, a short-run analysis of the policy would conclude that the causal effects of the policy lead to an increase in costs.

32. Our analysis also explores other policies that expanded Medicaid to children, such as the national expansion of Medicaid to those born after September 30, 1983. These policy changes correspond to separate MVPF constructions because they arise from different sources of policy variation.

33. For consistency across papers analyzing the reform, we deflate all numbers to 2012 US$ using the CPI-U-RS; as a result, they differ slightly from reported figures in each paper.

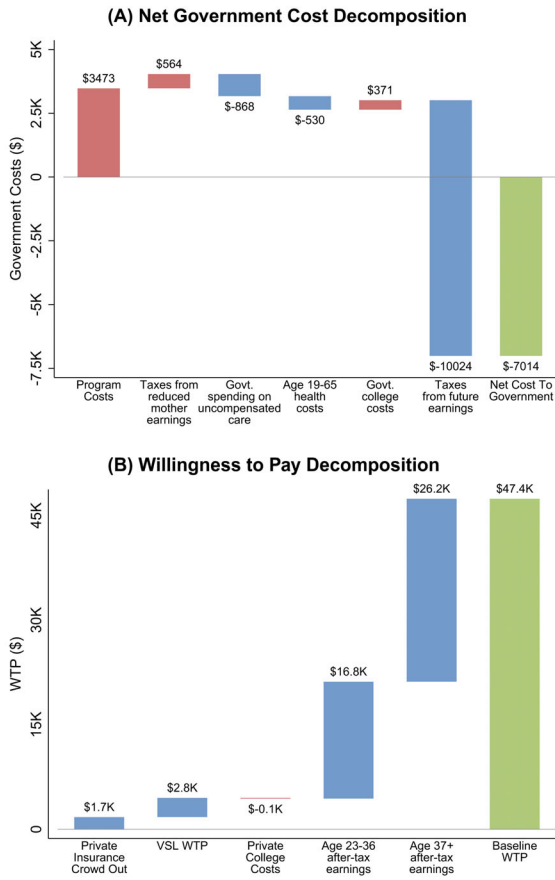

FIGURE II

WTP and Cost Components for Medicaid Expansions to Pregnant Women and Infants

This figure illustrates the cost to the government of providing Medicaid to pregnant women and infants. The evidence comes from state Medicaid expansions between 1979 and 1992. Panel A breaks the total cost down into its various components. The savings on uncompensated care come from Currie and Gruber (1996), who estimate rates of uninsurance, and Gold and Kenney (1985) who estimate the quantity of uncompensated care for the uninsured. The savings on future health costs come from Miller and Wherry (2019). The increase in government revenue combines an effective tax rate with the estimates of earnings gains from Miller and Wherry (2019). Panel B reports the components of our WTP calculations. The point estimate includes the willingness to pay for reductions in infant mortality, combined with the change in income for children over their life cycle after taxes and educational expenses. All numbers are in 2011 dollars deflated using the CPI-U-RS and discounted using a 3% real interest rate.

Turning to the effects on children, Miller and Wherry (2019) estimate that a 1 percentage point increase in parental eligibility leads to a reduction in future hospitalizations of 0.237% when children are 19 to 32 years old. With a 3% discount rate, this implies government savings on Medicaid and uncompensated care of $868 over the 14-year period from ages 19 to 32.[34] Miller and Wherry (2019) also find a 3.5% increase in college attendance and an 11.6% increase in earnings for children made eligible. On the one hand, to the extent to which the government subsidizes college expenses, increased enrollment raises government costs. We estimate that effect to be $371. On the other hand, the increase in earnings when children are 23–36 years old leads to an increase in government revenue of $3,909. By the time children are 36 years old, the estimates suggest that the policy has paid for itself.

As with the example in Section III.A, we forecast these earnings gains to age 65 by assuming that the percentage impact on earnings remains constant throughout the life cycle. This suggests that the government recoups an additional $6,114 in tax revenue over this period, for a total of $10,024. The up-front cost of $3,473 led to a long-run net government surplus of $7,014 (95% CI of [1,178, 12,971]).

Before moving on to discussing the details of willingness to pay, it is worth noting that the MVPF of this expenditure has already been determined. For a policy to have an infinite MVPF, net costs must be negative and willingness to pay must be any positive value. The policy evaluated here expanded health care opportunities to parents and children, so it is safe to assume willingness to pay is positive. In fact, if the policy did not make anyone worse off, then these expenditures resulted in a Pareto improvement.

2. WTP. While the baseline MVPF estimate is infinite, we calculate willingness to pay for use in constructing confidence intervals and evaluating alternate specifications where costs are positive. We briefly summarize this construction, which consists of three components. (Step-by-step details of this calculation can be found in Online Appendix D.)

First, Cutler and Gruber (1996) document that half of the increase in Medicaid actually crowded out private coverage. Assuming that the public and private costs of insurance were roughly

34. We forecast to age 65 by assuming a constant dollar saving and discounting by 3%, which implies $530 of total savings, as shown in Figure II.

similar, this finding implies that beneficiaries no longer had to pay roughly $1,737 in health insurance costs. This means that WTP is at least $1,737. Second, Currie and Gruber (1996) estimate a causal effect of the Medicaid expansion on infant mortality. We assume parents have a willingness to pay out of their own income of $1M to avoid an infant death (and assess robustness to alternative specifications).[35] Third, we consider the WTP by the children for improved labor market prospects in adulthood. To do so, we assume that the increase in earnings documented by Miller and Wherry (2019) reflects an expansion of labor market opportunities and not an increase in costly labor effort. This means that the children should be willing to pay the increase in their net income after private expenses that results from increased educational attainment. The increase in after-tax income is $16,775 for the observed 14-year age range (23–36) in Miller and Wherry (2019) and an additional $26,236 in the subsequent years. Subtracting the cost of college expenses reduces this by $111 for a net WTP of $47,400.

We also provide a conservative WTP estimate using solely the transfer value of the insurance of $1,737. This would be valid if the increase in after-tax earnings came at the expense of increased effort as opposed to increased opportunities. To be sure, the difference between the conservative and baseline WTP estimate is quite large. As we discuss below, our primary conclusions remain valid under either approach.

III.C. Introduction of Food Stamps

Third, we construct an MVPF for the impact of the introduction of the Food Stamp Program, today known as the Supplemental Nutritional Assistance Program (SNAP). This example illustrates how we incorporate potential spillovers of adult-targeted policies onto children.

The Food Stamp Program provides in-kind transfers to low-income families that can be used on food. Its introduction in the 1970s was staggered across counties in the United States.[36]

35. Note we should think of this as a "private" not a "social" willingness to pay. It assumes that parents are willing to pay $10,000 out of their own pocket to have a 1% reduction in infant mortality. It is important to note that society may well be willing to pay more than $1M. In the language of the social welfare function, this suggests that the population has a high social marginal utility of income, η_j.

36. This variation was initially studied by Currie and Moretti (2006) in California and extended nationally by Almond, Hoynes, and Schanzenbach (2011),

Hoynes and Schanzenbach (2012) exploit this variation to analyze its impact on labor income and welfare participation of adult beneficiaries; Almond, Hoynes, and Schanzenbach (2011) study its effect on birth outcomes. Bailey et al. (2019) use the same variation to study its impacts on the adult earnings of children whose parents received food stamps.

1. Costs. The first component of our total costs is the average yearly benefit from food stamp enrollment, equal to $2,904. To this, we add the fiscal externality resulting from the effects on both adults and children. For adults, Hoynes and Schanzenbach (2012) document large yet imprecise reductions in earnings of $3,650 that imply a fiscal externality of $471 from reductions in tax revenue—roughly $0.16 per $1 of food stamps provided. For children, Bailey et al. (2019) find increases in earnings in adulthood corresponding to 7.1% for six full years of childhood exposure to food stamps between the ages of zero and five. In Online Appendix E, we show that this corresponds to an estimated increase in tax revenue of $0.24 per $1 of food stamps for every family with a child aged 0–5. We then multiply this by 0.35, the fraction of SNAP benefits received by households with children age 0–5. We subsequently multiply by 1.32, the average number of children in these households. This suggests that for each $1 in food stamp spending, the resulting effects on children increase government revenue by $0.11.[37] Taken together, these estimates imply that every $1 of spending on food stamps costs $1.05.[38]

2. WTP. We provide a willingness to pay from three components. First, the envelope theorem suggests that individuals are

Hoynes and Schanzenbach (2012), Hoynes, Schanzenbach, and Almond (2016), and Bailey et al. (2019).

37. We assume no impact on children at older ages, but clearly such effects could alter the MVPF. In Section V, we discuss the implications for a policy targeted to families with children aged 0–5; this leads to a larger MVPF.

38. Our costs estimates here are constrained by the set of observed outcomes that we can reliably translate into effects on the government budget. For example, Hoynes, Schanzenbach, and Almond (2016) report that the introduction of food stamps was associated with a reduction in adult metabolic syndromes. Although our earnings estimates likely capture the effect of those health changes on labor supply, we lack a reliable way to measure the impact of those health changes on health care utilization. Future work documenting long-run health impacts that reduce (increase) government spending on medical care could lead to a higher (lower) MVPF than we estimate here.

willing to pay for the mechanical cost of SNAP benefits, which we estimate to be $1,809. We arrive at this number by taking the $3,650 increase in earnings and noting that SNAP benefits decline with earnings at a 30% phaseout rate. This means that $1,095 of the food stamp cost is the result of a cost increase from behavioral responses. Consequently, our point estimate suggests individuals value $0.62 for each $1 spent by the government on food stamps.[39] Second, we incorporate the WTP for reductions in infant mortality and increases in longevity among their children. As in the case of Medicaid in Section III.D, we assume this is given by the reduction in child mortality multiplied by a value of a statistical life (VSL) of $1M (2012US$). We add to that value the number of years of increased longevity multiplied by a quality of adjusted life-year (QALY) of $20k (2012US$). This leads to an additional WTP of $0.02. Last, we incorporate an additional willingness to pay because of increases in after-tax income among those who received food stamps as children. These estimates of after-tax income are based on the earnings gains we calculate above. Combining costs with willingness to pay creates an MVPF of 1.04 (95% CI of $[-0.97, \infty]$).[40]

It is important to note in this case that statistical uncertainty in these estimates is quite high. The combination of substantial earnings reductions among parents and large earnings gains among children mean that we cannot reject MVPFs of 0 or ∞. We return to this uncertainty in more detail in Section VI.A when we discuss the value of additional research or data access in reducing sampling uncertainty.

III.D. Paycheck Plus in New York City

Fourth, we measure the MVPF of the Paycheck Plus program. This construction illustrates how we create the MVPF from RCTs.

39. It is also worth noting that this willingness to pay is nearly identical to the value we would receive if we did not apply the envelope theorem in this context, but rather used estimates from Whitmore (2002) suggesting that food stamps have a trade value of at least 65%. For our "conservative" willingness to pay specification, we make both the envelope theorem and trade value modifications and find that the MVPF falls to 0.39.

40. In Online Appendix E, we also explore several alternate specifications and find that these produce only small changes to the MVPF. For example, we assume a higher VSL of $9M and a QALY of $180k and find an MVPF of 1.22. We incorporate the impact of reduced incarceration based on effects estimated in Bailey et al. (2019) and costs of incarceration from Heckman et al. (2010). We find that the MVPF rises from 1.04 to 1.07.

It also provides guidance on the ideal set of measures future researchers could construct to more directly estimate the MVPF associated with RCTs.

The Paycheck Plus program is modeled after the Earned Income Tax Credit (EITC). The EITC provides income subsidies to low-income workers that are intended to encourage employment. If workers face high marginal tax rates due to the benefit schedule for means-tested transfers such as food stamps, the EITC may offset those high rates. While the EITC generally targets adults with children, the Paycheck Plus program in New York City conducted an RCT to evaluate the provision of EITC-like benefits to single adults without dependents—a group not traditionally eligible for significant EITC benefits. The credit is worth up to $2,000 a year and is available over three years (2014–2016 fiscal tax years with bonuses paying out in 2015–2017).

Miller et al. (2017) estimate the effect of the policy on income, employment, and after-tax income for the first two years of the policy, which we translate here into their implied MVPF.[41] We begin with costs.

1. Cost. The cost of the policy is the observed causal effect of the policy on the government budget.[42] To measure the costs, let T^j denote the tax schedule faced by the control ($j = 0$) and treatment ($j = 1$) groups. Let y_i^j denote individual i's earnings if they face the $j = 0, 1$ tax/transfer schedule. The cost is then given by:

$$Cost = E\left[T^0\left(y_i^0\right)\right] - E\left[T^1\left(y_i^1\right)\right]. \tag{5}$$

41. As discussed in Online Appendix D, the current set of results from the third year do not include sufficient information to form the MVPF in as precise a manner as we do here; but we note how imposing a reasonable additional assumption suggests that the third-year effects lead to a very similar MVPF also near 1.

42. In the context of an RCT, our approach measures the welfare impact of randomly assigning additional people to the treatment as opposed to the control group. As a result, one can use the reduced-form results to form our welfare analysis (i.e., one need not separately isolate a LATE/TOT). The denominator is the causal effect of this assignment on the budget and the numerator is the aggregate WTP by members of the control group to be in the treatment group. As a result, whether our welfare analysis can be externally generalized to a different policy with different take-up of benefits would depend on how its treatment effects vary across the population.

Because Paycheck Plus is an RCT, we compute equation (5) using the difference in tax and transfer revenue obtained by the government. In 2014, the causal impact on government costs was \$621; in 2015, this cost was \$453. Combining these values, the cost is \$1,074.

2. WTP. We use the envelope theorem to estimate the WTP for Paycheck Plus. In 2014, the average bonus paid is \$1,399 among those who take it up, and 45.9% of people do so. The envelope theorem suggests that participants do not value the full \$1,399 subsidy dollar for dollar. This is because part of this cost reflects the impact of behavioral responses. To the first order, those who entered the labor force to obtain the transfer are indifferent between working and not working. Miller et al. (2017) find a causal effect of the program on the extensive margin labor supply of 0.9%. Absent behavioral responses, this implies that 45% of the sample, as opposed to 45.9%, would have received the transfer had they not changed their behavior. Consequently, 98% of the transfer ($\frac{45}{45.9}$) is valued by the beneficiaries, which implies a WTP of \$630 for the transfers in 2014.[43] Repeating this calculation using the data from 2015 yields a WTP of \$441. This suggests a two-year WTP of \$1,070. The estimated WTP of \$1,070 combined with the net cost of \$1,074 implies an MVPF of 0.996 (which rounds to 1 in Table II).

One can also construct an MVPF separately using the 2014 or 2015 transfers and responses. This yields similar MVPFs of 1.014 and 0.973. This dynamic similarity will be a recurring theme among transfer programs to adults. It means that a static model of the labor market distortions provides a reasonable approximation to measuring the MVPF for these policies. Every \$1 the government spends in transfers leads to a benefit of roughly \$1.[44]

43. This calculation assumes no intensive-margin responses. If one observed the microdata from the RCT, one could allow for intensive-margin responses. To the first order, the WTP is the mechanical change in the tax schedule (i.e., replacing T^0 with T^1) holding behavior fixed for each individual at y_i^0:

$$WTP = E\left[T^0\left(y_i^0\right) - T^1\left(y_i^0\right)\right]. \tag{6}$$

This means the ideal method of calculating WTP is to feed the distribution of control group earnings into both the control and treatment group tax schedule. In practice, this number is rarely reported, but future work conducting welfare analyses of RCTs can directly construct this measure.

44. If the provision of work subsidies today leads to an increase in labor earnings and thus tax revenue after the earnings subsidies have ended, then

TABLE II

MVPF, WTP, AND COST ESTIMATES WITH CONFIDENCE INTERVALS, ALL PROGRAMS

Program	MVPF	MVPF CI	WTP	WTP CI	Cost	Cost CI	Baseline
Child education	∞	[17.83, ∞]	4.82	[3.38, 6.28]	−0.21	[−0.59, 0.19]	
Abecedarian	11.89	[−0.18, ∞]	2.62	[−0.24, 5.63]	0.22	[−0.76, 1.15]	x
CPC Extended	∞	[−∞, ∞]	4.15	[−21.80, 27.36]	−1.22	[−6.13, 4.36]	
CPC Preschool	∞	[∞, ∞]	2.23	[0.24, 4.21]	−0.35	[−0.62, −0.10]	
CPC School	1.32	[−∞, ∞]	−0.18	[−1.23, 0.83]	−0.14	[−1.27, 0.98]	
Head Start	∞	[10.58, ∞]	4.42	[2.90, 6.08]	−0.11	[−0.52, 0.27]	x
Head Start RD	0.72	[−0.02, ∞]	0.72	[−12.90, 11.46]	0.99	[−0.03, 1.78]	
Head Start RCT	2.41	[1.90, 3.15]	1.29	[1.10, 1.50]	0.54	[0.49, 0.59]	
K12 Spend	∞	[∞, ∞]	8.78	[4.58, 13.03]	−1.03	[−2.02, −0.06]	x
K12 Spend Mich.	0.65	[0.05, 2.19]	0.62	[−0.01, 1.58]	0.95	[0.79, 1.08]	
Perry Preschool	43.61	[1.83, ∞]	3.45	[1.19, 5.70]	0.08	[−0.52, 0.68]	x
College adult	−5.59	[−∞, ∞]	−2.68	[−143.04, 61.16]	0.48	[−7.74, 18.61]	
AOTC (IS)	6.75	[−1.61, ∞]*	2.45	[−6.52, 13.42]*	0.36	[−6.64, 6.47]*	x
AOTC (JE)	−1.77	[−17.06, ∞]*	−7.63	[−68.99, 40.12]*	4.31	[−11.54, 24.28]*	x
AOTC (JS)	∞	[−5.96, ∞]*	9.96	[−44.67, 76.39]*	−1.37	[−16.83, 12.68]*	x
AOTC (SI)	10.05	[−18.36, ∞]	5.36	[−89.06, 104.44]	0.53	[−12.93, 13.61]	x
AOTC (SE)	−0.02	[−2.25, ∞]*	−0.02	[−7.28, 5.59]*	1.12	[−6.30, 8.17]*	x
AOTC (SS)	∞	[−8.00, ∞]*	23.39	[−112.96, 191.48]*	−1.61	[−26.75, 19.56]*	x
HOPE Cred.	12.58	[−24.72, ∞]	5.27	[−745.41, 518.28]	0.42	[−61.22, 131.34]	x
HTC (IS)	18.86	[−2.87, ∞]*	5.91	[−24.65, 43.39]*	0.31	[−11.81, 11.68]*	x
HTC (JE)	2.37	[−2.22, ∞]*	8.21	[−35.77, 61.73]*	3.47	[−21.81, 28.40]*	x
HTC (JS)	∞	[−3.51, ∞]*	18.41	[−87.39, 148.22]*	−3.15	[−69.14, 53.90]*	x
HTC (SE)	11.83	[−4.48, ∞]*	4.59	[−17.25, 31.56]*	0.39	[−4.19, 4.15]*	x
HTC (SS)	−1.64	[−13.38, ∞]*	−1.91	[−22.71, 14.11]*	1.16	[−3.87, 6.67]*	x

TABLE II (CONTINUED)

Program	MVPF	MVPF CI	WTP	WTP CI	Cost	Cost CI	Baseline
HOPE/LLC	−8.81	[−∞, ∞]	−42.82	[−266.09, 9.92]	4.86	[−7.59, 31.13]	x
Adult Pell	2.18	[0.71, 6.11]	3.42	[1.02, 6.25]	1.57	[1.03, 2.31]	x
Tuition deduc (JE)	0.77	[−1.92, 38.88]	1.00	[−4.88, 6.49]	1.29	[0.17, 2.51]	x
Tuition deduc (JS)	−0.02	[−2.50, 5.62]	−0.03	[−5.59, 4.43]	1.38	[0.55, 2.49]	x
Tuition deduc (SE)	∞	[−∞, ∞]	1.00	[−7.76, 8.53]	−1.13	[−2.04, −0.26]	x
Tuition deduc (SS)	∞	[−∞, ∞]	5.38	[−1.58, 14.00]	−5.10	[−6.36, −3.41]	x
College child	∞	[4.18, ∞]	8.79	[3.05, 15.65]	−0.36	[−1.76, 0.73]	
Cal Grant GPA	∞	[10.72, ∞]	9.41	[3.43, 16.44]	−0.57	[−1.63, 0.32]	x
Cal Grant Inc	−0.69	[−2.36, 7.41]	−1.04	[−5.37, 4.29]	1.51	[0.63, 2.21]	x
CUNY Pell	1.39	[−2.95, 12.88]	1.42	[−3.42, 7.15]	1.02	[0.48, 1.56]	x
CC Mich	29.46	[−2.33, ∞]	7.80	[−9.29, 29.19]	0.26	[−3.39, 2.72]	x
CC Texas	349.51	[1.61, ∞]	10.69	[1.73, 20.89]	0.03	[−2.08, 2.10]	x
DC Grant	22.98		7.62		0.33		x
FIU GPA	∞	[∞, ∞]	13.73	[1.40, 62.13]	−2.97	[−15.62, −0.02]	x
Florida Grant	7.42	[1.09, ∞]	7.40	[1.24, 15.61]	1.00	[−0.32, 2.42]	x
Free FAFSA (dep)	4.03	[0.65, 10.75]	33.67	[3.04, 95.17]	8.35	[2.00, 20.03]	
Free FAFSA (indep)	2.12	[−0.06, 9.71]	5.32	[−0.89, 15.05]	2.51	[0.77, 4.91]	
Georgia HOPE	4.00	[0.37, 20.63]	3.60	[0.73, 6.48]	0.90	[0.28, 1.57]	x
HAIL Aid	1.30	[0.24, 3.65]	0.97	[0.14, 1.78]	0.75	[0.54, 0.95]	
Kalamazoo	1.93	[0.97, 5.61]	1.93	[0.93, 3.71]	1.00	[0.77, 1.24]	x
MA scholarship	0.72	[−0.92, 3.05]	1.21	[−1.81, 4.00]	1.68	[1.25, 2.23]	x
Ohio Pell	2.49	[0.80, 5.40]	2.88	[1.29, 4.40]	1.16	[0.80, 1.56]	x
TN Pell	0.84	[−1.59, 3.57]	0.78	[−1.64, 2.84]	0.93	[0.62, 1.24]	x

TABLE II (CONTINUED)

