**Director’s Perspective**

**Generating Better Evidence on Costs, Benefits of Policies***

Worldwide, there is growing public interest and demand for government use of more rigorous evidence on program performance and policy effectiveness to inform policymaking and program management. Evidence-based policymaking, in which policies and practices are based on hard, scientific evidence, has long been espoused in the medical field. Yet only more recently has evidence-based policymaking been embraced in social policy, with the potential for significant advances in its use still ahead.

“How should society assess the value of the vast array of interventions that are proposed or are operating in social policy arenas?” ask Aidan Vining and David Weimer in the first article in this Policy Report. It has long been acknowledged that it is challenging to achieve the equivalent of highly controlled, laboratory-like conditions for

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**The Application of Cost-Benefit Analysis to Social Policy**

By Aidan R. Vining and David L. Weimer

Social policy can be defined as the laws, rules, programs, and other interventions government employs to increase investments in human capital; to reduce disparities in wealth, income, or consumption; to encourage behaviors that benefit society as well as the individual; or to discourage behaviors that create costs that accrue beyond the individual. How should society assess the value of the vast array of interventions that are proposed or are operating in social policy arenas? Fiscal pressures at all levels of government, but especially at the state and local levels where most social programs are funded and implemented, make this question important and urgent. We believe that the answer is cost-benefit analysis.

Cost-benefit analysis (CBA) provides a framework for taking account of the full range of social benefits and costs. Indeed, CBA is the only normative framework that claims to assess these costs and benefits comprehensively in an explicit manner. Although cost-benefit analysis has traditionally been applied primarily to infrastructure investments, economic regulation, and environmental policy, it has now increasingly been applied to social policy. The application of CBA to potential social policies requires prediction of the effects of society’s investments of scarce resources and the valuation of these effects in a money metric, specifically present-value dollars.

The purpose of CBA is to identify the most efficient policy in terms of getting the most value from the resources available. It includes technical efficiency, which means producing things of value in ways that involve giving up the smallest amounts of other things of value. More generally, however, efficiency concerns the allocation of resources to generate the largest aggregate value, as assessed by summing individual valuations across all members of society. A policy is efficient if no other policy can be identified that offers a larger excess of benefits over costs. Any policy alternative that would create greater costs than benefits relative to the status quo is clearly inefficient. For example, a policy that would impose $4 million in costs but provide only $3 million in benefits would decrease, rather than increase, efficiency. Put another way, this

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inefficient policy would make society poorer in that people in aggregate would value what they give up more than they value what they would receive in return. On the other hand, a policy that offers $4 million in benefits and $3 million in costs would make society richer in the sense that people in aggregate would value what they gain more than they value what they have to give up.

CBA does not, however, take account of how these costs and benefits are distributed. Efficient policies may convey net benefits to people who are relatively well off and impose net costs on people who are relatively disadvantaged, and therefore not be socially desirable despite their efficiency. In the case of social policies, however, the people social programs target are typically disadvantaged. Even though the programs may provide substantial benefits to the rest of society, especially in terms of reduced criminal behavior and dependency, they often provide net benefits to the targeted participants. Social programs that offer positive net benefits often promote equity as well.

The principles of CBA, especially the comprehensive prediction and monetization of all relevant impacts, hold in its application to social policies. However, social policies often involve impacts that challenge the application of the basic principles, especially in terms of monetization. The relative uncertainty of these impacts, especially ones estimated from secondary sources in the quest for comprehensiveness, pose challenges in assessing the uncertainty in estimates of net benefits.

**Challenges in Applying CBA**

A comprehensive CBA should take account of all valued effects in predicting net benefits. Achieving comprehensiveness poses a special challenge in applying CBA to social policies because many of their effects are typically difficult to predict and value. Social policies often have effects that spill over from one policy domain to another, such as education and health investments that affect human capital and work effort. They also often have effects that are likely to persist over long periods of time but are difficult to predict. For example, investments in early childhood (e.g., subsidies for enriched day care) may affect labor market productivity (e.g., earnings) decades after the investment, requiring predictions of a chain of effects leading from cognitive development through school achievement to employment. Consider, for example, the analysis of interventions aimed at reducing child abuse and neglect. The Washington State Institute for Public Policy, the most prominent organization providing high-quality CBAs at the request of a state legislature, conducted such an analysis in 2008. The institute employed a meta-analysis of studies linking childhood abuse to adult crime. A second set of meta-analyses predicted the likely effect of a number of possible interventions. Chaining these impacts together provided predictions of the reduction in subsequent criminal behavior.