Program	MVPF	MVPF CI	WTP	WTP CI	Cost	Cost CI	Baseline
Texas Pell	∞	$[\infty, \infty]$	85.74	[0.77, 173.60]	−17.38	[−33.15, −1.92]	x
Soc Sec College	4.86	[0.98, 52.39]	5.03	[0.82, 10.92]	1.03	[0.32, 1.95]	x
College spend	4.00	[1.25, 20.44]	3.17	[1.26, 5.48]	0.79	[0.36, 1.21]	x
TN Hope	1.86	[0.92, 5.08]	1.94	[0.94, 3.51]	1.05	[0.81, 1.36]	x
College tuition	1.02	[−1.06, 5.47]	1.02	[−1.47, 3.58]	1.00	[0.68, 1.32]	x
WI scholarship	1.43	[1.00, 2.32]	1.46	[1.04, 2.08]	1.02	[0.93, 1.13]	x
Job training	0.44	[−19.57, 0.91]	0.36	[−0.82, 1.51]	0.83	[−0.09, 1.75]	
Job Corps	0.15	[−0.23, 0.58]	0.15	[−0.23, 0.55]	0.98	[0.93, 1.03]	x
JTPA adult	1.38	[−0.21, 2.13]*	1.17	[−0.17, 2.64]*	0.85	[0.08, 1.65]*	x
JTPA youth	−0.23	[−3.43, 1.27]*	−0.21	[−1.70, 1.29]*	0.91	[0.15, 1.66]*	x
JobStart	0.20	[0.04, 0.42]	0.20	[0.06, 0.34]	1.02	[0.80, 1.24]	x
NSW Women	1.48	$[-\infty, \infty]$	0.57	[−0.50, 1.64]	0.39	[−0.09, 0.86]	x
NSW Ex-Addict	0.44		0.35		0.79		x
NSW Ex-Offender	0.64		0.53		0.82		x
NSW Youth	0.60	$[-\infty, \infty]$	0.47	[−4.23, 5.15]	0.78	[−3.32, 4.87]	x
Work Advance	0.78	[0.26, 1.34]*	0.64	[0.21, 1.11]*	0.83	[0.83, 0.83]*	x
Year Up	0.43	[0.37, 0.48]	0.41	[0.36, 0.45]	0.96	[0.95, 0.97]	x
Disability ins.	0.85	[0.82, 0.88]	1.00	[1.00, 1.00]	1.18	[1.14, 1.22]	
DI generosity	0.96	[0.95, 0.97]	1.00		1.04	[1.03, 1.05]	x
DI judge	0.78	[0.72, 0.85]	1.00		1.28	[1.18, 1.39]	x
DI examiner	0.74	[0.71, 0.78]	1.00		1.34	[1.28, 1.41]	x
DI veterans	0.95	[0.92, 0.98]	1.00		1.05	[1.02, 1.08]	x

TABLE II (CONTINUED)

Program	MVPF	MVPF CI	WTP	WTP CI	Cost	Cost CI	Baseline
Health adult	0.89	[0.56, 1.57]	1.49	[1.00, 1.99]	1.67	[1.01, 2.39]	
Mass HI (150%FPL)	0.80		1.00		1.25		x
Mass HI (200%FPL)	0.85		1.00		1.18		x
Mass HI (250%FPL)	1.09		1.00		0.92		x
Medicare intro	1.63	[0.52, 3.83]	2.00	[0.58, 3.44]	1.23	[0.48, 1.78]	x
Oregon Health	1.16	[1.08, 1.25]	1.46	[1.19, 1.83]	1.26	[1.04, 1.57]	x
Medigap tax	0.40	[0.22, 1.54]	1.00		2.53	[0.64, 4.44]	x
Health child	∞	[24.82, ∞]	6.10	[3.05, 13.17]	−0.78	[−2.52, 0.17]	
MC child 83+	∞	[0.26, ∞]	0.86	[0.66, 1.44]	−0.20	[−0.47, 1.82]	x
MC pregnant & infants	∞	[∞, ∞]	13.65	[5.92, 40.80]	−2.02	[−7.85, −0.27]	x
MC child (state exp)	∞	[−0.37, ∞]	8.13	[−0.24, 14.00]	−1.08	[−2.25, 0.57]	x
MC intro	10.24	[0.93, ∞]	1.78		0.17	[−1.60, 1.93]	x
Supp. Sec. Inc.	0.75	[0.64, 0.85]	1.00	[1.00, 1.00]	1.33	[1.17, 1.56]	
SSI review	0.76	[0.56, 1.00]	1.00		1.32	[1.00, 1.78]	x
SSI judge	0.74	[0.72, 0.77]	1.00		1.34	[1.30, 1.39]	x
Unemp. ins.	0.61	[0.53, 0.74]	1.20	[1.15, 1.24]	1.95	[1.63, 2.26]	
UI ben (state max)	0.68	[0.48, 1.13]	1.17	[1.11, 1.22]	1.71	[0.99, 2.41]	x
UI ben (DD)	0.43	[0.28, 0.78]	1.17	[1.11, 1.22]	2.74	[1.51, 4.17]	x
UI ben (DD w UR)	0.48	[0.30, 1.69]	1.17	[1.11, 1.22]	2.43	[0.79, 3.90]	x
UI ben (GA)	1.03	[0.97, 1.09]	1.17	[1.11, 1.22]	1.14	[1.09, 1.18]	x
UI ben (MO Exp.)	0.74	[0.67, 0.81]	1.17	[1.11, 1.22]	1.59	[1.46, 1.73]	x
UI ben (MO Rec.)	0.44	[0.39, 0.50]	1.17	[1.11, 1.22]	2.68	[2.36, 3.01]	x
UI ben (NY)	0.89	[0.82, 0.97]	1.17	[1.11, 1.22]	1.31	[1.21, 1.41]	x
UI ben (RK)	0.84	[0.76, 0.92]	1.17	[1.11, 1.22]	1.40	[1.28, 1.52]	x
UI dur (DD)	0.45	[0.25, 2.12]	1.30	[1.24, 1.36]	2.89	[0.61, 5.19]	x

TABLE II (CONTINUED)

Program	MVPF	MVPF CI	WTP	WTP CI	Cost	Cost CI	Baseline
UI dur (MO)	0.83	[0.76, 0.90]	1.30	[1.24, 1.36]	1.57	[1.46, 1.69]	x
Housing vouchers	0.77	[0.74, 0.81]	0.91	[0.91, 0.91]	1.19	[1.13, 1.24]	
HCV RCT to welfare	0.91	[0.86, 0.96]	1.00		1.10	[1.04, 1.17]	x
HCV Chicago lottery	0.65	[0.61, 0.70]	0.83		1.27	[1.18, 1.37]	x
Jobs+	1.42	[0.45, 2.83]*	1.14	[0.41, 1.91]*	0.81	[0.67, 0.93]*	
MTO							
MTO	∞	$[-2.80, \infty]$	18.40	[−15.46, 51.85]	−2.44	[−11.35, 6.81]	x
Nutrition							
WIC	1.38	[1.10, 1.66]	1.28	[1.08, 1.47]	0.93	[0.88, 0.98]	
SNAP assist	0.92	[0.91, 0.96]*	0.92	[0.91, 0.96]*	1.00		x
SNAP info	0.89	[0.89, 0.89]*	0.89	[0.89, 0.89]*	1.00		x
SNAP intro	1.04	$[-0.97, \infty]$	1.09	[−2.45, 4.55]	1.05	[−0.38, 2.51]	x
Cash transfers	0.74	[0.36, 1.47]	0.86	[0.50, 1.37]	1.16	[0.89, 1.34]	
EITC 1986	1.20	[1.05, 1.38]	1.00		0.84	[0.73, 0.95]	x
EITC 1993	1.12	[0.82, 1.21]	1.00		0.89	[0.67, 1.06]	x
AFDC generosity	0.91	[0.83, 1.00]	1.04	[0.96, 1.11]	1.14	[1.10, 1.18]	x
AFDC term limits	0.81	[0.73, 0.90]	1.00		1.23	[1.11, 1.38]	x
Alaska UBI	0.92	[0.89, 0.96]	1.00		1.09	[1.05, 1.12]	x
Paycheck+	1.00	[0.87, 1.19]	1.00		1.00	[0.85, 1.15]	x
Neg. inc. tax	−0.01	[−0.82, 9.83]	−0.02	[−2.50, 3.53]	1.96	[0.18, 3.20]	x
Top taxes	3.03	$[1.35, \infty]$	1.00	[1.00, 1.00]	0.33	[−0.09, 0.74]	
Top tax 2013	1.16	[0.87, 1.92]	1.00		0.86	[0.54, 1.16]	x
Top tax 1993	1.85	[1.19, 4.07]	1.00		0.54	[0.25, 0.84]	x
Top tax 1986	44.27	$[2.37, \infty]$	1.00		0.02	[−0.37, 0.42]	x
Top tax 2001	1.37	[0.92, 2.86]	1.00		0.73	[0.36, 1.09]	x
Top tax 1981	∞	$[0.94, \infty]$	1.00		−0.51	[−2.13, 1.06]	x

Notes. This table presents our baseline estimates for each program in our extended sample, along with the category averages reported in the bold header rows in each category. We exclude the welfare-to-work policies discussed in Section VI.C. For each policy, we report its MVPF, cost per dollar of programmatic spending, and willingness to pay per dollar of programmatic spending. We also report bootstrapped 95% confidence intervals with adjustments discussed in Online Appendix H. The final column indicates whether the program is included in the baseline estimates (and thus included in the category averages). Confidence intervals are marked with an asterisk in cases where we infer p-values using reported interval ranges. Programs in which the confidence interval is either inferred from p-values or missing are excluded from category averages.

III.E. Job Corps

Next we construct the MVPF for an RCT of Job Corps, one of the largest vocational education programs in the United States. This example illustrates how not all attempts to increase children's human capital and earnings have high MVPFs.

Established in 1964, Job Corps is administered by the U.S. Department of Labor and provides job training and other services to at-risk youth between the ages of 16 and 24 via a network of centers run by local public and private agencies (Schochet, Burghardt, and McConnell 2008). Between 1994 and 1996, the National Job Corps study randomized 80,000 eligible applicants into the program. We form an MVPF for this RCT using the recent work of Schochet (2018), who links the original RCT to tax data; we supplement this analysis with the earlier cost-benefit analysis of Schochet et al. (2006).

1. Cost. Schochet et al. (2006) estimates that the up-front programmatic cost per recipient is \$16,158. Schochet (2018) then estimates the earnings impact of the program over the course of 20 years and finds minimal effects. In particular, they find that the program increases the present discounted value of participant earnings by \$121 using a 3% discount rate. We estimate that this corresponds to an increase in tax and transfer revenue of \$52.[45] To these, we add the value of the products produced by the Job Corps participants, which Schochet, Burghardt, and McConnell (2008) estimates to be \$220. Summing, this implies a net cost of the program over 20 years of \$15,886. Given the small effects on earnings, we use this 20-year observed period as our baseline estimate. In Online Appendix C, we show that if one extrapolates

the MVPF would be higher. We discuss these forecasts and their implied MVPFs in Online Appendix F. To ensure our conclusions are not biased by including policies for adults that do not have long-run follow-ups, in Section IV.C we conduct robustness of all our analysis to policies where long-run follow-ups have been measured.

45. As discussed in Online Appendix C, we form this estimate by summing the observed increase in tax revenue for years 6–20 in administrative data from Schochet (2018) combined with an application of the CBO tax rate to the earnings effects for the first five years. We note that a fiscal externality of \$52 in this case corresponds to a high implicit marginal tax rate. This is driven by a low tax rate on initial earnings declines and a comparatively higher tax rate on subsequently small earnings gains.

these earnings effects to age 65, the net cost of the program would fall to $15,832 due to a small subsequent earnings gain.

2. WTP. Following our approach for other policies that have the potential to increase human capital, our baseline measure of willingness to pay consists of the impact of the policy on after-tax income.[46] This is given by the $69 increase in after-tax earned income plus the $2,314 component of the programmatic cost that is a transfer to participants to pay for food and clothing while participating in the program. Summing, this yields a WTP of $2,383. Dividing by the government cost of $15,886 yields an MVPF of 0.15. If one extrapolates the earnings affects to age 65, the resulting MVPF is 0.18.[47]

III.F. Top Marginal Tax Rates

Finally we turn to the MVPF of top marginal tax rate changes. This example illustrates how we can utilize estimates from existing literature that attempts to provide empirical guidance on optimal government policy (e.g., optimal top tax rates, optimal unemployment insurance benefits). Whereas those literatures often consider the policies in isolation (e.g., optimal UI policy), we can translate the estimates into their implied MVPF to facilitate comparisons across policy domains.

46. A pure revealed-preference approach in this context could rely on the assumption that job training is accessible in the private market at its programmatic cost. One could then set willingness to pay equal to (or perhaps below) the up-front cost of program enrollment. In contrast, setting willingness to pay equal to after-tax earnings does not require the assumption that potential Job Corps enrollees have perfect information about the returns to job training at the time of initial enrollment. However, it does require that after-tax income is sufficient to capture willingness to pay. This means we do not incorporate any welfare costs from optimization errors in consumption decisions that stem from program participation.

47. Our analysis here focuses on the MVPF of the entire treatment group. However, it is worth noting that Schochet (2018) finds larger effects for the subsample of age 20–24 participants, including a 2.4 percentage point reduction in disability insurance receipt and a roughly $500 a year increase in earnings. To see how this could lead to a different MVPF, we can first take a back-of-the-envelope calculation of a PDV of lifetime disability insurance receipt of roughly $200k consistent with Von Wachter, Song, and Manchester (2011). This implies a cost saving of $4,800. Second, we note that the $500 a year impact on earnings corresponds to a PDV increase in earnings of $12.8k. Applying an approximate 20% tax and transfer rate implies an increase in WTP by $10.2k and an increase in tax revenue of $2.6k. This implies a net cost of roughly $8,600, which implies an MVPF of 1.18.

There is a large theoretical and empirical literature discussing the optimal top marginal income tax rate, summarized in Saez, Slemrod, and Giertz (2012). This literature notes that a tax cut providing $1 in additional after-tax income is valued at $1 by mechanical beneficiaries. In other words, the tax cut is valued at cost by those who would receive it in the absence of any behavioral response to the change in the tax code. As a result, measuring WTP is straightforward. The cost to the government of the tax policy is more difficult. The cost of a tax cut that provides $1 of benefits in the absence of a behavioral response is given by $1 + FE$, where FE is the impact of the behavioral response to the tax cut on government revenue.

For top marginal tax rate reductions, Saez, Slemrod, and Giertz (2012) and Diamond and Saez (2011) show that this FE can be expressed as $-\frac{\tau}{1-\tau}\alpha\epsilon^{ETI}$, where α is the Pareto parameter of the income distribution[48] and $\epsilon^{ETI} = \frac{1-\tau}{E[y]}\frac{dE[y]}{d(1-\tau)}$ is the elasticity of taxable income for top earners with respect to the top marginal "keep" rate of $1-\tau$.[49]

The elasticity ϵ^{ETI} has been estimated using various tax reforms including the 1981 and 1986 tax decreases and 1993 increases in the top marginal income tax rate. We compute the MVPF of the historical tax policy changes that allowed researchers to identify ϵ^{ETI}. The MVPF for each tax reform is the ratio of WTP to cost, $\frac{1}{1+FE}$:

$$MVPF = \frac{1}{1-\frac{\tau}{1-\tau}\alpha\epsilon^{ETI}}. \tag{7}$$

We translate estimates of ϵ^{ETI} estimated from five major tax reforms in 1981, 1986, 1993, 2001, and 2013, which are outlined in Online Appendix F.

To take one example, consider the 1981 tax cut that reduced the top marginal income tax rate from 70% to 50%. Saez (2003) finds an estimate of $\epsilon = 0.311$. We estimate $\alpha = 2.299$ from Atkinson, Piketty, and Saez (2011). We plug these into equation (7). We use marginal tax rates of $\tau = 75\%$ and $\tau = 55\%$ before and after the reform, which include a 5% state tax adjustment.

48. Mathematically, $\alpha = \frac{E[y_i|y_i \geq \bar{y}]}{E[y_i-\bar{y}|y_i \geq \bar{y}]}$ where $\bar{y}$ is the threshold over which the top marginal income tax rate applies.

49. Online Appendix F provides a derivation.

Combining, and averaging FE obtained using the prereform and postreform tax rates, we obtain $FE = \frac{\tau}{1-\tau}\alpha\epsilon^{ETI} = 1.51$. This means that the 70% marginal tax rate appears to have been on the "wrong side of the Laffer curve," so reducing tax rates may have increased revenue. In other words, the MVPF is infinite and the tax cut "pays for itself." However, it is important to note the statistical uncertainty in this estimate: we cannot reject an MVPF of 1 or ∞.

In contrast, for later reforms we find lower MVPFs. For example for the 1993 tax increase from 31% to 39.6% we find an MVPF of 1.85 (95% CI of [1.19, 4.07]). This distinction is not because of differences in ϵ, but results from the fact that τ was much lower in 1993 than it was in 1981.

Comparison to the "Optimal" Top Tax Rate. To compare our results to the literature on the "optimal" top tax rates, it is helpful to consider the case studied in Diamond and Saez (2011) where society is assumed to place no weight on the additional consumption of the rich. If the social welfare weights, η_i, are equal to 0 for top earners, then the optimal tax is set to maximize government revenue: τ is chosen to be at the peak of the Laffer curve. This occurs when taxes are set so that the net cost to the government of providing a tax cut is 0, or $FE = -1$.

This approach then makes the additional assumption that the elasticity, ϵ^{ETI}, and α do not change when the tax rate changes. Solving for the optimal tax rate then implies $\tau^* = \frac{1}{1+\alpha\epsilon^{ETI}}$.

For $\alpha = 2.299$ and $\epsilon^{ETI} = 0.311$, this implies $\tau^* = 58\%$ inclusive of state and federal tax rates. The fact that this number is slightly below 70% is consistent with our finding of an infinite MVPF for the 1981 reform, in which tax rates were around 70%. In contrast to this optimal tax approach, the MVPF does not impose an assumption that society places no weight on the consumption of the rich.

IV. Main Results: Targeting Kids versus Adults

We construct the MVPF for each policy in our sample. Here, we present all our baseline MVPF estimates and outline our main results. As noted, details on our MVPF constructions are provided in Online Appendices A–F.

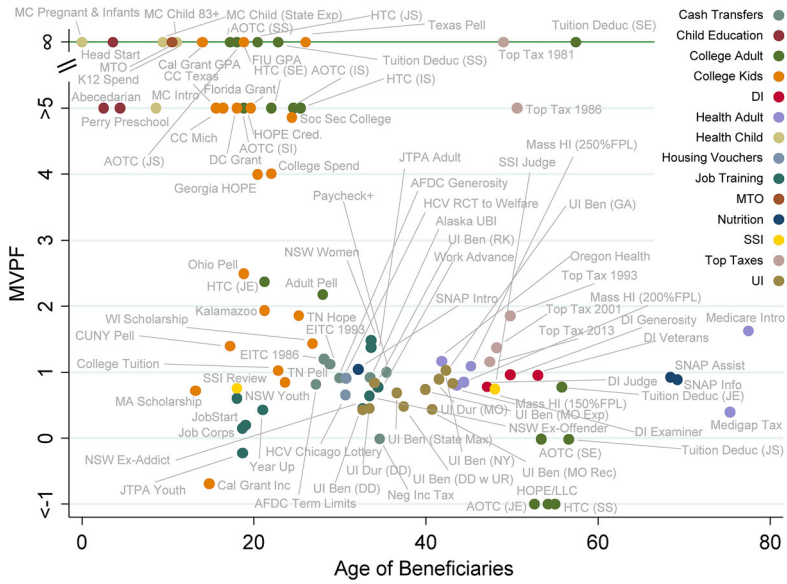

FIGURE III

MVPF Estimates by Age of Policy Beneficiary

This figure presents MVPF estimates for all policies in our baseline sample. For each MVPF, we plot them as a function of the average age of the policy's beneficiaries. In cases where both parents and children potentially benefit, we assign the age of the individuals with the highest willingness to pay. Where policies within a category have the same age, we stagger these ages around this common value for visual clarity. On the vertical axis, we report the MVPF estimates, capping these estimates at 5. We separately report cases where the MVPF is infinite on the uppermost line in green (shown in color in the online version only).

IV.A. Kids

We begin our discussion with the MVPFs of policies targeting children. Figure III presents the MVPF for each policy on the vertical axis plotted by the average age of the beneficiaries of the policy on the horizontal axis.[50] Each dot represents the MVPF of a particular policy, with labels provided in Table I.

50. In cases where both parents and children are beneficiaries of the policy, we assign the age of the "economic" beneficiary based on who has the highest WTP. For example, when analyzing the Movement to Opportunity (MTO) experiment, which provided housing vouchers and counseling to parents with children, the age shown is the average age of the children in the household. This is because the policy induced higher earnings among the children, leading them to have a higher WTP for the policy than their parents.

The figure reveals our primary result: direct investments in children have historically had the highest MVPFs, often paying for themselves. In addition to the evidence on the Medicaid expansions and admission to FIU, we also find high MVPFs for other education and child health policies. For example, Wherry et al. (2018) document that the discontinuous Medicaid coverage eligibility for children born after September 30, 1983 led to reduced medical costs and chronic conditions in adulthood. In Online Appendix D, we calculate that the up-front costs are fully repaid in the long run from reduced Medicaid and uncompensated care costs, leading to an infinite MVPF. More generally, all four major health insurance expansions to children studied in the past 50 years have MVPFs in excess of 10, with three of them paying for themselves.[51]

In addition to health policies, we find large MVPFs for education policies. The widely studied Perry Preschool program has an MVPF of 43.61; the more expensive Abecedarian model has an MVPF of 11.89 (neither of these estimates are statistically distinguishable from ∞).[52] In contrast with the idea that the returns to human capital investment diminish rapidly with age (Heckman 2006), we find there is potential for high MVPFs investments throughout childhood. We find an infinite MVPF for increased K–12 spending due to school finance equalization as studied in Jackson, Persico, and Johnson (2016).[53] We also find infinite MVPFs for several college policies, such as admissions to FIU and

51. The only policy that does not have an infinite MVPF is the introduction of Medicaid. For this policy, we directly incorporate MVPF estimates from Goodman-Bacon (2017). This working paper includes estimated impacts through age 55; our back-of-the-envelope calculations suggest that it is likely that forecasting these effects through 65 would lead the policy to pay for itself as well.

52. To harmonize these estimates with other programs, we do not include the benefits to the government from reduced crime. This is both because these costs are difficult to quantify and most papers do not estimate impacts on crime outcomes. If we include a forecast of reduced government spending on the criminal justice system and policing, our point estimates suggest that Perry Preschool paid for itself. However, the standard errors of these estimates also significantly increase. Including these costs for Abecedarian also increases its MVPF, but the policy does not appear to pay for itself.

53. It is important to note that we only analyze one paper on K–12 education spending because of limitations in existing evidence on long-term outcomes. While there is a large literature looking at the effect of school spending on test scores, we lack a reliable method to translate these effects into long-run impacts. Jackson, Persico, and Johnson (2016) demonstrate the potential for high returns to K–12 education, but future work is needed to robustly establish the presence of high returns to K–12 investment.

the provision of CalGrants to low-income students.[54] A key insight of our results is that many policies targeting children do not face the classic budgetary trade-off. Instead, those expenditures pay for themselves in the long run.

Before drawing too many conclusions about each data point in Figure III, it is important to note there is sampling uncertainty inherent in our estimates. Figure IV, Panel A plots each MVPF along with its 95% confidence interval. In some cases, our estimates are relatively precise. For example, both the Medicaid expansion to pregnant women and infants and admissions to FIU have confidence intervals that reject any finite MVPF. We can rule out any positive net cost to the government. In many other instances, however, the conclusions at the individual policy level are less clear due to the sampling variation in the underlying estimates. For example, the 1990 health care expansion to children born after September 30, 1983 has a confidence interval ranging from 0.26 to infinity. In other words, we cannot with 95% confidence reject the hypothesis that the policy paid for itself, nor can we reject the hypothesis that the policy provides much less than $1 of benefits per dollar of government spending.