Many social policies reduce negative externalities like crime. To incorporate these benefits into CBA requires that they be monetized. However, the metrics, or “shadow prices,” for monetizing a number of these externalities are currently uncertain. The ubiquity of uncertain predictions of effects and uncertain shadow prices for valuation make the explicit recognition of uncertainty especially important in the application of CBA to social policy. Comprehensiveness requires the valuation of all effects, including those that might not achieve conventional levels of statistical significance in particular studies. The challenge is particularly significant when a single study provides a number of important estimates of effects and few of these effects have statistical significance under the rules of multiple comparisons. As the focus of CBA is the hypothesis that net benefits are positive, current statistical practices need to be re-examined. Analysts appropriately incorporate predictions based on statistically insignificant coefficients if they take account of their standard errors in the creation of predicted distributions of net benefits through Monte Carlo simulations. Indeed, because of the many uncertainties in the application of CBA to social policy, we argue that Monte Carlo simulation should be standard.

The application of comprehensive CBA generally also requires a large number of shadow prices to monetize the multiple impacts of social policies. Economists have estimated some of these shadow prices using different methods and data so that analysts can be fairly confident in their use. However, others have never, or only rarely, been estimated, or raise conceptual issues not yet fully resolved, so that an---

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**The application of cost-benefit analysis to potential social policies requires prediction of the effects of society’s investments of scarce resources and the valuation of these effects in a money metric.**

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analysts must be audacious and clever in completing their analyses.

**Some Important Shadow Prices**

Economists have plausibly estimated a number of shadow prices commonly needed in the application of CBA to social policy. The availability of these shadow price estimates should greatly expand the capability of analysts to employ CBA. Indeed, in their absence, the constraints of time and limited analytical resources, especially severe at the state and local levels, would largely preclude the use of CBA to assess social policies. It is important, however, that the estimates not just be available. These estimates need also to be conceptually correct and reliably estimated.

Consider, for example, the cost of crime. Many social policy interventions affect the incidence of crime. Indeed, crime reduction is one of the primary impacts for interventions in the areas of juvenile justice and prisoner reentry. Additionally, taking an appropriately long-term perspective, crime reduction may also be an important benefit category in early childhood development programs and substance abuse treatment. The incidence of crime may also be affected and (ideally) reduced to some small degree by interventions in almost all areas of social policy, such as mental health, and primary and secondary education. Thus, it is crucial to have accurate and current estimates of the cost of crime because avoided crime is an important source of benefits. The development of appropriate shadow prices for crimes that take account of their full social costs are thus extremely important for promoting good social policy CBA. The costs of crime can be divided into three types: tangible costs to victims, intangible costs to victims, and criminal justice system costs. There is a clear need for better shadow prices for both tangible and intangible victim costs and for better and state-specific estimates of criminal justice system costs, in other words improvement of all three parts.

Current estimates of the private monetized costs of the crimes typically include property damage and loss, the costs of medical care and mental health care, the cost of police and fire services, the cost of victim services, and productivity losses. Estimates of intangible costs are based on estimates of the average value of life revealed by people’s willingness to bear mortality risks.

Most estimates of the costs of pain, suffering, fear, and lost quality of life are currently based on jury awards. These do not necessarily reflect people’s willingness to pay to avoid such harms. However, some estimates have been based on contingent valuation studies that attempt to assess willingness to pay for crime reductions through surveys of the population. These surveys can elicit the total tangible and intangible costs of crime or focus on just the intangible costs, especially fear and lost quality of life.

The third crime cost category of importance is the marginal cost of criminal justice resources. Reductions in crime not only benefit those who would otherwise be victimized, but also society more broadly through the reduction of real resources devoted to the criminal justice system. Ideally, we wish to estimate these benefits in terms of avoided marginal costs. However, the estimation of marginal cost changes is complicated, especially for correctional resources. The most common approach estimates the time savings to various criminal justice system employees, typically police, public defenders, prosecutors, judges, court staff, and probation officers. This method then values these time savings at the employees’ hourly wages and benefits.

One problem with this approach is that criminal justice agencies are not necessarily equating marginal cost to marginal benefit in their application of labor and other resources. The expenditure of additional employee hours could produce marginal benefits in terms of crime reduction and justice that were either smaller or larger than the full wage rate. For example, adding the time of an additional police officer might very well reduce crime costs to victims by more than the wages and benefits of that officer. Further, an exclusive focus on employee costs may result in an underestimation of marginal cost because non-employees, victims, witnesses, jurors, and innocent defendants also bear time costs in the operation of the criminal justice system.