To reach more precise conclusions at a broader level, we pool across policies using category averages. We imagine a new policy that spends $1 of initial program cost on each policy j in category J containing N_J policies. We then construct the MVPF of this category-average policy as:

$$\overline{MVPF}_J = \frac{\frac{1}{N_J}\sum_{j\in J}\frac{WTP^j}{C_j}}{\frac{1}{N_J}\sum_{j\in J}\left(1+\frac{FE_j}{C_j}\right)}, \tag{8}$$

where the numerator is the average willingness to pay per dollar of program cost and the denominator is the average net cost to the government of the category-average policy.[55]

Figure IV, Panel B presents the category-average MVPFs. On average, spending on child education, child health insurance,

54. It is important to be clear that although our estimates suggest high returns to policies investing in older youth, the policies in our sample affect a range of subpopulations. As a result, further work is needed to assess how the rate of return on investment varies for a given child over the life cycle.

55. We construct this average measure, as opposed to a precision-weighted average or other measure, because it corresponds to a feasible policy at the time of initial implementation. It is straightforward for the government to construct a policy that spends an equal amount on each of these programs.

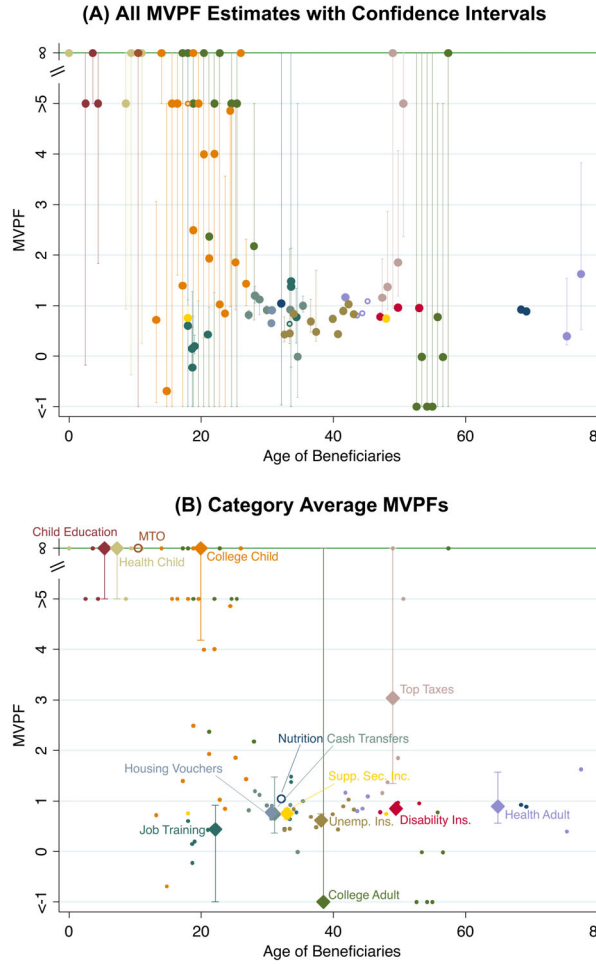

FIGURE IV

MVPF Estimates and Category Averages with Confidence Intervals

Panel A presents the MVPFs and 95% confidence intervals for each policy in our baseline sample, plotted as a function of the average age of the policy's beneficiaries. Panel B presents $1 spend domain averages and 95% confidence intervals across categories of programs, plotted as a function of the average age of each policy's beneficiaries within a category. Individual policy MVPFs are shown in smaller dots, color-coded to align with their respective categories. In both panels, we report the MVPF estimates on the vertical axis, capping these estimates at 5 and separately reporting cases where the MVPF is infinite on the uppermost line in green (shown in color in the online version only). All confidence intervals are 95% bootstrapped confidence intervals with adjustments discussed in Online Appendix H.

FIGURE V

Net Government Costs per Dollar of Programmatic Spending

This figure presents estimates of costs normalized by initial programmatic for each category-average group of policies in our baseline sample. We plot these estimates as a function of the average age of each policy's beneficiaries within category. Bootstrapped 95% confidence intervals with adjustments discussed in Online Appendix H are shown for the category averages. The normalized costs of individual policies are shown in smaller dots, color-coded to align with their respective categories (shown in color in the online version only).

and college policies have historically had high or infinite MVPFs. One dollar of spending across each of the policies in each of these categories has an MVPF of ∞ in child education (95% CI of [17.8, ∞]), ∞ in child health (95% CI of [24.8, ∞]), and ∞ in college policies (95% CI of [4.2, ∞]).

We can dig deeper into these category averages by focusing on the net costs to the government of these policies (the denominator in our formula in equation (8)). Figure V computes the average net cost to the government per \$1 of programmatic expenditure spent evenly across the policies in each category. This allows us to explore the extent to which different types of policies have paid for themselves. For example, \$1 invested in the four major Medicaid expansions to children has paid back an estimated

$1.78. In other words, the spending actually generated $0.78 of surplus to the government in the long run.[56]

Having established this primary result, it is important to qualify that these patterns do not hold uniformly across policies. There is considerable variation in MVPFs from policy to policy. For example, we find lower MVPFs ranging from −0.23 to 1.48 for job-training policies, such as an estimate of 0.15 for Job Corps—a program targeted toward at-risk youth.[57] We also analyze 14 examples of college policies where the MVPFs fall below 2.[58] In most cases, this is because those policies represent transfers to existing students, rather than expenditures that increase attainment.[59] In some cases, expenditures may even negatively affect student attainment. For example, Cohodes and Goodman (2014) analyze the impact of the Adams Scholarship in Massachusetts. They find that this merit aid program does not induce more students to go to or complete college. Rather, it induces individuals to change colleges to attend in-state schools where they are

56. Analogously, Appendix Figure II presents willingness to pay per dollar of programmatic spending. For our baseline WTP measures, we find very similar patterns: much higher estimates of $\frac{1}{N_J}\sum_{j\in J}\frac{WTP^j}{C_j}$ for child policies than for policies targeting adults.

57. The one potential exception to this is the recent Year Up RCT, analyzed in Fein and Hamadyk (2018), who document large increases in earnings in the two years after initial implementation. As we discuss in Online Appendix C, if these earnings gains persist for an additional 5 years, the MVPF would be 2.78, and if they persist for 21 years, the MVPF would be infinite. In addition, in estimates outside of our sampling frame, the nine-year follow-up results from the sectoral training program Project Quest suggest an MVPF of 1.52, which increases to an infinite MVPF if projected to age 65. This suggests a high value to future work estimating the continued persistence of these more promising sectoral training programs.

58. Our analysis also demonstrates the limitations of the traditional way that research papers report the impact of college expenditures. It is very common for papers to note the percentage point increase in enrollment associated with $1,000 in expenditures. The difficulty with that approach is that it doesn't account for the number of inframarginal students receiving the benefit. Providing $1,000 to 10% of the school-age population to achieve a 3.6 percentage point increase in enrollment may be a very efficient investment, while providing $1,000 to 80% of the school-age population to achieve a 3.6 percentage point increase is mostly a transfer to existing students. For this reason, there are cases where we find substantially different MVPFs for policies that had similar percentage point enrollment effects.

59. In Section IV.C we discuss how our results on college expenditures vary with the method of our MVPF calculation. Although we find persistently high MVPFs when long-run earnings outcomes are observed, we find lower MVPFs when we project earnings gains from attainment outcomes.

eligible to use the scholarship. The change in schooling actually results in a fall in graduation rates arguably due to switching from more selective schools with higher graduation rates. Incorporating these schooling declines, we calculate that the program has an MVPF of 0.72. Job training or education polices like this one do not substantially increase human capital and so they do not recoup meaningful portions of their initial costs via higher tax revenue.

We also find lower MVPFs for transfers to disabled children, such as an MVPF of 0.76 for expanded eligibility for Supplemental Security Income (SSI) at age 18 analyzed in Deshpande (2016). It is important to note that spending on these policies may increase social welfare, even though they have lower MVPFs. Decisions about optimal policy are determined by the welfare weights the government places on policy beneficiaries. If the government makes it a priority to provide support for disabled children, these SSI expansions may be welfare enhancing.

IV.B. Adults

In contrast to policies targeting children, we generally find lower MVPFs (e.g., 0.5–2) for policies targeting adults. For example, in contrast to the nearly infinite MVPFs for child health insurance expenditures, we find MVPFs ranging from 0.40 to 1.63 for the six health insurance policies in our baseline sample targeted to adults.[60] Along the same lines, we find MVPFs ranging from 0.43 to 1.03 for unemployment insurance policies, 0.74–0.96 for disability insurance expansions, and 1.12–1.20 for earned income tax credits. We find MVPFs of housing vouchers ranging from 0.65 using assignment of vouchers in Chicago via lottery (Jacob and Ludwig 2012) to 0.91 using an RCT of the provision of housing vouchers to families on cash welfare (Mills et al. 2006).

The lower MVPFs reflect the fact that many of these expenditures have been shown to reduce labor earnings through labor market distortions. As depicted in Figure V, the average cost per $1 of government spending on these adult policies is generally

60. Those adult health insurance estimates include expenditures such as the subsidies in the Massachusetts health insurance exchange prior to the Affordable Care Act. In that case, Finkelstein, Hendren, and Shepard (2019) exploit discontinuities in the subsidy schedule to estimate both individuals' willingness to pay for insurance and the cost those individuals impose on the government. Translating these estimates into an MVPF suggests values ranging from 0.800 to 1.09 for different subsidy eligibility levels.

slightly above $1. This result contrasts with our findings on expenditures directed toward children, for whom labor market earnings tended to rise, leading to a decline in net costs. There are a limited number of cases, such as the Job Training Partnership Act and National Supported Work Experiment, where investment in adults sought to increase earnings by increasing human capital. Those policies, however, did not produce persistent earnings gains, so they still yield relatively low MVPFs.[61] The MVPFs of job-training programs for adults over the age of 23 range from 0.44 to 1.48.[62]

As with our main results for policies targeting children, these findings represent general patterns. They do not hold uniformly across all policies targeting adults. In particular, there are two types of adult policies that tend to result in higher MVPFs: reductions of high marginal tax rates for top incomes and policies with indirect spillovers onto children.

1. Top Tax Rates. We find high MVPF point estimates for historical reductions in the top marginal tax rate when the initial tax rate lay at 50% or higher. In the case of the 1981 reform, the tax bill reduced the top federal marginal tax rate on income from 70% to 50%. Using estimates of the elasticity of taxable income from Saez (2003), we calculate that the MVPF is ∞ (95% CI of [0.94, ∞]). This implies that marginal tax rates were beyond the top of the Laffer curve prior to 1981. Our confidence interval, however, suggests this estimate contains considerable sampling uncertainty.[63]

61. For this reason, we calculate the MVPFs of job-training programs based on the number of years of earnings effects observed, rather than projecting the effects out to age 65. In Online Appendix C we discuss the sensitivity of our results to that assumption.

62. The presence of high MVPFs for spending on children and low MVPFs for spending on adults does not necessarily indicate that families are failing to optimize their investment decisions. Even if families are fully informed of available investment decisions, a simple model of parental investment could produce these outcomes if parents are credit constrained. A higher MVPF for investment in children could occur if low-income parents expect intergenerational regression to the mean such that their children will earn more than them. That would produce lower marginal utilities of income for those children, and therefore increase the return on spending. In addition, this logic also suggests that when parents are given cash transfers, they would rationally not spend all of it on their children despite high returns—this is because their marginal utility of their own consumption is also high.

63. As we discuss in Online Appendix F, these estimates appear to have considerable uncertainty not just from sampling uncertainty but also model uncertainty:

Along the same lines, we analyzed the 1986 reform and found an MVPF of 44.27, with a confidence interval ranging from 2.37 to ∞.

Although this may be considered by some to be suggestive evidence for Laffer effects in tax policy, it is important to approach that conclusion with considerable caution. In the case of the 1981 reform our confidence intervals suggest we cannot rule out an MVPF close to 1. In other words, we cannot rule out the conclusion that the policy produced no positive fiscal externality. Moreover, estimates of the impacts of recent reforms have produced substantially smaller MVPFs (e.g., 1.16 for the 2013 top tax rate increase). Compared with these findings on taxes, our results suggest stronger evidence for the presence of Laffer effects when investing in young children.

2. Spillovers onto Children. We also find that spending on adults may have high MVPFs if those policies have spillover effects on children. For example, Chetty, Hendren, and Katz (2016) study the long-run impact of the MTO experiment, which gave families residing in public housing projects a voucher and counseling to assist them in moving to lower-poverty neighborhoods.[64] Chetty, Hendren, and Katz (2016) document that the program significantly increased later-life earnings for young children, but they find null or even slightly negative effects on earnings for children who were teenagers at the time their parents obtained the vouchers. Combining these effects across all subgroups suggests the effects on the young children outweigh the adverse effects on the older children, leading to an infinite MVPF.[65] This

using different taxable income estimates from existing literature studying these reforms can generate wide variation in the MVPFs of these tax reforms, preventing precise conclusions about their MVPFs.

64. Because the program was targeted to families already in public housing and because the cost of public housing is similar to the cost of a voucher, the primary marginal cost of the program was the cost of the counseling (roughly $3,783 per family).

65. Not all policies providing benefits to parents generate such large spillover effects onto children. For example, Price and Song (2018) find that the Negative Income Tax experiment led to a reduction in children's earnings in adulthood, which partially explains its low MVPF of −0.01. In other cases, such as the provision of housing vouchers in Chicago, and the provision of housing vouchers to families on AFDC and the expansion of AFDC benefits, there is suggestive evidence that positive spillovers on children are small. In those cases, researchers have documented that the policies have limited effects on outcomes such as test scores, college attendance, and birthweight. Appendix Figure III, Panel A

high MVPF is driven solely by child outcomes, as the policy has no significant effect on economic outcomes for adult beneficiaries.

One policy with a substantial degree of uncertainty about potential spillovers onto children is the EITC. Appendix Figure III, Panel C shows how our MVPF estimates would change if one attempted to impute effects on children using different estimates from previous literature. In particular, we take the MVPF for the 1993 OBRA tax reform and supplement that estimate with spillover effects of the EITC estimated in other contexts. Projecting earnings effects based on child test scores produces MVPFs that range from 3.48 to ∞, while incorporating effects on college attendance produces MVPFs from 0.84 to 1.12.[66] Incorporating the work of Bastian and Michelmore (2018) on long-term earnings would result in an infinite MVPF, suggesting that the policy pays for itself.[67]

This uncertainty highlights the importance of understanding the potential spillovers onto children. It also reinforces our conclusion that policies raising children's human capital often have the highest MVPFs. We return to this issue in Section VI.A, where we use the MVPF framework to quantify the value to governments of more precise estimates for potential long-run effects of policies on children.

IV.C. Robustness

Creating these MVPF estimates inevitably requires that we make a number of judgment calls regarding the set of causal effects included and the methodology used to translate those effects into an MVPF. Here, we provide a short summary of the robustness of our main conclusions to those assumptions.[68]

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presents results for policies in our baseline sample where child effects are observed. Panels B and C show how the MVPFs change when effects on children are incorporated or removed from the MVPF calculation.

66. The college effects are restricted to a small subset of recipients, so it is unsurprising that the MVPFs remain small.

67. We exclude these results from the baseline estimates because Bastian and Michelmore (2018) do not estimate the effect of a particular EITC expansion, but rather pool across many state and federal policy changes. In Online Appendix F, we note the impact of incorporating their estimates. The fact that these impacts matter is consistent with our broader conclusions that potential spillovers onto children can generate high MVPFs for adult-targeted policies.

68. Online Appendix J details an extensive set of robustness analyses.

Constructing the MVPF for policies with dynamic effects requires the choice of a discount rate. Although our baseline approach assumes 3%, Appendix Figure IV shows that higher discount rates do not substantively change our conclusions. Discount rates of 7% or 10% produce slightly lower MVPFs for child-targeted policies (more so for young children), but we still find those policies have higher MVPFs than policies targeting adults.

Our baseline approach uses the cross-sectional life cycle earnings profile to forecast lifetime effects from observed earnings changes. Our results are robust to alternative methods of forecasting earnings, such as assuming no income growth over the life cycle. The baseline sample also includes some policies targeting children for which effects on income are not directly measured. Most notably, we include college policies where researchers have observed a measure of attainment such as initial enrollment, college credits, or degree receipt. In those cases we forecast income impacts using estimates from Zimmerman (2014) on the returns to college. Online Appendix J provides a discussion of how our estimates vary depending on the use of intermediate outcomes to construct long-run forecasts. In particular, Appendix Figure III shows the effects of restricting our analysis to policies where earnings are directly observed. We continue to find high, often infinite MVPFs for these child-targeted policies.

In many cases, our MVPFs for policies targeting adults rely upon estimates of short-run earnings impacts. Consequently, one might be worried that our low MVPFs for adult policies are driven by policies for which we do not observe long-run impacts. In order to assess this, Appendix Figure VII, Panel B restricts the analysis to the subset of policies for which we observe at least five years of income estimates. We continue to find higher MVPFs for policies targeting children.[69]

Our baseline willingness to pay approach often relies on measures of a policy's impact on after-tax income. Appendix Figure VI, Panel A reports our MVPFs using our conservative

69. Related to this, the pattern of higher MVPFs for children could be driven by longer payoff periods for children relative to adults, as children have their entire lives to experience higher earnings. However, the length of the payoff period is not what is driving our results—even restricting child benefits to accrue only up to age 45 or 55, we find similar high returns for child-targeted policies. Rather, the patterns are generally driven by a higher positive impact on per-year future earnings for policies targeting children.

measure of willingness to pay. Although the willingness to pay measures are much lower, we continue to find high MVPFs for policies targeting children, generally exceeding 5 on average. This is to be expected as many policies analyzed have very low net costs, leading to large MVPFs even when willingness to pay is small.

One might also be concerned that the causal effects incorporated in our MVPFs may vary in quality due to variation in the underlying techniques used to produce those estimates. Appendix Figure VII, Panel C shows our results remain the same when restricting our sample to policies evaluated via randomized controlled trial, lottery, or a regression discontinuity design. The results are also robust to restricting our sample to peer-reviewed publications. In all these robustness analyses, direct childhood investments continue to have the highest MVPFs.

Finally, one might worry that MVPFs for child policies were high in previous decades but have declined over time—perhaps as the government takes advantage of high-return investments. Appendix Figure IX assesses this by plotting the child- and adult-average MVPFs separately by decade. We find no evidence for that pattern of decline. Instead, we find high MVPFs for policies targeting children throughout the past 50 years.[70] The robustness of high MVPFs for direct investments in children over time may suggest the presence of fundamental political constraints to enacting policies in which the benefits have a long time horizon.[71]

IV.D. Publication Bias

All of the robustness analyses above take the estimates from existing literature as given. However, one might be concerned that the research and publication process suffers from the problem

70. The one exception to this pattern is the low average MVPF among child policies implemented in the 1970s. The child policies in that decade primarily consisted of job-training programs that did not have significant effects on children's earnings.

71. There are a range of forms that these political constraints might take. For example, it could be that governments (and politicians) apply a much higher discount rate, requiring projects to pay off over short horizons. Alternatively, underinvestment might occur because these policies require spending by state and local governments, but much of the benefits accrue to the federal tax system. Hence, local incentives may not be sufficient to make efficient investments. It may also be that the high MVPF policies are undersupported because low-income children have little political power. We leave a formal analysis of these potential mechanisms for future work.

TABLE III
PUBLICATION BIAS ESTIMATION

	Children estimates			Adult estimates		
	(1)	(2)	(3)	(4)	(5)	(6)
$Z > 1.64$	3.72	–		2.52	–	
	(2.46)			(1.32)		
$Z < -1.64$	1.15	–		7.90	–	
	(0.44)			(1.48)		
$Z \in [1.64, 1.96]$			3.65			1.36
			(3.46)			(1.14)
$Z \in [-1.96, -1.64]$			1.02			4.19
			(0.57)			(0.81)
$Z > 1.96$	–	3.09	3.78	–	3.27	3.59
		(1.09)	(2.17)		(1.50)	(1.21)
$Z < -1.96$	–	1.21	1.24	–	10.39	11.52
		(0.50)	(0.62)		(2.53)	(2.43)
N	237	237	237	150	150	150

Notes. The numbers shown are the estimated likelihood ratio of publication relative to an insignificant result. Standard errors are in parentheses.

of publication bias, where studies are published only if they find clear positive (or negative) effects. In particular, one might worry that research on children is more likely to be published if it finds statistically significant positive effects on children in adulthood. Conversely, one could imagine that research on adults is more likely to be published if it finds statistically significant evidence of distortionary or negative effects on adult outcomes.

To address this, we implement the approach developed in Andrews and Kasy (2019).[72] They provide a method to test and correct for the effect of publication bias on the observed set of estimates. Online Appendix K discusses the details of our implementation of their approach. Table III documents the evidence of publication bias in our estimates.

The results suggest the presence of a moderate degree of publication bias. In the baseline sample, we find studies of child outcomes are 3.7 times more likely to be published if they find positive effects on children with $p < .10$ relative to a finding of no statistically significant effect. In contrast, we find that studies

72. We thank Isaiah Andrews and Max Kasy for their invaluable guidance in implementing these procedures.

on adult policies are 11 times more likely to be published if they find significant distortionary effects on outcomes.

Despite evidence of publication bias in our samples, Appendix Figure VIII, Panel A shows that correcting for the observed degree of publication bias in this manner does not affect our conclusion of higher MVPFs for policies targeting children. Although we find a slight decrease in the MVPFs for child education policies, such as preschool programs, the general patterns are quite similar to our baseline results. Moreover, Appendix Figure VIII, Panel B shows that even if we assumed that statistically significant estimates of positive effects on children are 35 times[73] more likely to be published, our primary conclusions still hold.

V. Mapping the MVPFs to Theory

The MVPF provides an empirical method for evaluating the effectiveness of different policies for improving social welfare. Having established the key patterns of the data, it is natural to place our empirical results into the context of theoretical literature on optimal government policy. In this section, we outline how our results speak to that theory.

1. Optimal Taxation. To begin, the MVPF measures the price of redistributing to different policy beneficiaries. In this sense, the approach is related to a large body of theoretical and empirical optimal tax literature in the spirit of Mirrlees (1971) and Saez (2001).

As previously explained using the Okun's bucket logic, the ratio of MVPFs across two different tax changes measures the price of moving money between the respective beneficiaries. In general, optimal tax theory suggests that a progressive planner should be willing to incur efficiency losses to move resources from the affluent toward the lower regions of the income distribution. The MVPF provides an empirical means of testing that basic prediction: the MVPF of tax changes should increase with the income of the beneficiaries.

Figure VI, Panel A explores the relationship between the MVPF of each tax policy change we analyze and the income levels of the associated beneficiaries. Consistent with this prediction,

73. A publication bias of 35x is the degree of publication bias documented in Andrews and Kasy (2019) for small-sample experimental economics studies.

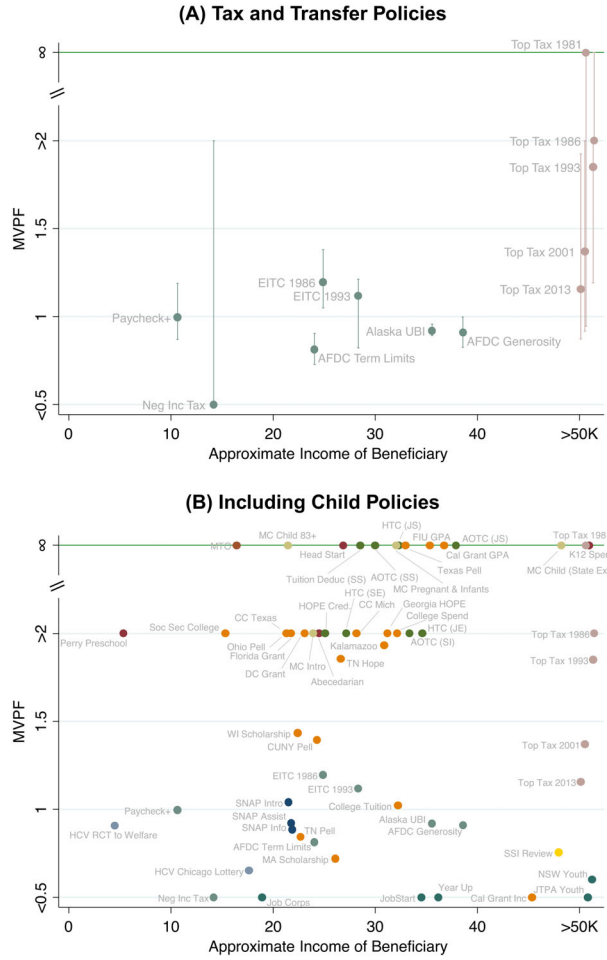


FIGURE VI

MVPF by Income of Beneficiaries

Panel A shows MVPFs for tax and transfer policies in our baseline sample against the income of their economic beneficiaries. Panel B adds in-kind transfers to parents and direct expenditures on children (child education, health, job training, and college policies). See Figure III for an explanation of the color scheme. The income measures should be considered approximations, as not all papers report consistent measures of incomes of their samples. We include all papers for which we are able to obtain a measure of income of the beneficiaries, and we attempt to normalize these measures to correspond to a notion of individual income per adult in the household at age 30. All confidence intervals are 95% bootstrapped confidence intervals with adjustments discussed in Online Appendix H.

we observe an upward slope. For example, the 1993 tax reform (OBRA93) simultaneously raised top marginal tax rates and expanded the EITC. The MVPF of the increased top tax rates led to an MVPF of 1.85 (95% CI of [1.19, 4.07]), and the expansion of the EITC led to an MVPF of 1.12 (95% CI of [0.82, 1.21]). This suggests the tax schedule created under the 1993 reform is optimal if one is indifferent to providing $1.85 to top earners versus $1.12 to those on the EITC. To the extent one's social preferences strictly prefer $1.12 to low earners (or strictly prefer $1.85 to top earners), our results suggest that more progressive (regressive) taxation than the 1993 schedule would be optimal.[74]

Although our MVPF estimates for tax changes are loosely consistent with the preferences of a progressive planner, this is no longer the case when we consider policies targeting children. As shown in Figure VI, Panel B, there is no clear relationship in our sample between MVPFs and the incomes of beneficiaries when including direct investments in children. This means that, historically, investments in the next generation have been more efficient than transfers within generations.[75]

2. In-Kind versus Cash Transfers. The low MVPFs for policies targeting very low-income households raises the question of whether other methods of redistribution—perhaps through in-kind transfers—can be more effective than cash.[76] Figure VII

74. Our estimate for the MVPF of the 1993 EITC is based on evidence from Meyer and Rosenbaum (2001) on the fiscal externality associated with the labor supply responses of single women. It is worth noting, however, that there is considerable debate over the fiscal externalities associated with the EITC. On the one hand, several recent papers have argued that reductions in transfers have offset a substantial portion of the cost of historical EITC expansions (Hoynes and Patel 2018; Bastian and Jones 2019). These large fiscal externalities can produce infinite MVPFs (Bastian and Jones 2019). On the other hand, recent debates have argued that the effects are overstated in the current literature because the impact of the EITC expansions cannot be disentangled from the effects of contemporaneous welfare reforms (Kleven 2019). These conflicting estimates suggest there is a high value to future work that reconciles these findings.

75. We develop this argument formally in Online Appendix L, where we relate this logic to the nonexistence of a social welfare function that can rationalize our results of high MVPFs for low-income children but low MVPFs for low-income adults.

76. There is a large theoretical debate on this question, which largely centers around the applicability of the Atkinson-Stiglitz theorem (Atkinson and Stiglitz 1976; Hylland and Zeckhauser 1981). When utility satisfies a "weak separability" assumption, one would expect that the MVPF for an in-kind transfer would fall

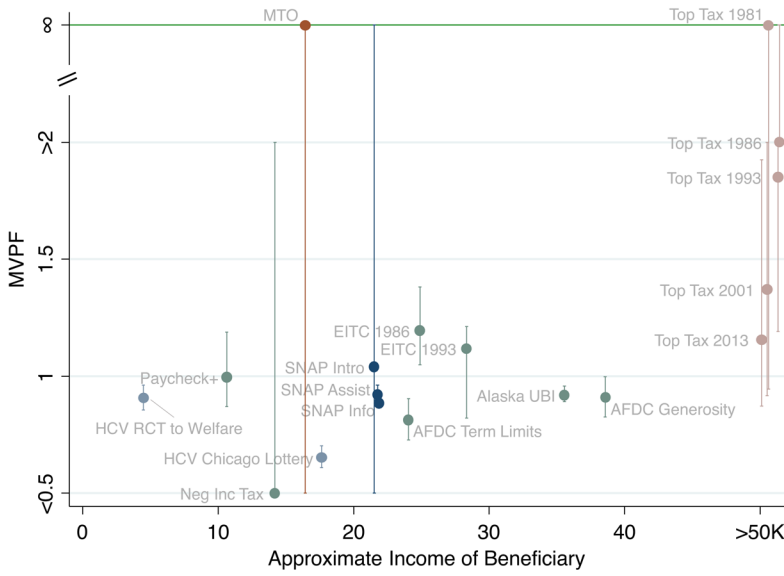


FIGURE VII

MVPF by Income of Beneficiaries: Cash versus In-Kind Transfers

This Figure presents MVPFs as a function of the average income of beneficiaries for tax and transfer policies (shown in Figure IX, Panel A) combined with our estimates for in-kind transfer policies. The income measures should be considered approximations, as not all papers report consistent measures of incomes of their samples. We include all papers for which we are able to obtain a measure of income of the beneficiaries, and we attempt to normalize these measures to correspond to a notion of individual income per adult in the household at age 30. All confidence intervals are 95% bootstrapped confidence intervals with adjustments discussed in Online Appendix H.

adds the MVPF estimates for housing and food subsidies to the estimates provided in Figure VI, Panel A for cash transfers and tax credits. Broadly, we find a pattern consistent with our general result: in-kind transfers are most effective when they induce spillover effects onto children.

For example, the housing vouchers in Chicago (Jacob and Ludwig 2012; Jacob, Ludwig, and Kapustin 2014) and the provision of Welfare to Work housing vouchers (Mills et al. 2006) find minimal spillover effects on children. This means that the

below the MVPF of a cash transfer or tax credit targeted to beneficiaries at the same income level.

distortionary impact on adults' earnings leads them to have MVPFs below that of distributionally equivalent tax cuts. In contrast, the MTO experiment explained previously increased earnings of young children by a sufficient amount to pay for the cost of the in-kind policy (the policy had an infinite MVPF with a 95% confidence interval of $[-2.80, \infty]$). Similarly, the spillover effects onto children for the introduction of food stamps policy leads to an MVPF of 1.04. Both point estimates suggest these in-kind transfers are as efficient or more efficient than cash transfers as a result of the spillovers onto children.[77]

3. Tagging. There is a large literature in optimal policy design focused on improving efficiency by targeting the right subset of individuals. In general, this work focuses on the use of "tags"—characteristics of program eligibility that are generally not manipulable (Akerlof 1978).[78] With that in mind, previous literature has identified recipient age as a potentially valuable tag for optimal government policy. Consistent with that work, we observe that the MVPFs of certain policies differ substantially based on the age of the recipients.

For example, our analysis of the MTO experiment finds an infinite MVPF with a confidence interval of $[-2.80, \infty]$. That said, the result masks substantial heterogeneity in the program's effects. In families with children younger than 12, the MVPF is infinite with a confidence interval contained at infinity. In families with children older than 12, the MVPF is negative, as their point estimates imply a reduction in earnings. Along the same lines, our analysis of the introduction of food stamps produces an MVPF of 1.04. This MVPF is partly buoyed by large positive effects on children ages 0–5 (Bailey et al. 2019). If we excluded any effects on children, the MVPF would fall from 1.04 to 0.54. By contrast, if we restricted our analysis to families with young children and assumed that causal effects of food stamp introduction remained the same for that targeted policy, we would find an MVPF of 2.28.

77. In relation to the Atkinson-Stiglitz theorem, the violation of the weak separability assumption for these policies comes not from a short-term change in earnings but from the long-run indirect impact on children.

78. If the tag were manipulable, then individuals not intended as beneficiaries of the policy could distort their behavior to obtain the benefit. To the first order, they would not value the transfer by the envelope theorem, consequently lowering the MVPF of the policy.

Despite this substantial variation in MVPFs by the age of policy recipients, we do not report subgroup-specific MVPFs in our main tables. This is a deliberate choice to restrict our analysis to policy changes defined by explicit identification conditions established in existing work. Reporting MVPFs for subgroups requires the additional assumption that the observed behavioral response to the policy among the relevant subgroup is not impacted by the provision of the policy to other subgroups. Although this may be plausible in certain cases, we have no disciplined way of adjudicating its plausibility across all possible permutations of subgroup analysis. Instead, we highlight the potential for age-specific tagging but refrain from more definitive statements regarding subgroup-specific welfare impacts.

VI. Lessons for Future Work

In this section, we discuss three implications for future economic research. First, we show how the MVPF framework facilitates a straightforward method to quantify the value of future work that reduces the statistical uncertainty in our estimates. Second, we show the value-added provided by measuring the MVPF relative to what is provided by a more traditional cost-benefit analysis. Third, we discuss how the intuitions of the MVPF framework might influence future empirical designs. The key is to design experiments in a way that facilitates measuring willingness to pay. In particular, we discuss how 27 different welfare reform programs in the 1980s–90s randomized upwards of 100,000 participants into RCTs, but the nature of the research designs makes it infeasible to conduct reliable welfare analysis.

VI.A. Value of Information in Evidence-Based Policy Making

Our MVPF estimates measure the welfare impact of a range of government policies. Although it is our hope that these estimates can be useful for a policy maker seeking to conduct "evidence-based" policy, it is quite clear from Figure IV, Panel A that many of our individual policy estimates contain considerable sampling uncertainty. Here, we show how one can use the MVPF framework to understand the value of future research that reduces the uncertainty in our estimates. The MVPF framework provides a measure of the value of information because it is a price: it measures the price faced by the government to

redistribute across beneficiaries of different types of policies. A welfare-maximizing government should be willing to pay to reduce the uncertainty in these prices, just as consumers would be willing to pay to learn the true value of the products they buy.

There are many ways one could conceptualize reducing the various sources of modeling and sampling uncertainty in our estimates. In this section, we develop a simple approach to measure the value of reducing sampling uncertainty. We defer an exhaustive treatment to future work. We use this example to illustrate the value of future research that increases estimate precision, perhaps through improved access to larger administrative longitudinal data sets.[79]

Our conceptual experiment is organized as follows: suppose a policy maker is considering whether to raise revenue to spend an additional \$1 on policy j. The policy has a net cost to the government of G_j and a willingness to pay of WTP_j per dollar of programmatic cost. The policy maker does not know the true values of WTP_j and G_j. Instead, we assume she only observes the estimates, $\hat{WTP}_j$ and $\hat{G}_j$, and their sampling distributions.[80] We assume the policy maker has an uninformed prior about the impact of the policy so that the estimated sampling distribution reflects her belief about the policy's effects.

For simplicity, we assume the policy is financed with a tax change that targets the same beneficiaries and has an MVPF of 1. A budget-neutral policy that increases taxes to spend on policy j has a welfare gain of

$$U\left(WTP_j, G_j\right) = WTP_j - G_j.$$

Ideally, the policy maker would wish to pursue this policy if and only if $U(WTP_j,G_j) > 0$ (i.e., the policy increases welfare). In practice, the policy maker only observes estimates and sampling distributions of these values. We assume these estimates are unbiased but noisy estimates of the truth (e.g., $E[\hat{G}_j|G_j] = G_j$). Utility is linear in WTP_j and G_j, so the policy maker will choose the policy if and only if $\hat{WTP}_j > \hat{G}_j$. The expected utility of this

79. The focus here is on reducing uncertainty among the observed outcomes of each program. Uncertainty regarding unobserved causal effects remains beyond the scope of this exercise.

80. For simplicity, we assume programmatic costs are known and equal to their point estimates.

strategy given the point estimates $(\hat{WTP}_j, \hat{G}_j)$ is

$$\begin{aligned} &EU^{Uninformed}\left(\hat{WTP}_j, \hat{G}_j\right) \\ &= E\left[U\left(WTP_j, G_j\right) * 1\left\{U\left(\hat{WTP}_j, \hat{G}_j\right) > 0\right\} | \hat{WTP}_j, \hat{G}_j\right] \\ &= \left(\hat{WTP}_j - \hat{G}_j\right) * 1\left\{\hat{WTP}_j > \hat{G}_j\right\}. \end{aligned}$$

Now suppose that instead of spending \$1 on the policy, the policy maker can invest a fraction of this dollar, v_j, into learning more about the WTP_j and G_j of the policy before making this decision. We begin by considering a case where spending v_j allows the policy maker to perfectly learn WTP_j and G_j before deciding whether to invest in the policy. Once informed, the government chooses to pursue the policy if and only if $U(WTP_j, G_j) > 0$. Now it can decide to pursue the policy if and only if the true WTP exceeds the true costs. In that case, the net utility to the government is

$$\begin{aligned} &U^{informed}\left(WTP_j, G_j, v_j\right) \\ &= \left(1 - v_j\right)\left(WTP_j - G_j\right) * 1\left\{WTP_j > G_j\right\} - v_j, \end{aligned}$$

where the first term is the surplus from investing the remaining fraction $1 - v_j$ in the policy and the second term is the cost of paying for the information.

The value to the government of learning the true willingness to pay and cost for policy j is the value of v_j^{info} which solves the following equation:

$$\begin{aligned} &E\left[U^{informed}\left(WTP_j, G_j, v_j^{info}\right) | \hat{WTP}_j, \hat{G}_j\right] \\ &= EU^{uninformed}\left(\hat{WTP}_j, \hat{G}_j\right). \end{aligned} \tag{9}$$

Here, v_j^{info} equates the government's expected utility in the case where it spends v_j^{info} to receive additional information and the case where it remains uninformed. The expectation in the left side of equation (9) is taken with respect to the distribution of the true parameters, (WTP_j, G_j), given the estimates, $(\hat{WTP}_j, \hat{G}_j)$. Since we assume uninformed priors, this distribution is parameterized by the sampling distribution of the estimates. This implicitly defines v_j^{info} as the value that makes one indifferent to remaining uninformed versus paying for the information and making a decision based on it.

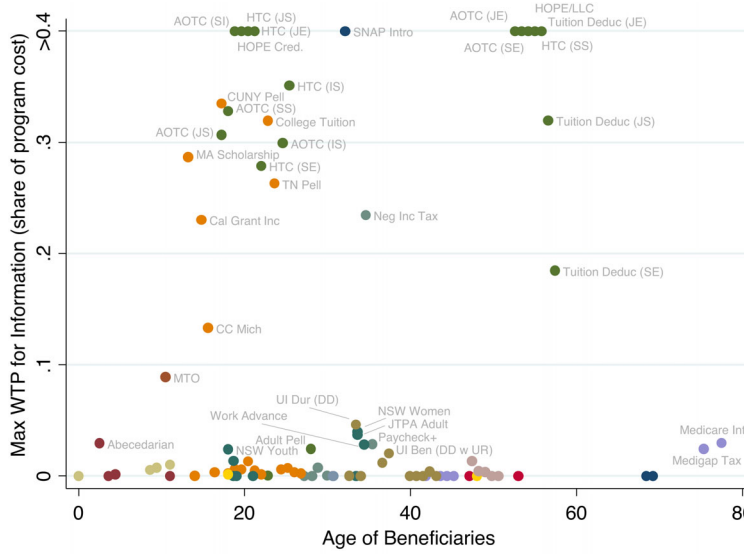


FIGURE VIII

Value of Information

This figure presents the value of information, v^{info}, discussed in Section VI.A, for each policy in our sample as a function of the average age of the policy beneficiaries. See Figure III for an explanation of the color scheme.

1. Results. We estimate the value of info in equation (9) both for each individual policy and for our category averages. Figure VIII presents the results of v_j^{info} for each policy, j, plotted relative to the age of the policy's beneficiaries. Broadly, we find the highest values of future research for policies with uncertain long-run effects on children. For example, we estimate $v_{FS}^{info} = \$0.50$ for the introduction of food stamps. Moreover, we also find large values of information for policies with potential indirect effects on children and uncertain effects on adults. We also find large values of information for college subsidies to parents (shown in green; color version available online). This reflects the fact that these policies have highly uncertain effects on college attainment, and small increases in attainment can translate into large gains. In contrast, we find smaller values of information for policies where the effects have been already precisely estimated. For example, we find the evidence-based policy maker would be willing to pay little to remove the statistical uncertainty in the estimated impact of disability insurance on labor earnings (e.g., we estimate

the policy maker is willing to pay \$0 to learn the precise impact of assignment to a more lenient disability insurance judge). This lower value of information reflects the relatively high precision of existing estimates in those studies.

2. Administrative verus Survey Data: Long-Run Impacts of Food Stamps. Our estimates in Figure VIII report the value of learning the true effect of the policy. In practice, the true effect is never observable. That said, improved access to larger administrative data sets can help obtain more precise effects of government policies. For example, a policy maker can decide whether a researcher should use a survey data set for the analysis or obtain access to linked administrative data on the population.

To illustrate this decision, we consider the case of the introduction of food stamps discussed in Section III.C. Earlier work by Hoynes and Schanzenbach (2009) used the Panel Study of Income Dynamics (PSID) survey data set to identify the long-run effect of food stamps on children's outcomes. More recently, Bailey et al. (2019) used linked census data to estimate those effects more precisely. Here, we imagine that a policy maker is deciding whether to introduce food stamps based on the existing evidence. Consider the hypothetical example that they know the PSID estimates from Hoynes and Schanzenbach (2009), $\hat{WTP}^{PSID}$ and $\hat{FE}^{PSID}$. Suppose that they can instead invest v^{Census} to learn the estimates with the same statistical precision as those found in Bailey et al. (2019) based on census data. Instead of learning the true value of WTP and FE, the policy maker learns $\hat{WTP}^{Census}$ and $\hat{FE}^{Census}$. The policy maker will expect these estimates to be drawn from the PSID sampling distribution but contain the standard errors found in the census data estimates. The value of learning the census estimates, v^{Census}, then solves

$$
\begin{aligned}
&E\Big[\left(1-v^{Census}\right)U\left(\hat{WTP}^{Census},\hat{FE}^{Census}\right)\\
&\quad\times 1\left\{\hat{WTP}^{Census}>1-\hat{FE}^{Census}\right\}-v^{Census}\mid \hat{WTP}^{PSID},\hat{FE}^{PSID}\Big]\\
&\quad=U\left(\hat{WTP}^{PSID},\hat{FE}^{PSID}\right)1\left\{\hat{WTP}^{PSID}>1-\hat{FE}^{PSID}\right\}
\end{aligned}
\tag{10}
$$

The left side of equation (10) is the expected value of investing in administrative data at a price v^{Census}. The right side is the expected value of the policy if she makes her decision using the information in the PSID.

We reconstruct the estimates of the WTP and FE for the introduction of food stamps using the estimates from Hoynes and Schanzenbach (2009) in place of those in Bailey et al. (2019), normalizing by the mechanical program cost. This yields an infinite point estimate for our MVPF, and we find a willingness to pay estimate of 6.06 (95% CI of [−12.07, 23.78]) and cost of −0.19 (95% CI of [−5.19, 4.92]). These estimates are notably less precise than those using the results from Bailey et al. (2019) that use census data, which generate a WTP of 1.09 (95% CI of [−2.45, 4.55]).

Plugging these estimates into equation (10) suggests the policy maker would be willing to invest \$0.24 per dollar of investment in the food stamp program to learn the long-run estimates from census data instead of PSID data. This exercise illustrates that if the policy maker only knew the PSID estimates, there would be a large value in learning additional information before making this investment decision.

This is, of course, a stylized exercise. We are imagining a policy maker that sees the ex post evaluation of a policy prior to making her decision—something that is clearly not feasible. The goal here is merely to illustrate potential value of expanding access to administrative data sets that can generate more precise estimates of long-run policy effects.

VI.B. Comparison to Benefit-Cost Ratios

While we focus on computing the MVPF for each policy, the most common form of welfare analysis in previous literature is benefit-cost analysis, as in equation (4). With that in mind, we compare our results to the benefit-cost ratios for the same policies. Figure IX, Panel A plots the benefit-cost ratio for a deadweight loss of $\phi = 50\%$ as in Heckman et al. (2010) as a function of the age of the beneficiary of the policy. Our general conclusion about the high returns to investment in children would remain true even if one used a benefit-cost ratio instead of the MVPF. The average benefit-cost ratio is 4.13 for child education, 5.30 for child health, and 6.78 for college policies. In contrast, we find smaller benefit-cost ratios for adult policies—often less than 1.

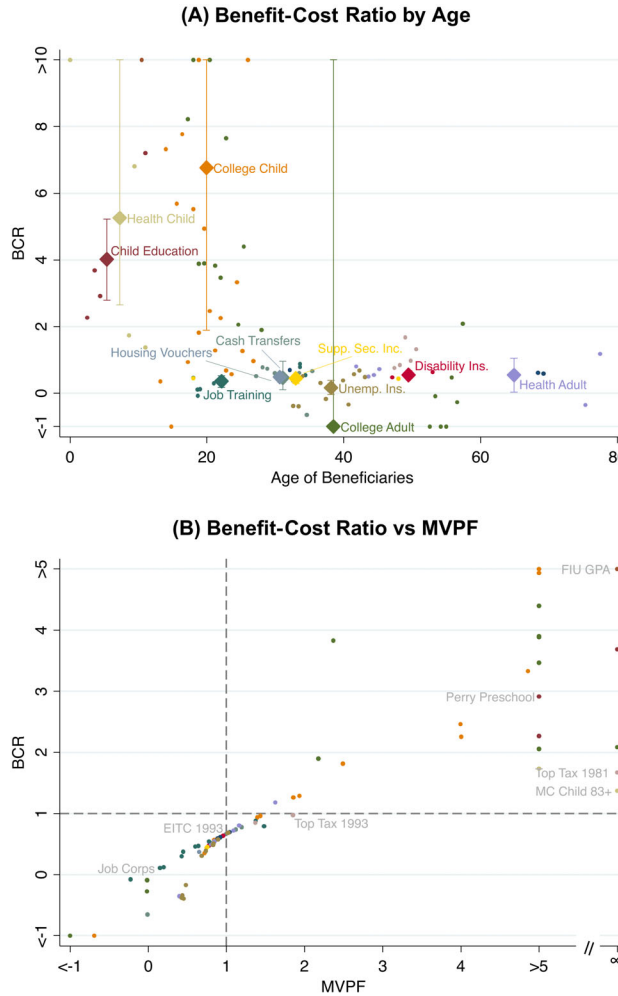


FIGURE IX

Comparison to CBA

This figure presents estimates of benefit-cost ratios for all policies evaluated in the article and shows their relationship to the MVPF. The method for calculating these benefit-cost ratios is outlined in Section II. We assume a marginal deadweight loss of $\phi = 50\%$ for these calculations. Panel A plots the benefit-cost ratio of each policy as a function of the age of the beneficiaries, along with category average estimates and their confidence intervals. The capped lines show the 95% bootstrapped confidence intervals with adjustments discussed in Online Appendix H. Panel B plots the benefit-cost ratio of each policy as a function of the MVPF estimate for the policy. See Figure III for an explanation of the color scheme.