**A Shadow Price That Should Be Used**

A common practice in applied CBA is to not include the opportunity cost of government expenditures. However, most social policy interventions do, and would, require net public expenditures, at least in the short run: one way or another, whether now or in the future, taxation must fund these expenditures. The ratio of these additional costs of taxation to the amount of revenue collected is the marginal excess tax burden (METB) of the taxation. Each dollar of expenditure funded by tax revenue costs society $(1+METB)$ dollars in real resources. The implication of not using the METB is that the conventionally described net benefits of interventions involving an excess of government expenditures over revenues will be too large, while those for interventions involving an excess of government revenue over expenditures will be too small.

The preponderance of positive net benefits found in published CBAs does suggest that quite a few proposed social policy interventions would still show positive net benefits.
if the appropriate opportunity cost of public funds were included. Yet, from a comprehensiveness perspective, this does not excuse the exclusion of these costs. The pursuit of all apparently cost-beneficial interventions would require much larger budgets and the greater taxation required to fund them.

What is the source of the opportunity cost of public funds? There are two reasons why raising one dollar of revenue from taxes typically costs society more than one dollar of resources. First, a tax creates inefficiency, or deadweight loss, that results from taxpayers’ responses to the tax. For example, income taxes induce taxpayers to work less or take other actions to reduce their tax payments. These actions involve real social costs, whether in terms of forgone production or consumption. There are, of course, some well-defined exceptions to this rule, such as an excise tax on a good that produces a negative externality. Second, the collection of taxes requires the use of real resources that have an opportunity cost. We need both more reliable estimates of the METB as well as a commitment to use it in our CBAs.

**Concerns about equity legitimately motivate the adoption of many social policies.**

In contrast to many other policy areas where the equitable distribution of benefits and costs is not an important issue, concerns about equity legitimately motivate the adoption of many social policies. As we have emphasized, standard CBA itself is based solely on the value of efficiency. However, advances in survey techniques make it possible to elicit people’s stated preferences and thus gauge their willingness to pay for the equitable redistribution of costs and benefits. For example, it may be feasible to estimate how much the population would be willing to pay to move a child or family above the poverty line. Dale Whittington at the University of North Carolina at Chapel Hill is pursuing this line of inquiry at the request of the MacArthur Foundation. Equity effects valued in this way may be included in CBA through a broader definition of efficiency, such as the one used to apply CBA to environmental policies, that includes not only people’s willingness to pay for the consumption of private goods, but also their willingness to pay for other people’s consumption of public goods, including more equitable redistributions. While debate continues about the best methodology to determine willingness to pay, even a few studies would be valuable in assessing the feasibility of this approach.

**Those Shadow Prices that Require More Development**

Improving and expanding the application of CBA to social policy requires research to provide important shadow prices that so far have only been tentatively estimated or not estimated at all. Consider the shadow price of productivity gains. The current approach to valuing increases in human capital is based on changes in the present value of lifetime earnings. For example, researchers relate higher earnings to school attainment, typically high school graduation, or to school achievement, typically increases in standardized test scores. This approach measures the benefit to those who experience the gain in human capital. However, there may also be external benefits. For instance, higher productivity may reduce criminal activity by making participation in the labor market relatively more attractive. It may also have intergenerational effects by changing the fertility choices of parents and even those of their children. Using two approaches, Robert Haveman and Barbara Wolfe of the La Follette School of Public Affairs have toted up these various external effects. They conclude that the external effects from educational achievement may be as large as the productivity gains commonly measured.

Social policies quite often involve behaviors that do not necessarily conform to the principles of neoclassical economics that underpin welfare economics generally and CBA specifically. For example, a behavior of particular importance is addiction. Should consumption that satisfies addiction be treated the same way as the consumption of other goods? Should the consumer loss resulting from a tax on cigarettes be treated the same as the consumer loss from a tax on an automobile? Along with Randall Thomas of ICF International, we conducted a contingent valuation of cigarette smokers to estimate their willingness to pay for the elimination of their addiction. This in turn allowed us to estimate the demand schedule for cigarettes in the absence of addiction, which we see as the proper basis for assessing losses to smokers from interventions such as higher cigarette taxes. As research in behavioral economics broadens, it will be important to assess their implications for CBA.

**More, and Better, CBA**

We believe that CBA can contribute to better decisions about the use of scarce public resources, especially in the area of social policy. Most important, it demands a comprehensive approach to assessing policy impacts. Further, it demands an assessment of the social values of the impacts in terms of the common metric of dollars. However, the feasibility of its expanded use by analysts requires that policy researchers provide reliable estimates of important shadow prices. Providing these estimates may be one of the most important contributions researchers can make to effective social policy in the future.◆
Discussions of policy responses to curb U.S. greenhouse gas emissions have intensified during the last several years as concern has increased about the future damages associated with a less stable climate. Estimates of future warming and its effects are generally becoming more severe. The adverse societal impacts of possible rapid changes to the climate system have become a more prominent consideration in policy debates, even if the likelihood of changes occurring remains difficult to assess. Moreover, actual emissions worldwide surpass the most pessimistic predictions of 10 years ago. Despite the ensuing attention, establishing climate change mitigation policy that is effective and politically feasible remains fraught with difficulty. Scientific consensus exists on observed temperature increase, sea level rise, and human attribution, but estimates of the scale of future damages to natural systems and human economies vary dramatically. Abatement costs are also uncertain. As a result, society is struggling to agree on targets for emissions reductions. Compounding the challenge of identifying what we ought to be willing to pay for abatement is the question of how steeply to discount the future benefits of avoided climate change. If investments to reduce greenhouse gas emissions can be understood as buying insurance against uncertain global warming-related damages, then what premium our society should be paying is not clear.

In Wisconsin, hotter, drier, and longer summers with more frequent droughts and heat waves are projected, while winters will likely have more precipitation. More numerous severe storms will mean more flooding and other catastrophic damage. Farmers may benefit from longer growing seasons, but they will need to adjust to more punctuated rainfall, drier soil conditions, and pests typical of warmer temperatures. Greater evaporation will change the ecological quality and recreational possibilities of the state’s waterways. In addition, if warming exacerbates water security problems in other states or regions, then pressure could increase on the freshwater supplies in the Great Lakes.

By virtue of geography, Wisconsin may adapt more easily to further global warming than other parts of the United States. However, reduction of greenhouse gas emissions could place a relatively heavy burden on Wisconsin consumers because of the widespread use of coal-fired electric power. Providers of lower-carbon options such as natural gas and hydroelectric power are out of state, as are most potential sites for wind turbines, solar collectors, and the geologic sequestration of carbon dioxide. At present, state policy explicitly prohibits new nuclear generating stations. As a result, Wisconsin consumers are particularly vulnerable to higher energy prices as federal and regional authorities implement policies that put a price on greenhouse gas emissions.

The impacts of these policies on Wisconsin consumers may be quite substantial. As we see in debates about policy proposals like the American Clean Energy and Security Act (the Waxman-Markey bill) and its Senate companion, the Clean Energy, Jobs, and American Power Act, the details of implementation vary considerably across policies — and these particulars are crucial. Policy details will be significant cost drivers and their configuration will depend on how policymakers decide to move ahead in a highly uncertain environment. This article seeks to isolate the effects of individual implementation details in existing policy proposals. It discusses those policy mechanisms that are most likely to drive up costs, and it describes scenarios that could have major direct economic impacts on Wisconsin utility consumers.

**Key Policy Mechanisms**

We argue that five key policy mechanisms will particularly influence the new costs that Wisconsin consumers face from climate policy. Each mechanism is very likely to be part of climate change legislation, but there is considerable uncertainty in the specifics of how each policy mechanism will be written into law.

Most of these policy mechanisms are directly related to the implementation of a cap-and-trade system. Govern-
ments use cap-and-trade systems to limit emissions to a desired amount for a particular year by issuing allowances for the corresponding number of tons of carbon dioxide. The other greenhouse gases, when included under a cap, create an obligation for emitters that is proportional to the estimated global warming caused by each gas. At the end of each reporting period, all capped emissions must be accounted for by the submission of allowances or equivalent offsets. These systems also typically allow for the free exchange of allowances in a market. We use economic modeling of future secondary market prices for emission allowances as a proxy for the cost of climate policy for Wisconsin consumers in 2018. This price ties the microeconomic decisions of Wisconsin businesses and agencies affected by cap-and-trade policy to the broader economic impacts. Under cap and trade, the five strong drivers of the costs of climate change mitigation policy are:

- the stringency of an emissions cap,
- the availability of international offsets,
- the presence of cost containment,
- the banking of emission allowances, and
- the distribution of allowance value.

The successful pursuit of cost-effective energy efficiency is an important additional determinant of the short-term cost of emissions reductions.