To directly compare the two methods of welfare analysis, Figure IX, Panel B plots the benefit-cost ratio on the vertical axis (again for $\phi = 50\%$) against the MVPF on the horizontal axis. In general, we find a fairly monotonic relationship—policies with high benefit-cost ratios also have high MVPFs. There are, however, some notable distinctions. For example, the Medicaid expansion to children born after September 30, 1983, has an infinite MVPF but a BCR of just 1.37. Similarly, the 1981 top tax rate reduction has an infinite MVPF but a benefit-cost ratio of 1.67. By the standards of benefit-cost ratios, these policies may not appear all that desirable, even though the MVPF point estimates imply that they pay for themselves and provide a Pareto improvement.

The difference between the MVPF and benefit-cost ratio in these cases reflects the fact that the benefit-cost ratio places all causal effects of the program in the numerator while the MVPF incorporates effects based on their incidence. In particular, the numerator of the MVPF captures the effects on beneficiaries while the denominator captures all effects on the government budget. In measuring the welfare effects of the 1983 Medicaid expansion and the 1981 tax cut, MVPF places all fiscal externalities in the denominator. The results show us that these policies have substantial benefits and limited or no net government cost. In the benefit-cost ratio framework these reforms would have been interpreted as high-cost policies with substantial benefits.

The second crucial distinction between the MVPF and benefit-cost ratio is how the two approaches conceptually close the budget constraint. While the MVPF closes the budget constraint by comparing MVPFs of different policies (and aggregating using Okun's bucket as in equation (3)), the same consistency does not exist in the benefit-cost ratio approach. In many cases, benefit-cost analysis includes no discussion of closing the budget constraint. In cases where the concept is addressed, it is customary to close the budget constraint in the same manner regardless of the policy context. For example, BCRs in Heckman et al. (2010) and García et al. (2016) imagine that the policy was funded by an increase in the marginal tax rate that led to a distortion in tax revenue and a deadweight loss of ϕ. Consequently, the deadweight loss parameter ϕ in equation (4) is not context dependent.

To see how this matters, consider the 1993 tax reform that simultaneously raised top marginal income tax rates and expanded the EITC. One could, in principle, use a benefit-cost ratio to evaluate whether the EITC expansion was desirable. As

shown in Figure IX, Panel A, the benefit-cost ratio for the 1993 EITC expansion is 0.74 after adjusting for a 50% deadweight loss. The costs exceed the benefits and so, if the government were applying a strict benefit-cost test, we would not expect this policy to be implemented. This is because the hypothetical 50% cost of raising the funds is too large to justify the expenditure.

That said, the goal of the EITC expansion was to provide redistributive benefits to low-income workers. Its MVPF is 1.12, near the highest among policies targeting adults. Rather than ruling this out as a means of redistribution, we can compare the MVPF of the EITC to the MVPF of a tax increase used to fund this policy. Comparisons of MVPFs correspond to precise statements of social welfare using Okun's bucket. As noted, the MVPF point estimate for the 1993 top tax rate change is 1.85. If society prefers giving $1.12 to a low-income worker on EITC to giving $1.85 to a high-income individual facing the top marginal income tax rate, then the policy is welfare enhancing despite its relatively low benefit-cost ratio.

VI.C. Welfare Reform: Lessons for Future RCTs

We end with a lesson of how an MVPF perspective can help inform the design of RCTs. Throughout, we aimed to include all possible MVPFs in the categories we considered. We included any policy where we thought we could provide reasonable measures of both costs and WTP. One set of notable omissions are the state-level welfare reforms made by states that sought to increase family self-sufficiency. Throughout the 1980s and early 1990s, states experimented with a range of reforms to cash welfare programs that imposed term limits, provided job training and other educational services, and provided job search and placement assistance.

The omission of these reforms is not because they were not analyzed. Many states rigorously evaluated the effect of these reforms. Upward of 100,000 participants were enrolled into 27 RCTs nationwide (Greenberg, Deitch, and Hamilton 2010). These RCTs measured and provided a clear estimate of the net cost of each reform. However, the design of the policies enacted in each state makes it difficult to understand their welfare effects. Generally, programs contained both a carrot and a stick.[81] As

81. Welfare reform experiments were expected to place no additional costs on the federal government and so it is natural that states bundled increases in some types of financial support with potential decreases in others.

a result, we cannot even accurately sign the WTP. As noted by Manpower Demonstration Research Corporation (MDRC) who implemented the evaluations of these policies,[82] "all [programs] contained a core quid pro quo arrangement in which the government would offer education, training, job search assistance, and support services to people receiving cash welfare, while most recipients—the majority of them single parents—would be required to participate in such services in order to qualify for benefits." Although we can evaluate whether the government saved money, we do not know if the people in these programs benefited from their participation. It may be that government revenue gains were the result of expanded job opportunities due to program participation. In that case, willingness to pay would be positive. By contrast, it may be that the government revenue gains were the result of stricter attendance requirements that drove individuals off welfare. In that case, willingness to pay would be negative.[83]

This highlights the value of isolating the carrot and the stick into separate RCTs.[84] It also demonstrates the value of designing experiments to estimate individual WTP for nonmarket goods such as job training, job search assistance, or other educational policies. In Appendix Figure X, we conduct a range of bounding exercises that attempt to construct lower and upper bounds on WTP for these welfare reform programs. Unfortunately, the bounds are very wide. In many cases, the policies are Pareto dominated, $MVPF < 0$, under one set of assumptions and represent a Pareto improvement, $MVPF = \infty$, under another set of assumptions.[85] Despite substantial expenditures on the evaluation of these reforms, the designs of these reforms in each state make it difficult

82. See https://www.mdrc.org/project/evaluations-state-welfare-work-programs#design-site-data-sources (accessed on July 7, 2019).

83. Previous work (Greenberg, Deitch, and Hamilton 2010) has conducted a cost-benefit analysis of these reforms by assuming willingness to pay is given by after-tax earnings. However, if the term limit is what causes individuals to choose to move off of welfare and into the labor market (thus increasing earnings), the envelope theorem would suggest the WTP is negative, even if after-tax earnings increase.

84. Welfare reform RCTs have been criticized for not experimentally varying each of the components of welfare reform (see Grogger and Karoly 2005). The MVPF framework suggests bundling carrots and sticks into a single treatment is particularly problematic for conducting welfare analysis, because it is difficult to know even whether willingness to pay is positive or negative.

85. In fact, we find policies that follow this pattern in each subcategory of welfare reform programs. These subcategories include job search assistance.

to know whether this massive shift in providing welfare benefits to low-income families led to an increase or decrease in welfare.

VII. Conclusion

In this article, we examine the MVPF of 133 different historical policies over the past half-century in the United States. We find a clear and persistent pattern that direct investments in children have yielded the largest MVPFs. There is a large "bang for the buck" associated with a range of expenditures on children from early education to child health insurance to college expenditures.

We also demonstrate that in a meaningful number of cases, these policies pay for themselves. In particular, when government expenditures boost human capital, the resulting increase in net government revenue can offset the policy's up-front costs. From a taxpayer perspective, these expenditures on children are investments, rather than just transfers.

We find that opportunities for high-return investments in children have persisted across policy categories for many decades. This is, however, no guarantee that all future investment in these categories will produce high MVPFs. Indeed, we find that MVPFs vary substantially within policy categories. Low-return policies exist even in high-return categories. This highlights the value of further understanding the mechanisms behind the high MVPFs of successful historical investments.

Even in cases where there is existing research, much remains unknown about the welfare consequences of government policy. To that aim, we quantify the value of future work that uses new data to reduce estimate uncertainty. We show that in many cases, an evidence-based policy maker seeking to maximize social welfare should be willing to make substantial budgetary expenditures to learn more about policy effectiveness. In particular, our results highlight the value of expanded use of administrative data for policy analysis.

The 133 policies included in this article are just a small subset of those that could be analyzed using the MVPF. We do not discuss the MVPF of crime policies, environmental policies, macroeconomic stabilization policies, or infrastructure policies, among many others. With careful tracking of willingness to pay and net costs, the MVPF can be used in any of these contexts and can guide cost-benefit analyses. We leave that analysis for future work.

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Head Start Introduction	Head Start	1965	4	x	x	x		Johnson and Jackson (2019)
Head Start Regression Discontinuity	Head Start RD	1970	4			x		Ludwig and Miller (2007)
Head Start Impact Study	Head Start RCT	2002	3			x	x	Kline and Walters (2016)
K–12 School Finance Reform	K12 Spend	1991	11	x	x	x		Hyman (2017)
K–12 School Spending in Michigan	K12 Spend Mich.	1994	11			x		Heckman et al. (2010)
Perry Preschool Program	Perry Preschool	1962	4	x	x	x		Heckman et al. (2011)
College adult								
American Opportunity Tax Credit, Independent Single Filers at Phase Start	AOTC (IS)	2011	25	x		x		Bulman and Hoxby (2015)
American Opportunity Tax Credit, Joint Filers at Phase End	AOTC (JE)	2011	55	x		x		Bulman and Hoxby (2015)
American Opportunity Tax Credit, Joint Filers at Phase Start	AOTC (JS)	2011	20	x		x		Bulman and Hoxby (2015)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
American Opportunity Tax Credit, Simulated Instrument	AOTC (SI)	2009	20	x	x			Bulman and Hoxby (2015)
American Opportunity Tax Credit, Single Filers at Phase End	AOTC (SE)	2011	55	x	x			Bulman and Hoxby (2015)
American Opportunity Tax Credit, Single Filers at Phase Start	AOTC (SS)	2011	20	x	x			Bulman and Hoxby (2015)
Hope Tax Credit	HOPE Cred.	1999	20	x	x			Turner (2011)
Hope Tax Credit, Independent Single Filers at Phase Start	HTC (IS)	2007	25	x	x			Bulman and Hoxby (2015)
Hope Tax Credit, Joint Filers at Phase End	HTC (JE)	2007	20	x	x			Bulman and Hoxby (2015)
Hope Tax Credit, Joint Filers at Phase Start	HTC (JS)	2007	20	x	x			Bulman and Hoxby (2015)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Hope Tax Credit, Single Filers at Phase End	HTC (SE)	2007	20	x	x			Bulman and Hoxby (2015)
Hope Tax Credit, Single Filers at Phase Start	HTC (SS)	2007	55	x	x			Bulman and Hoxby (2015)
Hope and Lifetime Learners Tax Credits	HOPE/LLC	1998	55	x	x			Long (2004)
Pell Grants Introduction to Adults	Adult Pell	1973	28	x	x			Seftor and Turner (2002)
Tax Deduction for Postsecondary Tuition, Joint Filers at Phase End	Tuition Deduc (JE)	2006	55	x	x			Hoxby and Bulman (2016) LaLumia (2012)
Tax Deduction for Postsecondary Tuition, Joint Filers at Phase Start	Tuition Deduc (JS)	2006	55	x	x			Hoxby and Bulman (2016) LaLumia (2012)
Tax Deduction for Postsecondary Tuition, Single Filers at Phase End	Tuition Deduc (SE)	2006	55	x	x			Hoxby and Bulman (2016) LaLumia (2012)
Tax Deduction for Postsecondary Tuition, Single Filers at Phase Start	Tuition Deduc (SS)	2006	20	x	x			Hoxby and Bulman (2016) LaLumia (2012)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
College child								
Cal Grant, GPA Threshold	Cal Grant GPA	1998	20	x	x	x		Bettinger et al. (2019)
Cal Grant, Income Threshold	Cal Grant Inc	1998	20	x	x	x		Bettinger et al. (2019)
City University of New York Pell Grants	CUNY Pell	2009	20	x		x		Marx and Turner (2018)
Community College Tuition Changes, Michigan	CC Mich	2005	20	x		x		Acton (2018)
Community College Tuition Changes, Texas	CC Texas	2005	20	x		x		Denning (2017)
District of Columbia Tuition Assistance Grant Program	DC Grant	1999	20	x		x		Abraham and Clark (2006)
Florida International University Admissions at GPA Threshold	FIU GPA	1999	20	x	x	x		Zimmerman (2014)
Florida Student Access Grant	Florida Grant	2001	20	x		x		Castleman and Long (2016)
Free Application for Federal Student Aid, Dependent Year Impact	Free FAFSA (Dep)	2008	20			x		U.S. Department of Education Office of Postsecondary Education (2010) Bettinger et al. (2012)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Free Application for Federal Student Aid, Independent Year Impact	Free FAFSA (Indep)	2008	20			x		U.S. Department of Education Office of Postsecondary Education (2010) Bettinger et al. (2012)
Georgia HOPE Scholarship	Georgia HOPE	1995	20	x		x		Cornwell et al. (2003) Cornwell et al. (2006)
HAIL Michigan Aid Awareness Letter	HAIL Aid	2016	20			x		Dynarski et al. (2018) Hoekstra (2009)
Kalamazoo Promise Scholarship	Kalamazoo	2006	20	x		x		Bartik et al. (2016) Bartik et al. (forthcoming)
Massachussetts Adams Scholarship	MA Scholarship	2005	20	x		x		Cohodes and Goodman (2014) Goodman (2008)
Pell Grants in Ohio	Ohio Pell	2000	19	x		x		Bettinger (2004)
Pell Grants in Tennessee	TN Pell	2008	20	x		x		U.S. Department of Education Office of Postsecondary Education (2010) Carruthers and Welch (2019)
Pell Grants in Texas	Texas Pell	2008	20	x	x	x		Denning et al. (2019)
Social Security Student Benefit Program	Soc Sec College	1982	20	x		x		Dynarski (2003)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Spending at Colleges from State Appropriations	College Spend	2001	20	x		x		Deming and Walters (2017)
Tennessee HOPE Scholarships	TN Hope	2008	20	x		x		Bruce and Carruthers (2014)
Tuition Cuts at Colleges from State Appropriations	College Tuition	2001	20	x		x		Deming and Walters (2017)
Wisconsin Scholar Grant to Low-Income College Students	WI Scholarship	2009	20	x		x		Goldrick-Rab et al. (2016)
Job training								
Job Corps	Job Corps	1995	19	x	x	x		Schochet et al. (2006, 2008) Schochet (2018)
Job Training Partnership Act, Adults	JTPA Adult	1988	34	x	x	x		Bloom et al. (1997)
Job Training Partnership Act, Youth	JTPA Youth	1988	19	x	x	x		Bloom et al. (1997)
JobStart	JobStart	1986	19	x	x	x		Cave et al. (1993)
National Supported Work Demonstration, Adult Women	NSW Women	1976	34	x	x	x		Hollister, Kemper, and Maynard (1984) Couch (1992)
National Supported Work Demonstration, Ex-Addicts	NSW Ex-Addict	1976	33	x	x	x		Hollister, Kemper, and Maynard (1984)
National Supported Work Demonstration, Ex-Offenders	NSW Ex-Offender	1976	33	x	x	x		Hollister, Kemper, and Maynard (1984)
National Supported Work Demonstration, Youth	NSW Youth	1976	18	x	x	x		Hollister, Kemper, and Maynard (1984) Couch (1992)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Work Advance	Work Advance	2012	34	x	x	x		Schaberg (2017) Hendra et al. (2016)
Year Up	Year Up	2013	21	x	x	x		Fein and Hamadyk (2018)
Panel B: Social insurance								
Disability ins.								
Disability Insurance Changes in Benefit Generosity	DI Generosity	2004	50	x	x	x		Gelber, Moore, and Strand (2017)
Disability Insurance Judge Leniency	DI Judge	2005	47	x	x	x		Maestas, Mullen, and Strand (2013) Gelber, Moore, and Strand (2017)
Disability Insurance Medical Examiner Leniency	DI Examiner	1995	48	x	x	x		Gelber, Moore, and Strand (2017) French and Song (2014)
Disability Insurance to Veterans	DI Veterans	2001	53	x	x	x		Autor et al. (2016)
Health adult								
Health Insurance Subsidies in Massachusetts to Individuals at 150% of the Federal Poverty Line	Mass HI (150%FPL)	2011	44	x	x	x		Hendren (2017c) Finkelstein, Hendren, and Shepard (2019)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Health Insurance Subsidies in Massachusetts to Individuals at 200% of the Federal Poverty Line	Mass HI (200%FPL)	2011	44	x	x	x		Hendren (2017c) Finkelstein, Hendren, and Shepard (2019)
Health Insurance Subsidies in Massachusetts to Individuals at 250% of the Federal Poverty Line	Mass HI (250%FPL)	2011	44	x	x	x		Hendren (2017c) Finkelstein, Hendren, and Shepard (2019)
Medicare Introduction in 1965	Medicare Intro	1965	78	x	x	x		U.S. Census Bureau (1966) Finkelstein and McKnight (2008)
Oregon Health Insurance Experiment (Provided to Single Adults)	Oregon Health	2008	42	x	x	x		Finkelstein et al. (2012) Finkelstein, Hendren, and Luttmer (2019)
Taxation of Medigap Policies	Medigap Tax	2002	75	x	x	x		Cabral and Mahoney (2019)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Health child								
Medicaid Expansion to Children Born after September 30, 1983	MC Child 83+	1990	11	x		x	x	Lo Sasso and Seamster (2007) Wherry and Meyer (2016) Wherry et al. (2018)
Medicaid Expansions to Pregnant Women & Infants	MC Pregnant & Infants	1986	0	x	x	x		Dave et al. (2015) Currie and Gruber (1996) Miller and Wherry (2019)
Medicaid Expansions to Young Children	MC Child (State Exp)	1986	9	x	x	x		Boudreaux, Golberstein, and McAlpine (2016) Brown, Kowalski, and Lurie (2017)
Medicaid Introduction to AFDC-eligible Families	MC Intro	1968	9	x	x	x	x	Goodman-Bacon (2017)
Supplemental Security Income								
Supplemental Security Income Age 18 Medical Review	SSI Review	1996	18	x	x	x	x	Deshpande (2016)
Supplemental Security Income Medical Examiner Leniency	SSI Judge	2005	48	x	x	x		Deshpande (2016) French and Song (2014) Gelber, Moore, and Strand (2017) U.S. Social Security Administration (2014)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Unemployment insurance								
Unemployment Insurance Benefit Changes (Diff in Diff Across States in Chetty 2008)	UI Ben (State Max)	1992	37	x	x	x		Chetty (2008) Gruber (1997) Hendren (2017b) Schmieder and Von Wachter (2016)
Unemployment Insurance Benefit Changes (Diff in Diff Across States in Katz and Meyer 1990)	UI Ben (DD)	1980	33	x	x	x		Gruber (1997) Hendren (2017b) Katz and Meyer (1990) Schmieder and Von Wachter (2016)
Unemployment Insurance Benefit Changes (Diff in Diff Across States in Kroft) and Notowidigdo 2016)	UI Ben (DD w UR)	1992	37	x	x	x		Gruber (1997) Hendren (2017b) Kroft and Notowidigdo (2016) Schmieder and Von Wachter (2016)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Unemployment Insurance Benefit Changes in Georgia	UI Ben (GA)	1979	42	x	x	x		Gruber (1997) Hendren (2017b) Schmieder and Von Wachter (2016) Solon (1985)
Unemployment Insurance Benefit Changes in Missouri (Expansion Estimates)	UI Ben (MO Exp)	2005	42	x	x	x		Card et al. (2015) Gruber (1997) Hendren (2017b) Schmieder and Von Wachter (2016)
Unemployment Insurance Benefit Changes in Missouri (Recession Estimates)	UI Ben (MO Rec)	2010	42	x	x	x		Card et al. (2015) Gruber (1997) Hendren (2017b) Schmieder and Von Wachter (2016)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Unemployment Insurance Benefit Changes in New York	UI Ben (NY)	1989	42	x	x	x		Gruber (1997) Hendren (2017b) Meyer and Mok (2007) Schmieder and Von Wachter (2016)
Unemployment Insurance Benefit Changes via Regression Kink in Benefit Schedule	UI Ben (RK)	1980	34	x	x	x		Gruber (1997) Hendren (2017b) Landais (2015) Schmieder and Von Wachter (2016)
Unemployment Insurance Duration Extensions (Diff in Diff Across States in Katz and Meyer 1990)	UI Dur (DD)	1980	33	x	x	x		Ganong and Noel (2019) Gruber (1997) Hendren (2017b) Katz and Meyer (1990) Schmieder and Von Wachter (2016)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Unemployment Insurance Duration Extensions in Missouri	UI Dur (MO)	2011	42	x	x	x		Ganong and Noel (2019) Gruber (1997) Hendren (2017b) Johnston and Mas (2018) Schmieder and Von Wachter (2016)
Panel C: In-kind transfers								
Housing vouchers								
Effects of Housing Vouchers on AFDC Families Experiment	HCV RCT to Welfare	2000	31	x		x		Jacob and Ludwig (2012) Mills et al. (2006) Wood, Turnham, and Mills (2008)
Housing Vouchers in Chicago	HCV Chicago Lottery	1997	31	x		x		Jacob and Ludwig (2012) Jacob, Ludwig, and Kapustin (2014)
Jobs Plus	Jobs+	1998	35			x		Bloom, Riccio, and Verma (2005) Riccio (2006)
MTO								
Moving to Opportunity Experiment Providing Vouchers and Counseling	MTO	1996	10	x	x	x		Chetty, Hendren, and Katz (2016) Goering et al. (1999) Sanbonmatsu et al. (2011)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Nutrition								
Special Supplemental Nutrition Program for Women, Infants, and Children	WIC	1975	26			x		Black, Devereux, and Salvanes (2007) Hoynes, Page, and Stevens (2011) Whitmore (2002)
Supplemental Nutrition Assistance Program Application Assistance	SNAP Assist	2016	69	x	x	x	x	Finkelstein and Notowidigdo (2019)
Supplemental Nutrition Assistance Program Application Information	SNAP Info	2016	69	x	x	x	x	Finkelstein and Notowidigdo (2019)
Supplemental Nutrition Assistance Program Introduction	SNAP Intro	1968	32	x	x	x		Hoynes, Schanzenbach, and Almond (2016) Almond, Hoynes, and Schanzenbach (2011) Bailey et al. (2019) Hoynes, Page, and Stevens (2011) Hoynes and Schanzenbach (2012) East (2018) Finkelstein and Notowidigdo (2019)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Panel D: Taxes and cash transfers								
1986 Earned Income Tax Credit Expansion	EITC 1986	1986	28	x	x	x		Ackerman, Holtzblatt, and Masken (2009) Tax Policy Center (2016) Blank and Ruggles (1996) Hotz and Scholz (2003) Meyer and Rosenbaum (2001) Moffitt (2002) Scholz (1993) Crouse and Waters (2014) Eissa and Hoynes (2004) Eissa and Liebman (1996)
1993 Earned Income Tax Credit Expansion	EITC 1993	1993	29	x	x	x		Tax Policy Center (2016) Hotz and Scholz (2003) Dahl and Lochner (2012) Meyer and Rosenbaum (2001) Bastian and Michelmore (2018) Chetty, Friedman, and Rockoff (2011) Crouse and Waters (2014) Eissa and Hoynes (2004) Hoynes and Patel (2018) Manoli and Turner (2018) Maxfield (2018) Michelmore (2013) Meyer and Rosenbaum (2001)
								Ackerman, Holtzblatt, and Masken (2009) Currie and Cole (1993) Moffitt (2003)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Aid to Families with Dependent Children (Term Limit Modifications)	AFDC Term Limits	1996	27	x	x	x		Grogger (2003) Pavetti (1995)
Alaska Permanent Fund Dividend	Alaska UBI	1998	34	x	x	x		Ackerman, Holtzblatt, and Masken (2009) Bhargava and Manoli (2015) Blank and Ruggles (1996) Hotz and Scholz (2003) Jones and Marinescu (2018) Meyer and Rosenbaum (2001) Moffitt (2002)
Paycheck Plus Experiment Providing EITC-benefits to Adults without Dependents	Paycheck+	2013	35	x	x	x		Miller et al. (2017)
Seattle-Denver Income Maintenance Experiment	Neg Inc Tax	1971	35	x	x	x		Price and Song (2018) U.S. Social Security Administration (2018) Tax Foundation (2013) U.S. Department of Health Human Services (1983) Von Wachter, Song, and Manchester (2011)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Top taxes								
Top Tax 2013 Increases from Affordable Care Act	Top Tax 2013	2013	49	x	x	x		Kawano, Weber, and Whitten (2016) Hendren (2017a)
Top Tax Rate Increase in Omnibus Budget Reconciliation Act 1993	Top Tax 1993	1993	49	x	x	x		Atkinson, Piketty, and Saez (2011) Carroll (1998)
Top Tax Rate Reductions in Tax Reform Act of 1986	Top Tax 1986	1986	49	x	x	x		Atkinson, Piketty, and Saez (2011) Auten and Caroll (1999)
Top Taxes, Economic Growth and Tax Relief Reconciliation Act 2001	Top Tax 2001	2001	49	x	x	x		Atkinson, Piketty, and Saez (2011) Heim (2009)
Top Taxes, Economic Recovery Tax Act 1981	Top Tax 1981	1981	49	x	x	x		Atkinson, Piketty, and Saez (2011) Saez (2003)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Panel E: Welfare reform								
Welfare to Work Alameda Mandatory Mixed-Initial-Activity Programs	GAIN Alm.	1988	31			x		Freedman et al. (1996) Greenberg, Deitch, and Hamilton (2010)
Welfare to Work Atlanta Mandatory Education-First Programs	HCD NEWWS Atl.	1992	33			x		Greenberg, Deitch, and Hamilton (2010) Hamilton et al. (2001)
Welfare to Work Atlanta Mandatory Job-Search-First Programs	LFA NEWWS Atl.	1992	33			x		Hamilton et al. (2001) Greenberg, Deitch, and Hamilton (2010)
Welfare to Work Butte Mandatory Mixed-Initial-Activity Programs	GAIN Butte	1987	31			x		Hamilton et al. (2001) Freedman et al. (1996)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Welfare to Work Columbus Integrated Mandatory Education-First Programs	NEWWS Col. Int.	1992	32			x		Greenberg, Deitch, and Hamilton (2010) Hamilton et al. (2001)
Welfare to Work Columbus Traditional Mandatory Education-First Programs	NEWWS Col. Trad.	1992	32			x		Greenberg, Deitch, and Hamilton (2010) Hamilton et al. (2001)
Welfare to Work Connecticut Time-Limit-Mix Programs	Jobs First	1996	31			x		Bloom et al. (2002) Greenberg, Deitch, and Hamilton (2010)
Welfare to Work Cook County Mandatory Work Experience Program	WIN Demo.	1985	32			x		Greenberg, Deitch, and Hamilton (2010) Brock, Butler, and Long (1993)
Welfare to Work Detroit Mandatory Education-First Programs	NEWWS Det.	1992	30			x		Greenberg, Deitch, and Hamilton (2010) Hamilton et al. (2001)
Welfare to Work Florida Mandatory Mixed-Initial-Activity Programs	Proj. Ind. FL	1990	32			x		Greenberg, Deitch, and Hamilton (2010) Kemple, Friedlander and Fellerath (1995)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Welfare to Work Florida Time-Limit-Mix Programs	FTP	1994	29			x		Bloom et al. (2000) Greenberg, Deitch, and Hamilton (2010)
Welfare to Work Grand Rapids Mandatory Education-First Programs	HCD NEWWS Gr. Rap.	1991	28			x		Greenberg, Deitch, and Hamilton (2010) Hamilton et al. (2001)
Welfare to Work Grand Rapids Mandatory Job-Search-First Programs	LFA NEWWS Gr. Rap.	1991	28			x		Hamilton et al. (2001) Greenberg, Deitch, and Hamilton (2010)
Welfare to Work Los Angeles Mandatory Job-Search-First Programs	GAIN LA jobs	1996	34			x		Freedman et al. (2000) Greenberg, Deitch, and Hamilton (2010)
Welfare to Work Los Angeles Mandatory Mixed-Initial-Activity Programs	GAIN LA	1988	31			x		Greenberg, Deitch, and Hamilton (2010) Freedman et al. (1996)

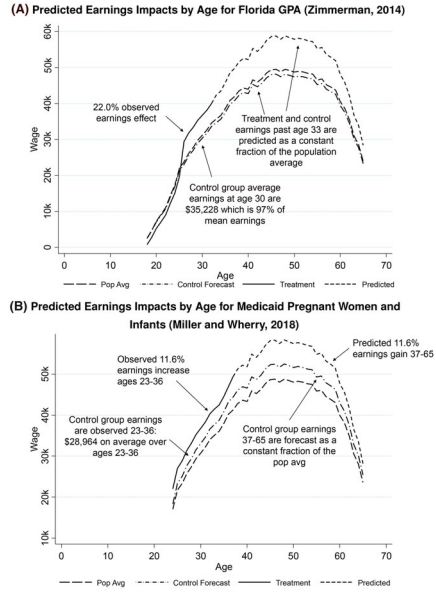
TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Welfare to Work Minnesota Earnings Supplement Programs	MFIP	1994	29			x		Greenberg, Deitch, and Hamilton (2010) Miller et al. (2000)
Welfare to Work Portland Mandatory Mixed-Initial-Activity Programs	NEWWS Port.	1993	30			x		Greenberg, Deitch, and Hamilton (2010) Hamilton et al. (2001)
Welfare to Work Riverside Mandatory Education-First Programs	HCD NEWWS Riv.	1991	32			x		Hamilton et al. (2001) Greenberg, Deitch, and Hamilton (2010)
Welfare to Work Riverside Mandatory Job-Search-First Programs	LFA NEWWS Riv.	1991	32			x		Hamilton et al. (2001) Greenberg, Deitch, and Hamilton (2010)
Welfare to Work Riverside Mandatory Mixed-Initial-Activity Programs	GAIN Riv.	1987	31			x		Freedman et al. (1996) Greenberg, Deitch, and Hamilton (2010)
Welfare to Work San Diego Mandatory Job-Search-First Programs	SWIM	1985	31			x		Greenberg, Deitch, and Hamilton (2010)

TABLE I (CONTINUED)

Program	Label	Year Implemented	Age of Beneficiaries	Sample			Paper Estimates MVPF	Papers Utilized
				Baseline	Restricted	Extended		
Welfare to Work San Diego Mandatory Mixed-Initial-Activity Programs	GAIN SD	1987	31		x			Greenberg, Deitch, and Hamilton (2010) Freedman et al. (1996)
Welfare to Work San Diego Mandatory Work Experience Program	Work Exp. SD	1982	32		x			Greenberg, Deitch, and Hamilton (2010) Brock, Butler, and Long (1993)
Welfare to Work Tulane Mandatory Mixed-Initial-Activity Programs	GAIN Tul.	1988	31		x			Greenberg, Deitch, and Hamilton (2010) Freedman et al. (1996)
Welfare to Work Vermont Earnings Supplement Programs	WRP Earn Supp.	1994	31		x			Greenberg, Deitch, and Hamilton (2010) Scrivener et al. (2002)
Welfare to Work Vermont Time-Limit-Mix Programs	WRP Time lim.	1994	31		x			Scrivener et al. (2002) Greenberg, Deitch, and Hamilton (2010)
Welfare to Work West Virginia Mandatory Work Experience Program	CWEP	1983	33		x			Brock, Butler, and Long (1993) Greenberg, Deitch, and Hamilton (2010)

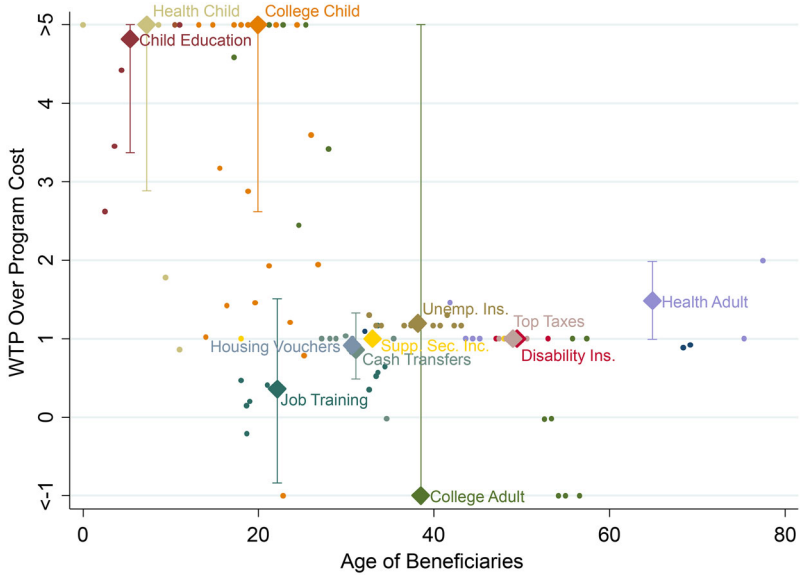
APPENDIX



APPENDIX FIGURE I

Income Projections Using the ACS

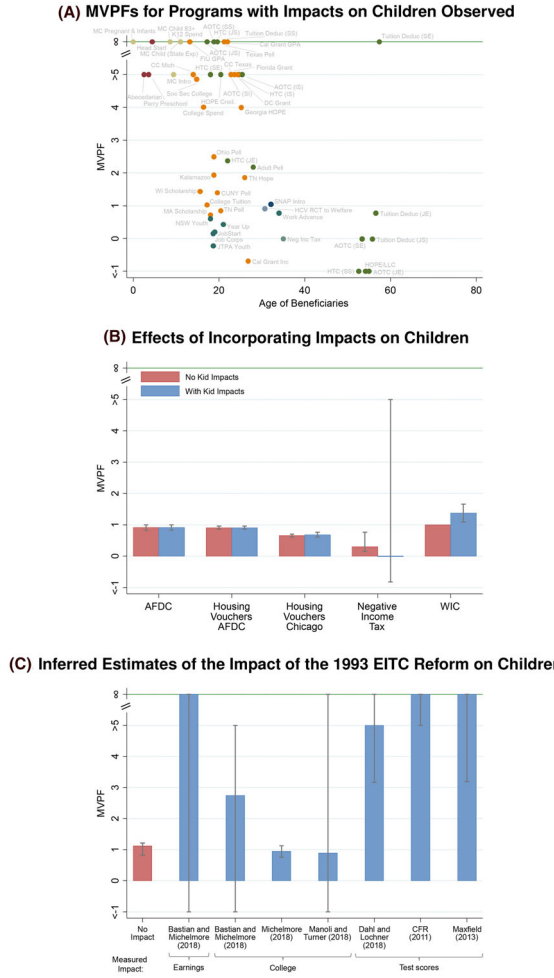
Panels A and B present a decomposition of the elements that make up our income projection process for the examples in Section III.A. The "Pop Avg" series is constructed in each case from the 2015 ACS and using a 0.5% wage growth assumption. At each age "Pop Avg" gives the mean wage level that would prevail in the population for individuals of that age, when individuals in the treatment group for the relevant policy were that age. This number is constructed by assuming that the mean wage level at each age will rise (and has previously risen) by 0.5% in each year. The "Control Forecast" series is constructed by taking an estimate of earnings for a relevant control group at a particular age or range of ages, then calculating the implied proportion of the "Pop Avg" series at those ages, then projecting the series forwards (and backwards) as this constant fraction of "Pop Avg." The "Treatment" series is constructed by summing the observed treatment effects in dollar terms and the "Control Forecast" series. To construct the "Predicted" series we take the final value of the "Treatment" series, then calculate the ratio of this value to the value of the "Pop Avg" series at that same age, before applying this ratio to the "Pop Avg" series up to age 65. See Online Appendix I for further details of this methodology.



APPENDIX FIGURE II

Willingness to Pay per Dollar of Programmatic Spending

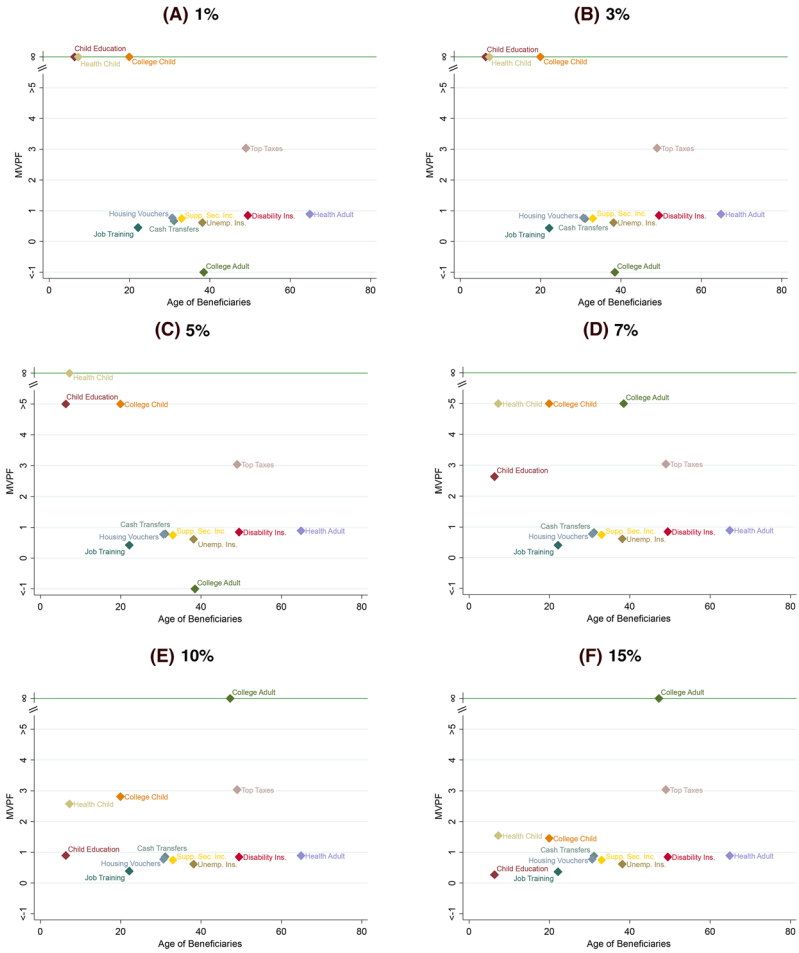
This figure presents estimates of WTP normalized by initial programmatic spending for each category-average group of policies in our baseline sample. We plot these estimates as a function of the average age of each policy's beneficiaries within category. Bootstrapped 95% confidence intervals with adjustments (discussed in Online Appendix H) are shown for the category averages. The normalized willingness to pay of individual policies are shown in smaller dots, color-coded to align with their respective categories.



APPENDIX FIGURE III

Robustness to Child Effects

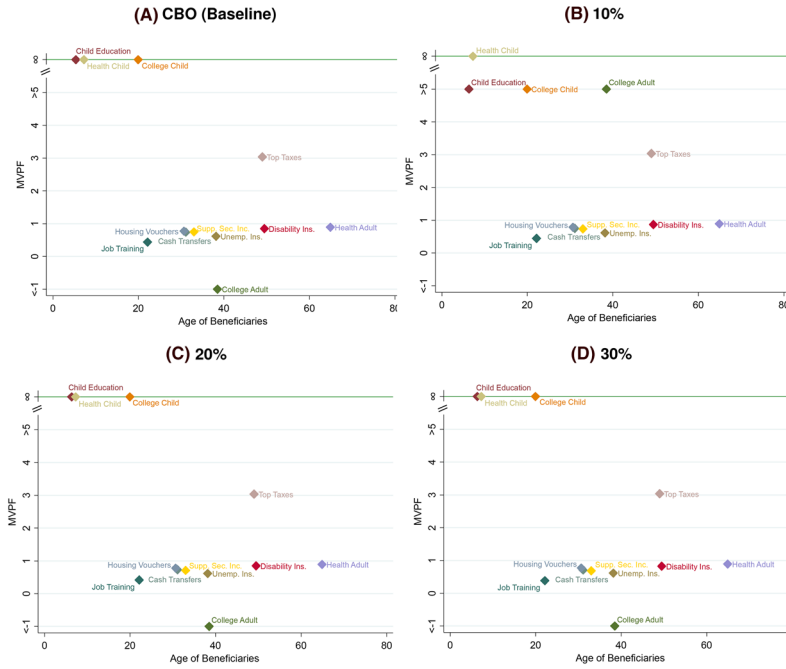
This figure assesses the impact of observing child effects on our estimates as a function of the average age of the economic beneficiaries of the policy. Panel A restricts our sample to the subset of policies for which we observe estimates of the impact of the policy on children. In addition, Panel B shows projected MVPFs for additional policies that do not observe earnings impacts but do observe another intermediate outcome such as birthweight (AFDC), college attendance (housing vouchers to AFDC recipients), and test scores (housing vouchers in Chicago). Panel C reports the MVPF for the EITC under alternative methods of incorporating indirect effects on children through test scores, college attendance, and income of EITC more broadly.



APPENDIX FIGURE IV

Robustness to Alternative Interest Rates

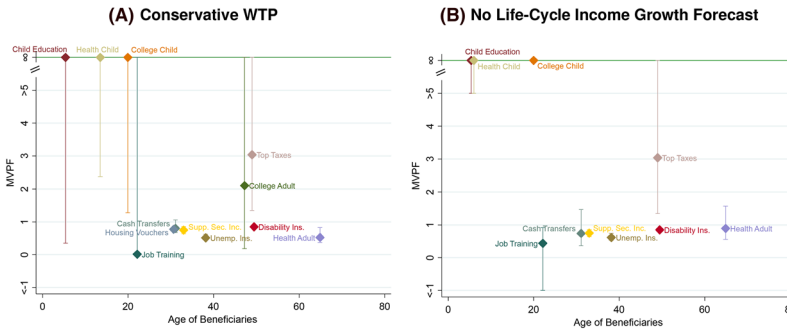
This figure presents our MVPF estimates as in Figure III and the category averages as in Figure IV, Panel B under alternative real interest rate assumptions, as opposed to our baseline specification of 3%. Panel B differs slightly from our baseline specification because we restrict to the subset of policies for which we are able to vary the discount rate (e.g., we exclude papers where we directly import an MVPF that relied on a particular discount rate). We omit confidence intervals for ease of viewing, but caution the reader that the estimate for the college adult category has a CI that includes 0 and infinity.



APPENDIX FIGURE V

Robustness to Alternative Tax Rates

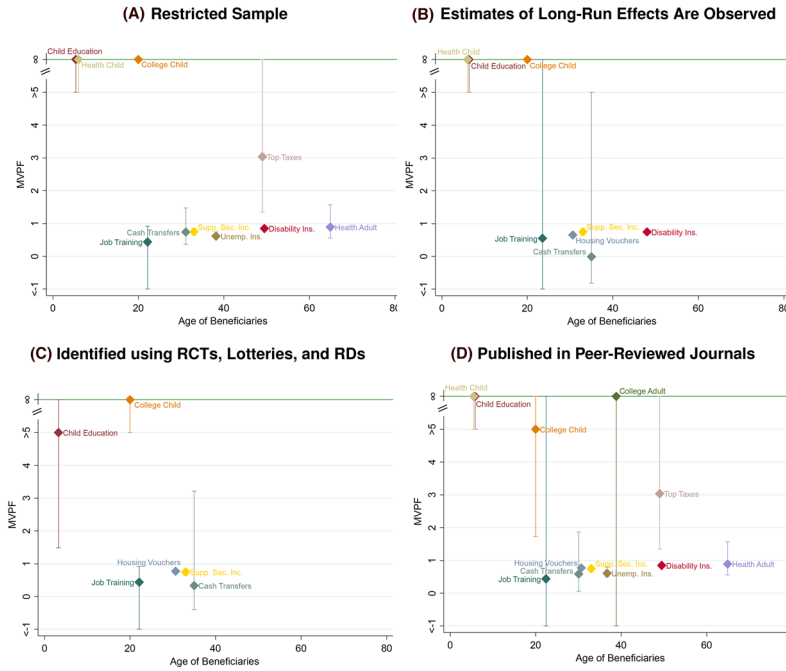
This figure presents our MVPF estimates as in Figure III and the category averages as in Figure IV, Panel B under alternative tax rate assumptions. Panel A replicates our baseline specification using the CBO estimates of the tax rates. Panels B–D adjust the tax rate to 10%, 20%, and 30%.



APPENDIX FIGURE VI

Specification Robustness

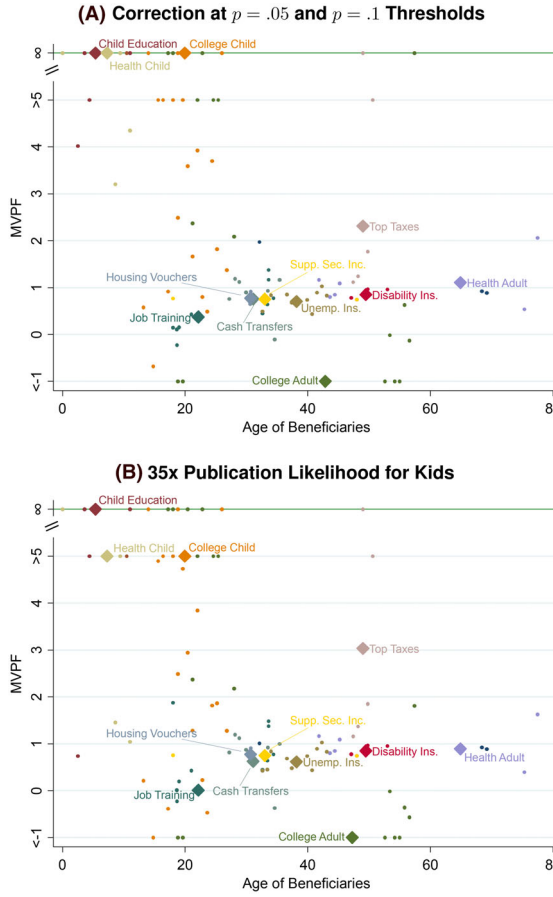
This figure presents the category-average MVPFs from Figure III using a range of different alternative specifications that are more conservative than our baseline specifications. Panel A replaces our point estimate WTP measures with our conservative measures of WTP. We report bootstrapped 95% confidence intervals with adjustments (discussed in Online Appendix H) for each category average. Panel B replaces our baseline income projection procedure with a procedure that assumes zero income growth over the lifecycle. We use our restricted sample of policies for this specification. See Online Appendix I for further details.



APPENDIX FIGURE VII

Sample Restrictions

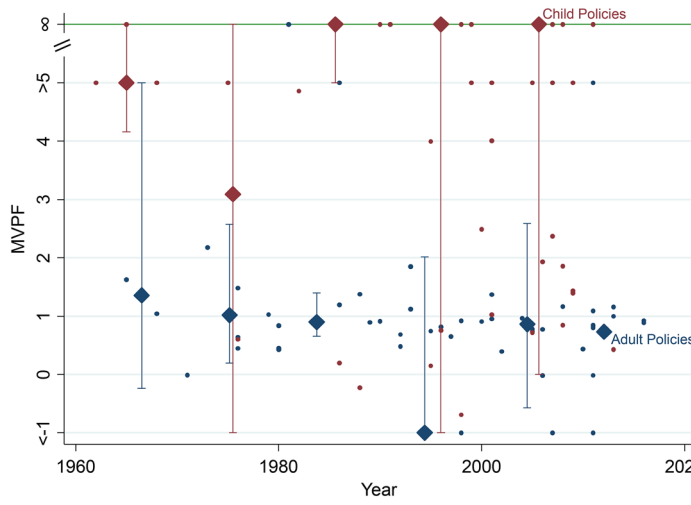
This figure presents the category-average MVPFs from Figure III using a range of alternative sample restrictions. Panel A considers our restricted sample that drops estimates for which we are forecasting earnings effects based on a policy's impact on college attendance. Panel B restricts the sample to only policies for which earnings outcomes are estimated for at least five years of follow-up after the policy. For this panel we show group averages even for groups with a single policy. Panel C restricts the sample to policies whose identification strategy is a randomized control trial, lottery, or regression discontinuity. Panel D restricts to policies whose primary analyses have been published in a peer-reviewed journal. We report bootstrapped 95% confidence intervals with adjustments (discussed in Online Appendix H) for each category average.



APPENDIX FIGURE VIII

Publication Bias

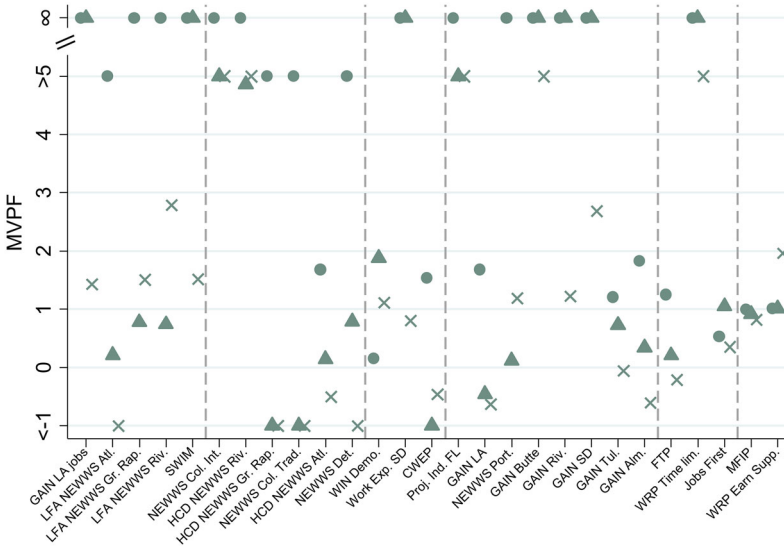
This figure presents the MVPF estimates from Figure III and category averages in Figure IV, Panel B using estimates corrected for publication bias from the method of Andrews and Kasy (2019). Panel A reports estimates using the corrections using the publication likelihood estimated from our model that imposes jumps at $p = .05$ and $p = .10$, as shown in Table III, columns (3) and (6). In Panel B we report corrected estimates under an assumption that child policies are 35 times more likely to be published if they find a positive effect on children's outcomes (and we assume no publication bias for adult policies or for child policies that find negative effects on children). This 35 times corresponds to the estimated publication bias implied by a large-scale replication of experimental economics papers by Camerer et al. (2016) (Table 1 of Andrews and Kasy 2019 reports that insignificant results are 0.029 times as likely to be published). We do not report confidence intervals for these estimates (to our knowledge there is no well-accepted method of constructing such intervals); but we refer readers to Figure IV, Panel B to note that some of these category averages are imprecise.



APPENDIX FIGURE IX

MVPFs by Decade

This figure presents MVPFs for all policies evaluated in the article based on the year in which the policy was implemented. Policies are divided into categories based on their decade of implementation and the average age of their economic beneficiaries. For policies implemented in each decade there are two categories—policies with beneficiaries over age 23 and policies with beneficiaries aged 23 or younger. Within each decade by age category we construct the MVPF for a hypothetical policy that allocates $1 of programmatic spending equally among all the policies in the category. This is the same approach used to create MVPF estimates for policy domains in previous figures. The capped lines show the 95% bootstrapped confidence intervals with adjustments discussed in Online Appendix H.



APPENDIX FIGURE X

Welfare Reform

This figure presents estimates of the MVPF of 27 welfare reform policies discussed in Section VI.C. We report MVPF estimates using three potential measures of WTP: (i) cost, the mechanical cost of the program incurred by the government, excluding any fiscal externalities from behavior change. Estimates from this specification are denoted by circles. (ii) Change in transfer payments (welfare, food stamps, and Medicaid). Estimates from this specification are denoted by Xs. (iii) Change in post-tax income, which includes the change in participants' incomes due to changes in employment and the change in their transfer payments. Estimates from this specification are denoted by triangles.

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SUPPLEMENTARY MATERIAL

An Online Appendix for this article can be found at *The Quarterly Journal of Economics* online. Data and code replicating tables and figures in this article can be found in Hendren and Sprung-Keyser (2020), in the Harvard Dataverse, doi: 10.7910/DVN/ZHOSGC.

REFERENCES

Abraham, Katharine G., and Melissa A. Clark, "Financial Aid and Students' College Decisions: Evidence from the District of Columbia Tuition Assistance Grant Program," *Journal of Human Resources*, 41 (2006), 578–610.
Ackerman, Deena, Janet Holtzblatt, and Karen Masken, "The Pattern of EITC Claims over Time: A Panel Data Analysis," in "Conference Paper from IRS RC 2009: Internal Revenue Service Research Conference." Washington, DC: Department of the Treasury.
Acton, Riley, "The Impact of Public Tuition Subsidies on College Enrollment Decisions: Evidence from Michigan," Michigan State University, 2018.
Akerlof, George A., "The Economics of 'Tagging' as Applied to the Optimal Income Tax, Welfare Programs, and Manpower Planning," *American Economic Review*, 68 (1978), 8–19.
Almond, Douglas, Hilary W. Hoynes, and Diana W. Schanzenbach, "Inside the War on Poverty: The Impact of Food Stamps on Birth Outcomes," *Review of Economics and Statistics*, 93 (2011), 387–403.
American Institutes for Research, "Delta Cost Project," (2017), https://www.deltacostproject.org/delta-cost-project-database (accessed April 26, 2019).
Andrews, Isaiah, and Maximilian Kasy, "Identification of and Correction for Publication Bias," *American Economic Review*, 109 (2019), 2766–2794.
Atkinson, Anthony B., Thomas Piketty, and Emmanuel Saez, "Top Incomes in the Long Run of History," *Journal of Economic Literature*, 49 (2011), 3–71.
Atkinson, Anthony B., and Nicholas H. Stern, "Pigou, Taxation and Public Goods," *Review of Economic Studies*, 41 (1974), 119–128.
Atkinson, Anthony Barnes, and Joseph E. Stiglitz, "The Design of Tax Structure: Direct versus Indirect Taxation," *Journal of public Economics*, 6 (1976), 55–75.
Auerbach, Alan, "The Theory of Excess Burden and Optimal Taxation," in *Handbook of Public Economics*, vol. 1, A. Auerbach and M. Feldstein, eds. (Amsterdam: Elsevier, 1985), 61–127.
Auerbach, Alan J., and James R. Hines, "Taxation and Economic Efficiency," in *Handbook of Public Economics*, vol. 3, A. Auerbach and M. Feldstein, eds. (Amsterdam: Elsevier, 2002), 1347–1421.
Auten, Gerald, and Robert Carroll, "The Effect of Income Taxes on Household Income," *Review of Economics and Statistics*, 81 (1999), 681–693.
Autor, David H., Mark Duggan, Kyle Greenberg, and David S. Lyle, "The Impact of Disability Benefits on Labor Supply: Evidence from the VA's Disability Compensation Program," *American Economic Journal: Applied Economics*, 8 (2016), 31–68.
Bailey, Martha, Hilary Hoynes, Maya Rossin-Slater, and Reed Walker, "Is the Social Safety Net a Long-Term Investment? Large-Scale Evidence from the Food Stamps Program," 2019. Goldman School of Public Policy Working Paper, 2019.

Barnett, W. Steven, and Leonard N. Masse, "Comparative Benefit Cost Analysis of the Abecedarian Program and Its Policy Implications," *Economics of Education Review*, 26 (2007), 113–125.
Bartik, Timothy J., Brad Hershbein, and Marta Lachowska, "The Merits of Universal Scholarships: Benefit-Cost Evidence from the Kalamazoo Promise," *Journal of Benefit-Cost Analysis*, 7 (2016), 400–433.
Bartik, Timothy J., Brad J. Hershbein, and Marta Lachowska, "The Effects of the Kalamazoo Promise Scholarship on College Enrollment, Persistence, and Completion," *Journal of Human Resources*, forthcoming.
Bastian, Jacob, and Maggie R. Jones, "Do EITC Expansions Pay for Themselves? Effects on Tax Revenue and Public Assistance Spending," Rutgers University working paper, 2019.
Bastian, Jacob, and Katherine Michelmore, "The Long-Term Impact of the Earned Income Tax Credit on Children's Education and Employment Outcomes," *Journal of Labor Economics*, 36 (2018), 1127–1163.
Bettinger, Eric, "How Financial Aid Affects Persistence," in *College Choices: The Economics of Where to Go, When to go, and How to Pay For It*, Caroline Hoxby, ed. (Chicago: University of Chicago Press, 2004, 207–238.
Bettinger, Eric, Oded Gurantz, Laura Kawano, Bruce Sacerdote, and Michael Stevens, "The Long-Run Impacts of Financial Aid: Evidence from California's Cal Grant," *American Economic Journal: Economic Policy*, 11 (2019), 64–94.
Bettinger, Eric P., Bridget Terry Long, Philip Oreopoulos, and Lisa Sanbonmatsu, "The Role of Application Assistance and Information in College Decisions: Results from the H&R Block Fafsa Experiment," *Quarterly Journal of Economics*, 127 (2012), 1205–1242.
Bhargava, Saurabh, and Dayanand Manoli, "Psychological Frictions and the Incomplete Take-Up of Social Benefits: Evidence from an IRS Field Experiment," *American Economic Review*, 105 (2015), 3489–3529.
Black, Sandra E., Paul J. Devereux, and Kjell G. Salvanes, "From the Cradle to the Labor Market? The Effect of Birth Weight on Adult Outcomes," *Quarterly Journal of Economics*, 122 (2007), 409–439.
Blank, Rebecca M., and Patricia Ruggles, "When Do Women Use Aid to Families with Dependent Children and Food Stamps? The Dynamics of Eligibility versus Participation," *Journal of Human Resources*, 31 (1996), 57–89.
Bloom, Dan, James J. Kemple, Pamela Morris, Susan Scrivener, Nandita Verma, Richard Hendra, Diana Adams-Ciardullo, and David Seith, et al., "Final Report on Florida's Initial Time-Limited Welfare Program," Manpower Demonstration Research Corporation, 2000.
Bloom, Dan, Susan Scrivener, Charles Michalopoulos, Pamela Morris, Richard Hendra, Diana Adams-Ciardullo, and Johanna Walter, "Jobs First: Final Report on Connecticut's Welfare Reform Initiative," ERIC, 2002.
Bloom, Howard S., Larry L. Orr, Stephen H. Bell, George Cave, Fred Doolittle, Winston Lin, and Johannes M. Bos, "The Benefits and Costs of JTPA Title II-A Programs: Key Findings from the National Job Training Partnership Act Study," *Journal of Human Resources*, 32 (1997), 549–576.
Bloom, Howard S., James A. Riccio, and Nandita Verma, "Promoting Work in Public Housing: The Effectiveness of Jobs-Plus," Manpower Demonstration Research Corporation, 2005.
Boardman, Anthony E, David H. Greenberg, Aidan R. Vining, and David L. Weimer, *Cost-Benefit Analysis: Concepts and Practice* (Cambridge: Cambridge University Press, 2017).
Boudreaux, Michel H., Ezra Golberstein, and Donna D. McAlpine, "The Long-Term Impacts of Medicaid Exposure in Early Childhood: Evidence from the Program's Origin," *Journal of Health Economics*, 45 (2016), 161–175.
Brock, Thomas, David Butler, and David Long, "Unpaid Work Experience for Welfare Recipients: Findings and Lessons from MDRC Research. MDRC Working Papers," Manpower Demonstration Research Corporation, 1993.
Brown, David, Amanda E. Kowalski, and Ithai Z. Lurie, "Long-Term Impacts of Childhood Medicaid Expansions on Outcomes in Adulthood," NBER Working Paper no. 20835, 2017.

Brown, David W., Amanda E. Kowalski, and Ithai Z. Lurie, "Medicaid as an Investment in Children: What Is the Long-Term Impact on Tax Receipts?," NBER Working Paper no. 20835, 2015.
Bruce, Donald J., and Celeste K. Carruthers, "Jackpot? The Impact of Lottery Scholarships on Enrollment in Tennessee," *Journal of Urban Economics*, 81 (2014), 30–44.
Bulman, George B., and Caroline M. Hoxby, "The Returns to the Federal Tax Credits for Higher Education," *Tax Policy and the Economy*, 29 (2015), 13–88.
Cabral, Marika, and Neale Mahoney, "Externalities and Taxation of Supplemental Insurance: A Study of Medicare and Medigap," *American Economic Journal: Applied Economics*, 11 (2019), 37–73.
Camerer, Colin F., Anna Dreber, Eskil Forsell, Teck-Hua Ho, Jürgen Huber, Magnus Johannesson, Michael Kirchler, and Johan Almenberg et al., "Evaluating Replicability of Laboratory Experiments in Economics," *Science*, 351 (2016), 1433–1436.
Campbell, Frances A., Elizabeth P. Pungello, Kirsten Kainz, Margaret Burchinal, Yi Pan, Barbara H. Wasik, Oscar A. Barbarin, Joseph J. Sparling, and Craig T. Ramey, "Adult Outcomes as a Function of an Early Childhood Educational Program: An Abecedarian Project Follow-Up," *Developmental Psychology*, 48 (2012), 1033–1043.
Card, David, Andrew Johnston, Pauline Leung, Alexandre Mas, and Zhuan Pei, "The Effect of Unemployment Benefits on the Duration of Unemployment Insurance Receipt: New Evidence from a Regression Kink Design in Missouri, 2003–2013," *American Economic Review: Papers and Proceedings*, 105 (2015), 126–130.
Carroll, Robert, "Do Taxpayers Really Respond to Changes in Tax Rates? Evidence from the 1993 Tax Act," U.S. Department of the Treasury Office of Tax Analysis, Working Paper 79, 1998.
Carruthers, Celeste K., and Jilleah G. Welch, "Not Whether, but Where? Pell Grants and College Choices," *Journal of Public Economics*, 172 (2019), 1–19.
Castleman, Benjamin L., and Bridget Terry Long, "Looking beyond Enrollment: The Causal Effect of Need-Based Grants on College Access, Persistence, and Graduation," *Journal of Labor Economics*, 34 (2016), 1023–1073.
Cave, George, Hans Bos, Fred Doolittle, and Cyril Toussaint, "Jobstart: Final Report on a Program for School Dropouts," Manpower Demonstration Research Corporation, 1993.
Chetty, Raj, "Moral Hazard versus Liquidity and Optimal Unemployment Insurance," *Journal of Political Economy*, 116 (2008), 173–234.
Chetty, Raj, John N. Friedman, and Jonah Rockoff, "New Evidence on the Long-Term Impacts of Tax Credits," IRS Statistics of Income White Paper, 2011.
Chetty, Raj, Nathaniel Hendren, and Lawrence F. Katz, "The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment," *American Economic Review*, 106 (2016), 855–902.
Cohodes, Sarah R., and Joshua S. Goodman, "Merit Aid, College Quality, and College Completion: Massachusetts' Adams Scholarship as an In-Kind Subsidy," *American Economic Journal: Applied Economics*, 6 (2014), 251–285.
Cornwell, Christopher, Kyung Hee Lee, and David Mustard, "The Effects of Merit-Based Financial Aid on Course Enrollment, Withdrawal and Completion in College," IZA Working Paper, 2003.
Cornwell, Christopher, David B. Mustard, and Deepa J. Sridhar, "The Enrollment Effects of Merit-Based Financial Aid: Evidence from Georgia's HOPE Scholarship," *Journal of Labor Economics*, 24 (2006), 761–786.
Couch, Kenneth A., "New Evidence on the Long-Term Effects of Employment Training Programs," *Journal of Labor Economics*, 10 (1992), 380–388.
Crouse, Gilbert, and Annette Waters, "Welfare Indicators and Risk Factors: Thirteenth Report to Congress," US Department of Health and Human Services, 2014.
Currie, Janet, "Welfare and the Well-Being of Children: The Relative Effectiveness of Cash and In-Kind Transfers," *Tax Policy and the Economy*, 8 (1994), 1–43.

Currie, Janet, and Nancy Cole, "Welfare and Child Health: The Link between AFDC Participation and Birth Weight," *American Economic Review*, 83 (1993), 971–985.
Currie, Janet, and Jonathan Gruber, "Saving Babies: The Efficacy and Cost of Recent Changes in the Medicaid Eligibility of Pregnant Women," *Journal of Political Economy*, 104 (1996), 1263–1296.
Currie, Janet, and Enrico Moretti, "Did the Introduction of Food Stamps Affect Birth Outcomes in California?," National Poverty Center Working Paper 06-20, 2006.
Cutler, David M., and Jonathan Gruber, "Does Public Insurance Crowd out Private Insurance?," *Quarterly Journal of Economics*, 111 (1996), 391–430.
Dahl, Gordon B., and Lance Lochner, "The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit," *American Economic Review*, 102 (2012), 1927–1956.
Dave, Dhaval M., Sandra L. Decker, Robert Kaestner, and Kosali Ilayperuma Simon, "The Effect of Medicaid Expansions in the Late 1980s and Early 1990s on the Labor Supply of Pregnant Women," *American Journal of Health Economics*, 1 (2015), 195–193.
DeLong, J. Bradford, Lawrence H. Summers, Martin Feldstein, and Valerie A. Ramey, "Fiscal Policy in a Depressed Economy," *Brookings Papers on Economic Activity* (2012), 233–297.
Deming, David J., and Christopher R. Walters, "The Impact of Price Caps and Spending Cuts on U.S. Postsecondary Attainment," NBER Working Paper no. 23736, 2017.
Denning, Jeffrey T., "College on the Cheap: Consequences of Community College Tuition Reductions," *American Economic Journal: Economic Policy*, 9 (2017), 155–188.
Denning, Jeffrey T., Benjamin M. Marx, and Lesley J. Turner, "ProPelled: The Effects of Grants on Graduation, Earnings, and Welfare," *American Economic Journal: Applied Economics*, 11 (2019), 193–224.
Deshpande, Manasi, "Does Welfare Inhibit Success? The Long-Term Effects of Removing Low-Income Youth from the Disability Rolls," *American Economic Review*, 106 (2016), 3300–3330.
Diamond, Peter, and Emmanuel Saez, "The Case for a Progressive Tax: from Basic Research to Policy Recommendations," *Journal of Economic Perspectives*, 25 (2011), 165–190.
Dynarski, Susan, "Hope for Whom? Financial Aid for the Middle Class and Its Impact on College Attendance," *National Tax Journal*, 53 (2000), 629–662.
Dynarski, Susan, C. J. Libassi, Katherine Michelmore, and Stephanie Owen, "Closing the Gap: The Effect of a Targeted, Tuition-Free Promise on College Choices of High-Achieving, Low-Income Students," NBER Working Paper no. 25349, 2018.
Dynarski, Susan M., "Does Aid Matter? Measuring the Effect of Student Aid on College Attendance and Completion," *American Economic Review*, 93 (2003), 279–288.
East, Chloe N., "Immigrants' Labor Supply Response to Food Stamp Access," *Labour Economics*, 51 (2018), 202–226.
Eissa, Nada, and Hilary W. Hoynes, "Taxes and the Labor Market Participation of Married Couples: The Earned Income Tax Credit," *Journal of Public Economics*, 88 (2004), 1931–1958.
Eissa, Nada, and Jeffrey Liebman, "Labor Supply Responses to the Earned Income Tax Credit," *Quarterly Journal of Economics*, 111 (1996), 605–637.
Fein, David, and Jill Hamadyk, "Bridging the Opportunity Divide for Low-Income Youth: Implementation and Early Impacts of the Year Up Program," OPRE Report 2018-65, 2018.
Finkelstein, Amy, Nathaniel Hendren, and Erzo F. P. Luttmer, "The Value of Medicaid: Interpreting Results from the Oregon Health Insurance Experiment," *Journal of Political Economy*, 127 (2019).

Finkelstein, Amy, Nathaniel Hendren, and Mark Shepard, "Subsidizing Health Insurance for Low-Income Adults: Evidence from Massachusetts," *American Economic Review*, 109 (2019), 1530–1567.
Finkelstein, Amy, and Robin McKnight, "What Did Medicare Do? The Initial Impact of Medicare on Mortality and Out of Pocket Medical Spending," *Journal of Public Economics*, 92 (2008), 1644–1668.
Finkelstein, Amy, and Matthew J. Notowidigdo, "Take-Up and Targeting: Experimental Evidence from SNAP," *Quarterly Journal of Economics*, 134 (2019), 1505–1556.
Finkelstein, Amy, Sarah Taubman, Bill Wright, Mira Bernstein, Jonathan Gruber, Joseph P. Newhouse, Heidi Allen, and Katherine Baicker, and Oregon Health Study Group, "The Oregon Health Insurance Experiment: Evidence from the First Year," *Quarterly Journal of Economics*, 127 (2012), 1057–1106.
Freedman, Stephen, Daniel Friedlander, Winston Lin, and Amanda Schweder, "The GAIN Evaluation: Five-Year Impacts on Employment, Earnings and AFDC Receipt," Manpower Demonstration Research Corporation, 1996.
Freedman, Stephen, Jean Tansey Knab, Lisa A. Gennetian, and David Navarro, "The Los Angeles Jobs-First GAIN Evaluation: Final Report on a Work First Program in a Major Urban Center," Manpower Demonstration Research Corporation, 2000.
French, Eric, and Jae Song, "The Effect of Disability Insurance Receipt on Labor Supply," *American Economic Journal: Economic Policy*, 6 (2014), 291–337.
Ganong, Peter, and Pascal J. Noel, "Consumer Spending during Unemployment: Positive and Normative Implications," *American Economic Review*, 109 (2019), 2383–2424.
García, Jorge Luis, James J. Heckman, Andres Hojman, Yu Kyung Koh, Joshua Shea, and Anna Ziff, "Documentation of full ABC/CARE Treatment Effects," Unpublished Manuscript, University of Chicago, 2016.
García, Jorge Luis, James J. Heckman, Duncan Ermini Leaf, and María José Prados, "Quantifying the Life-Cycle Benefits of a Prototypical Early Childhood Program," NBER Working Paper no. 23479, 2017.
Gelber, Alexander, Timothy J. Moore, and Alexander Strand, "The Effect of Disability Insurance Payments on Beneficiaries' Earnings," *American Economic Journal: Economic Policy*, 9 (2017), 229–261.
Goering, John, Joan Kraft, Judith Feins, Debra McInnis, Mary Joel Holin, and Huda Elhassan, "Moving to Opportunity for Fair Housing Demonstration Program: Current Status and Initial Findings," U.S. Department of Housing and Urban Development, 1999.
Gold, Rachel, and Asta Kenney, "Paying for Maternity Care," *Family Planning Perspectives*, 17 (1985), 103–111.
Goldrick-Rab, Sara, Robert Kelchen, Douglas N. Harris, and James Benson, "Reducing Income Inequality in Educational Attainment: Experimental Evidence on the Impact of Financial Aid on College Completion," *American Journal of Sociology*, 121 (2016), 1762–1817.
Goodman, Joshua, "Who Merits Financial Aid?: Massachusetts' Adams Scholarship," *Journal of Public Economics*, 92 (2008), 2121–2131.
Goodman-Bacon, Andrew, "The Long-Run Effects of Childhood Insurance Coverage: Medicaid Implementation, Adult Health, and Labor Market Outcomes," NBER Working Paper no 22899, 2017.
Greenberg, David H., Victoria Deitch, and Gayle Hamilton, "A Synthesis of Random Assignment Benefit-Cost Studies of Welfare-to-Work Programs," *Journal of Benefit-Cost Analysis*, 1 (2010), 1–30.
Grogger, Jeff, and Lynn A. Karoly, *Welfare Reform* (Cambridge, MA: Harvard University Press, 2005).
Grogger, Jeffrey, "The Effects of Time Limits, the EITC, and Other Policy Changes on Welfare Use, Work, and Income among Female-Headed Families," *Review of Economics and Statistics*, 85 (2003), 394–408.

Gruber, Jonathan, "The Consumption Smoothing Benefits of Unemployment Insurance," *American Economic Review*, 87 (1997), 192–205.
Hamilton, Gayle, Stephen Freedman, Lisa Gennetian, Charles Michalopoulos, Johanna Walter, Diana Adams-Ciardullo, Anna Gassman-Pines, and Sharon McGroder et al., "How Effective Are Different Welfare-to-Work Approaches? Five-Year Adult and Child Impacts for Eleven Programs. National Evaluation of Welfare-to-Work Strategies," Manpower Demonstration Research Corporation, 2001.
Heckman, James J., "Skill Formation and the Economics of Investing in Disadvantaged Children," *Science*, 312 (2006), 1900–1902.
Heckman, James J., Seong Hyeok Moon, Rodrigo Pinto, Peter A. Savelyev, and Adam Yavitz, "The Rate of Return to the High Scope Perry Preschool Program," *Journal of Public Economics*, 94 (2010), 114–128.
Heckman, James J., Rodrigo Pinto, Azeem M. Shaikh, and Adam Yavitz, "Inference with Imperfect Randomization: The Case of the Perry Preschool Program," NBER Working Paper no. 16935, 2011.
Heim, Bradley T., "The Effect of Recent Tax Changes on Taxable Income: Evidence from a New Panel of Tax Returns," *Journal of Policy Analysis and Management*, 28 (2009), 147–163.
Helburn, Suzanne W., "Cost, Quality and Child Outcomes in Child Care Centers. Technical Report, Public Report, and Executive Summary," Manpower Demonstration Research Corporation, 1995.
Hendra, Richard, David H. Greenberg, Gayle Hamilton, Ari Oppenheim, Alexandra Pennington, Kelsey Schaberg, and Betsy L. Tessler, "Encouraging Evidence on a Sector-Focused Advancement Strategy: Two-Year Impacts from the Work Advance Demonstration," Manpower Demonstration Research Corporation, 2016.
Hendren, Nathaniel, "The Policy Elasticity," *Tax Policy and the Economy*, 30 (2016), 51–89.
———, "Efficient Welfare Weights," NBER Working Paper no. 20351, 2017a.
———, "Knowledge of Future Job Loss and Implications for Unemployment Insurance," *American Economic Review*, 107 (2017b), 1778–1823.
———, "Measuring Ex-Ante Welfare in Insurance Markets," NBER Working Paper no. 24470, 2017c.
Hendren, Nathaniel, and Ben Sprung-Keyser, "Replication Data for: 'A Unified Welfare Analysis of Government Policies'," (2020), Harvard Dataverse, doi: 10.7910/DVN/ZHOSGC.
Hoekstra, Mark, "The Effect of Attending the Flagship State University on Earnings: A Discontinuity-Based Approach," *The Review of Economics and Statistics*, 91 (2009), 717–724.
Hollister, Robinson G., Peter Kemper, and Rebecca A. Maynard, "The National Supported Work Demonstration," 1984.
Hotz, V. Joseph, and John K. Scholz, "The Earned Income Tax Credit," in *Means-Tested Transfer Programs in the United States*, Robert A. Moffitt, ed. (Chicago: University of Chicago Press, 2003), 141–198.
Hoxby, Caroline M., and George B. Bulman, "The Effects of the Tax Deduction for Postsecondary Tuition: Implications for Structuring Tax-Based Aid," *Economics of Education Review*, 51 (2016), 23–60.
Hoynes, Hilary W., Marianne Page, and Ann Huff Stevens, "Can Targeted Transfers Improve Birth Outcomes?: Evidence from the Introduction of the WIC Program," *Journal of Public Economics*, 95 (2011), 813–827.
Hoynes, Hilary W., and Ankur J. Patel, "Effective Policy for Reducing Poverty and Inequality? The Earned Income Tax Credit and the Distribution of Income," *Journal of Human Resources*, 53 (2018), 859–890.
Hoynes, Hilary W., and Diana W. Schanzenbach, "Consumption Responses to In-Kind Transfers: Evidence from the Introduction of the Food Stamp Program," *American Economic Journal: Economic Policy*, 1 (2009), 109–139.
———, "Work Incentives and the Food Stamp Program," *Journal of Public Economics*, 96 (2012), 151–162.

———, "Safety Net Investments in Children," *Brookings Papers on Economic Activity* (2018), 89–133.
Hoynes, Hilary W., Diane Whitmore Schanzenbach, and Douglas Almond, "Long-Run Impacts of Childhood Access to the Safety Net," *American Economic Review*, 106 (2016), 903–934.
Hylland, Aanund, and Richard Zeckhauser, "Distributional Objectives Should Affect Taxes but not Program Choice or Design," in *Measurement in Public Choice*, Steinar Strøm, ed. (London: Palgrave Macmillan, 1981), 123–143.
Hyman, Joshua, "Does Money Matter in the Long Run? Effects of School Spending on Educational Attainment," *American Economic Journal: Economic Policy*, 9 (2017), 256–280.
Jackson, C. Kirabo, Claudia Persico, and Rucker C. Johnson, "The Effects of School Spending on Educational and Economic Outcomes: Evidence from School Finance Reforms," *Quarterly Journal of Economics*, 131 (2016), 157–218.
Jacob, Brian A., and Jens Ludwig, "The Effects of Housing Assistance on Labor Supply: Evidence from a Voucher Lottery," *American Economic Review*, 102 (2012), 272–304.
Jacob, Brian A., Jens Ludwig, and Max Kapustin, "The Impact of Housing Assistance on Child Outcomes: Evidence from a Randomized Housing Lottery," *Quarterly Journal of Economics*, 130 (2014), 465–506.
Johnson, Rucker C., and C. Kirabo Jackson, "Reducing Inequality through Dynamic Complementarity: Evidence from Head Start and Public School Spending," *American Economic Journal: Economic Policy*, 11 (2019), 310–349.
Johnston, Andrew C., and Alexandre Mas, "Potential Unemployment Insurance Duration and Labor Supply: The Individual and Market-Level Response to a Benefit Cut," *Journal of Political Economy*, 126 (2018), 2480–2522.
Jones, Damon, and Ioana Marinescu, "The Labor Market Impacts of Universal and Permanent Cash Transfers: Evidence from the Alaska Permanent Fund," NBER Working Paper no. 24312, 2018.
Kane, Thomas J., "College Entry by Blacks since 1970: The Role of College Costs, Family Background, and the Returns to Education," *Journal of Political Economy*, 102 (1994), 878–911.
Katz, Lawrence F., and Bruce D. Meyer, "The Impact of the Potential Duration of Unemployment Benefits on the Duration of Unemployment," *Journal of Public Economics*, 41 (1990), 45–72.
Kawano, Laura, Caroline Weber, and Andrew Whitten, "Estimating the Elasticity of Broad Income for High-Income Taxpayers," 2016, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2852048 (accessed July 7, 2019).
Kemple, James J., Daniel Friedlander, and Veronica Fellerath, "Florida's Project Independence. Benefits, Costs, and Two-Year Impacts of Florida's JOBS Program," *ERIC*, 1995.
Kleven, Henrik, "The EITC and the Extensive Margin: A Reappraisal," NBER Working Paper no. 26405, 2019.
Kleven, Henrik J., and Claus Thustrup Kreiner, "The Marginal Cost of Public Funds: Hours of Work versus Labor Force Participation," *Journal of Public Economics*, 90 (2006), 1955–1973.
Kline, Patrick, and Christopher R. Walters, "Evaluating Public Programs with Close Substitutes: The Case of Head Start," *Quarterly Journal of Economics*, 131 (2016), 1795–1848.
Kroft, Kory, and Matthew J. Notowidigdo, "Should Unemployment Insurance Vary with the Unemployment Rate? Theory and Evidence," *Review of Economic Studies*, 83 (2016), 1092–1124.
LaLumia, Sara, "Tax Preferences for Higher Education and Adult College Enrollment," *National Tax Journal*, 65 (2012), 59–92.
Landais, Camille, "Assessing the Welfare Effects of Unemployment Benefits Using the Regression Kink Design," *American Economic Journal: Economic Policy*, 7 (2015), 243–278.

Lo Sasso, Anthony T., and Dorian G. Seamster, "How Federal and State Policies Affected Hospital Uncompensated Care Provision in the 1990s," *Medical Care Research and Review*, 64 (2007), 731–744.
Long, Bridget, "The Impact of Federal Tax Credits for Higher Education Expenses," in *College Choices: The Economics of Where to Go, When to Go, and How to Pay for It*, Caroline Hoxby, ed. (Chicago: The University of Chicago Press, 2004), 101–168.
Ludwig, Jens, and Douglas L. Miller, "Does Head Start Improve Children's Life Chances? Evidence from a Regression Discontinuity Design," *Quarterly Journal of Economics*, 122 (2007), 159–208.
Maestas, Nicole, Kathleen J. Mullen, and Alexander Strand. "Does Disability Insurance Receipt Discourage Work? Using Examiner Assignment to Estimate Causal Effects of SSDI Receipt," *American Economic Review*, 103 (2013), 1797–1829.
Manoli, Day, and Nicholas Turner, "Cash-on-hand and College Enrollment: Evidence from Population Tax Data and the Earned Income Tax Credit," *American Economic Journal: Economic Policy*, 10 (2018), 242–271.
Marx, Benjamin M., and Lesley J. Turner, "Borrowing Trouble? Human Capital Investment with Opt-In Costs and Implications for the Effectiveness of Grant Aid," *American Economic Journal: Applied Economics*, 10 (2018), 163–201.
Masse, Leonard N., "A Benefit Cost Analysis of the Carolina Abecedarian Preschool Program," 2003, https://www.minneapolisfed.org/~/media/files/publications/studies/earlychild/2003conf/barnettdoc.doc?la=en.
Masse, Leonard N., and W. Steven Barnett, "A Benefit Cost Analysis of the Abecedarian Early Childhood Intervention," National Institute for Early Education Research working paper, 2002.
Maxfield, Michelle, "The Effects of the Earned Income Tax Credit on Child Achievement and Long-Term Educational Attainment," Michigan State University Working Paper, 2013.
Mayshar, Joram, "On Measures of Excess Burden and Their Applications," *Journal of Public Economics*, 43 (1990), 263–289.
Meyer, Bruce D., and Wallace K. C. Mok, "Quasi-Experimental Evidence on the Effects of Unemployment Insurance from New York State," NBER Working Paper no. 12865, 2007.
Meyer, Bruce D., and Dan T. Rosenbaum, "Welfare, the Earned Income Tax Credit, and the Labor Supply of Single Mothers," *Quarterly Journal of Economics*, 116 (2001), 1063–1114.
Michelmore, Katherine, "The Effect of Income on Educational Attainment: Evidence from State Earned Income Tax Credit Expansions," 2013, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2356444.
Miller, Cynthia, Lawrence F. Katz, Gilda Azurdia, Adam Isen, and Caroline B. Schultz, "Expanding the Earned Income Tax Credit for Workers without Dependent Children: Interim Findings from the Paycheck Plus Demonstration in New York City," MDRC, 2017.
Miller, Cynthia, Virginia Knox, Lisa A. Gennetian, Martey Dodoo, Jo Anna Hunter, and Cindy Redcross, "Reforming Welfare and Rewarding Work: Final Report on the Minnesota Family Investment Program. Vol. 1: Effects on Adults and Volume 2: Effects on Children," Manpower Demonstration Research Corporation, 2000.
Miller, Sarah, and Laura R. Wherry, "The Long-Term Effects of Early Life Medicaid Coverage," *Journal of Human Resources*, 54 (2019), 785–824.
Mills, Gregory, Daniel Gubits, Larry Orr, David Long, Judie Feins, Bulbul Kaul, Michelle Wood, and Amy Jones et al., "Effects of Housing Vouchers on Welfare Families," U.S. Department of Housing and Urban Development, Office of Policy Development and Research, 2006.
Mirrlees, James A., "An Exploration into the Theory of Optimal Income Taxation," *Review of Economic Studies*, 38 (1971), 175–208.
———, "Optimal Tax Theory: A Synthesis," *Journal of Public Economics*, 6 (1976), 327–358.

Moffitt, Robert A., "Welfare Programs and Labor Supply," *Handbook of Public Economics*, 4 (2002), 2393–2430.
———, *Means-Tested Transfer Programs in the United States* (Chicago: University of Chicago Press, 2003).
Okun, Arthur M., *Equality and Efficiency* (Washington, DC: Brookings Institution Press, 1975).
Pavetti, LaDonna, "Who is Affected by Time Limits?" in *Welfare Reform: An Analysis of the Issues*, Isabel V. Sawhill, ed. (Washington, DC: The Urban Institute, 1995), 31–34.
Price, David J., and Jae Song, "The Long-Term Effects of Cash Assistance," Working Paper, 2018.
Rea, David, and Tony Burton, "New Evidence on the Heckman Curve," *Journal of Economic Surveys*, 34 (2020), 241–262.
Reynolds, Arthur J., Judy A. Temple, Dylan L. Robertson, and Emily A. Mann, "Age 21 Cost-Benefit Analysis of the Title I Chicago Child-Parent Centers," *Educational Evaluation and Policy Analysis*, 24 (2002), 267–303.
Reynolds, Arthur J., Judy A. Temple, Suh-Ruu Ou, Irma A. Arteaga, and Barry A.B. White, "School-Based Early Childhood Education and Age-28 Well-Being: Effects by Timing, Dosage, and Subgroups," *Science*, 333 (2011), 360–364.
Riccio, James A., "Jobs–Plus: A Promising Strategy for Increasing Employment and Self–Sufficiency among Public Housing Residents," Technical Report, presented before the Subcommittee on Federalism and the Census, House Committee on Government Reform, 2006.
Saez, Emmanuel, "Using Elasticities to Derive Optimal Income Tax Rates," *Review of Economic Studies*, 68 (2001), 205–229.
———, "The Effect of Marginal Tax Rates on Income: A Panel Study of 'Bracket Creep'," *Journal of Public Economics*, 87 (2003), 1231–1258.
Saez, Emmanuel, Joel Slemrod, and Seth H. Giertz, "The Elasticity of Taxable Income with Respect to Marginal Tax Rates: A Critical Review," *Journal of Economic Literature*, 50 (2012), 3–50.
Sanbonmatsu, Lisa, Lawrence F. Katz, Jens Ludwig, Lisa A. Gennetian, Greg J. Duncan, Ronald C. Kessler, Emma K. Adam, and Thomas McDade et al., "Moving to Opportunity for Fair Housing Demonstration Program: Final Impacts Evaluation," U.S. Department of Housing and Urban Development, 2011.
Schaberg, Kelsey, "Can Sector Strategies Promote Longer-Term Effects? Three-Year Impacts from the WorkAdvance Demonstration," Manpower Demonstration Research Corporation, 2017.
Schmieder, Johannes F., and Till Von Wachter, "The Effects of Unemployment Insurance Benefits: New Evidence and Interpretation," *Annual Review of Economics*, 106 (2016), 547–581.
Schochet, Peter Z., "National Job Corps Study: 20-Year Follow-Up Study Using Tax Data," Mathematica Policy Research Report, 2018.
Schochet, Peter Z., John Burghardt, and Sheena McConnell, "Does Job Corps Work? Impact Findings from the National Job Corps Study," *American Economic Review*, 98 (2008), 1864–1886.
Schochet, Peter Z., John A. Burghardt, and Sheena M. McConnell et al., "National Job Corps Study and Longer-Term Follow-Up Study: Impact and Benefit-Cost Findings Using Survey and Summary Earnings Records Data," U.S. Department of Labor, Employment and Training Administration, 2006.
Scholz, John Karl, "The Earned Income Tax Credit: Participation, Compliance, and Antipoverty Effectiveness," Institute for Research on Poverty Discussion Papers 1020-93, 1993.
Scrivener, Susan, Richard Hendra, Cindy Redcross, Dan Bloom, Charles Michalopoulos, and Johanna Walter, "WRP: Final Report on Vermont's Welfare Restructuring Project, Manpower Demonstration Research Corporation, 2002.
Seftor, Neil S., and Sarah E. Turner, "Back to School: Federal Student Aid Policy and Adult College Enrollment," *Journal of Human Resources*, (2002), 336–352.
Slemrod, Joel, and Shlomo Yitzhaki, "The Social Cost of Taxation and the Marginal Cost of Funds," *International Monetary Fund Staff Papers*, 43 (1996), 172–198.

———, "Integrating Expenditure and Tax Decisions: The Marginal Cost of Funds and the Marginal Benefit of Projects," *National Tax Journal*, 54 (2001), 189–202.
Solon, Gary, "Work Incentive Effects of Taxing Unemployment Benefits," *Econometrica*, 53 (1985), 295–306.
Stiglitz, Joseph E., and Parthaa Dasgupta, "Differential Taxation, Public Goods, and Economic Efficiency," *Review of Economic Studies*, 38 (1971), 151–174.
Tax Foundation, "U.S. Federal Individual Income Tax Rates History, 1862–2013," 2013, https://taxfoundation.org/us-federal-individual-income-tax-rates-history-1913-2013-nominal-and-inflation-adjusted-brackets/.
Tax Policy Center, "Earned Income Tax Credit Parameters, 1975–2016," 2016, https://www.taxpolicycenter.org/sites/default/files/legacy/taxfacts/content/pdf/historical_eitc_parameters.pdf.
Turner, Nicholas, "The Effect of Tax-Based Federal Student Aid on College Enrollment," *National Tax Journal*, 64 (2011), 839–861.
U.S. Census Bureau, "Current Population Reports: Consumer Income," 1996, https://www2.census.gov/prod2/popscan/p60-049.pdf.
U.S. Department of Education Office of Postsecondary Education, "2009–2010 Federal Pell Grant Program End-of-Year Report," 2010, https://www2.ed.gov/finaid/prof/resources/data/pell-2009-10/pell-eoy-09-10.pdf.
U.S. Department of Health & Human Services, "The Final Report of the Seattle-Denver Income Maintenance Experiment," 1983, https://aspe.hhs.gov/report/overview-final-report-seattle-denver-income-maintenance-experiment.
U.S. Social Security Administration, "SSI Annual Statistical Report, 2013," SSA Publication No. 13-11827, 2014.
———, "Annual Statistical Supplement to the Social Security Bulletin, 2017," Publication No. 13-11700, 2018.
Von Wachter, Till, Jae Song, and Joyce Manchester, "Trends in Employment and Earnings of Allowed and Rejected Applicants to the Social Security Disability Insurance Program," *American Economic Review*, 101 (2011), 3308–3329.
Weimer, David (ed.), *Cost-Benefit Analysis and Public Policy*, vol. 1 (New York: John Wiley & Sons, 2009).
Weimer, David L., and Aidan R. Vining (eds.), *Investing in the Disadvantaged* (Washington, DC: Georgetown University Press, 2009).
Werning, Ivan, "Optimal Fiscal Policy with Redistribution," *Quarterly Journal of Economics*, 122 (2007), 925–967.
Wherry, Laura R., and Bruce D. Meyer, "Saving Teens: Using a Policy Discontinuity to Estimate the Effects of Medicaid Eligibility," *Journal of Human Resources*, 51 (2016), 556–588.
Wherry, Laura R., Sarah Miller, Robert Kaestner, and Bruce D. Meyer, "Childhood Medicaid Coverage and Later-Life Health Care Utilization," *Review of Economics and Statistics*, 100 (2018), 287–302.
Whitmore, Diane, "What Are Food Stamps Worth?," Princeton University Industrial Relations Section Working Paper no. 468, 2002.
Wood, Michelle, Jennifer Turnham, and Gregory Mills, "Housing Affordability and Family Well-Being: Results from the Housing Voucher Evaluation," *Housing Policy Debate*, 19 (2008), 367–412.
WSIPP, "Benefit-Cost Technical Documentation," Washington State Institute for Public Policy Technical Report, 2019.
Zimmerman, Seth D., "The Returns to College Admission for Academically Marginal Students," *Journal of Labor Economics*, 32 (2014), 711–754.