**Cap Stringency**

An emissions cap is the defining regulatory mechanism in a cap-and-trade policy proposal. A cap creates certainty in emissions levels by forcing regulated entities to hold allowances corresponding to their emissions levels. Cap levels written into law reflect the discretion that policymakers have to decide when permitted emissions peak and how tightly a cap-and-trade policy constrains emitters in its initial years. Arguments for strict caps include calls to action by climate scientists, a desire to make reductions deep enough to spur action among other major emitting countries, and the perceived presence of low- or zero-cost emissions reductions. Among the reasons to opt for a lenient cap that delays deeper cuts in emissions are concerns about the smooth functioning of the cap-and-trade system in its early years. In addition, early emissions reductions may raise costs without preventing marginal damage from climate change if the same long-term targets for atmospheric concentrations of greenhouse gases are met. A very tight cap in the short run may lead to high allowance prices and noncompliance that threatens the political sustainability of cap-and-trade legislation.

Recent federal and regional proposals to cap greenhouse gas emissions have taken two broad approaches to cap stringency in the early years of a cap-and-trade system. A pair of prominent Senate bills required no reductions below 2005 levels in 2018 (though reductions would be achieved with respect to a business-as-usual emissions path). A second, larger group of proposals called for 10 percent to 18 percent in reductions below the 2005 baseline. The Waxman-Markey energy and climate bill that the U.S. House passed in May 2009 mandates a 14 percent decrease by 2018. U.S. emissions in 2005 were 16 percent higher than the 1990 level, which anchors policy commitments in international negotiations.

Emissions caps create scarcity and present emitters with two options for compliance: reduce emissions or acquire allowances and/or offsets. A cap that tracks expected emissions requires little or no action by emitters and results in negligible extra costs. All else equal, a tighter cap leads to higher costs. However, a cap’s effective stringency also depends on the difference between the world without a policy and the cap level.
written into legislation. Assumptions about future weather, population growth, economic activity, market conditions, and geopolitical developments combine to indicate a business-as-usual emissions path. As a result, the difficulty of meeting emissions targets is a function of both the cap’s stringency and these exogenous factors.

Figure 1 shows the projected emission allowance price as a function of cap stringency. The allowance price rises with a more stringent cap. The dispersion of allowance prices in the 10-to-18-percent range of emissions reductions by 2018 also suggests that the risk of a much higher allowance price increases with a more stringent cap. The possibility of very high prices increases uncertainty for industry and consumers.

International Offsets

No cap covers all emissions for a particular geographic area. Emissions reductions beyond a cap’s requirement are deemed offsets. The notion of an international offset refers to a certificate of emissions reduction outside the United States or, in some cases, to an emission allowance issued by another government’s greenhouse gas reduction regime. The underlying scientific rationale for allowing international offsets as part of U.S. climate change mitigation policy is that the geographic source of greenhouse gas emissions is irrelevant when considering the warming of the earth’s climate.

International offsets are an important policy mechanism for several reasons. First, emissions reductions in many low-income countries are less expensive than equivalent reductions in the United States. If an emissions mitigation strategy like cap and trade aims to initiate the least expensive emissions reductions first, then the inclusion of projects in poorer countries keeps costs down in the short run. However, the demand for international offsets will not necessarily be met inexpensively if a new international climate agreement adds many entities that seek offsets. Second, tropical deforestation accounts for approximately 15 percent to 20 percent of global annual greenhouse gas emissions. International offsets can channel payments toward forest preservation, while some proposals make special provision to avoid deforestation. Third, international offsets can further involve countries that may not--- as a result of the principle of common, but differentiated responsibilities --- be required to limit emissions by a new international climate change agreement. Finally, critics inevitably will question the legitimacy of some international offsets made suspect by inherently difficult measurement and monitoring issues.

Policy design typically constrains the use of international offsets as a cost containment tool by limiting the percentage of compliance that may be achieved with this method. The use of quantitative ceilings rather than percentage limits in the Waxman-Markey bill marks a new approach that permits a greater role for offsets over time. Economic modeling suggests that the prohibition of international offsets would dramatically raise the price of allowances in the secondary market. Figure 2 shows the expected decline in allowance price as emitters use international offsets to achieve a larger percentage of compliance with a cap.

Explicit Allowance Price Limits

The scarcity created by a cap generates costs that policy designers seek to rein in. Cost containment mechanisms are crucial for the political viability of climate change policy proposals. They signal that policymakers are looking out for low- and middle-income energy consumers and for carbon-intensive industries that face international competition. Cost containment provisions attempt to balance the integrity of a cap with the desire for a stable, constrained price signal. The most explicit mechanism is a price ceiling in the emission allowance
market called a safety valve. When a price floor is coupled with a price ceiling, this dual constraint is called a price collar. The presence of a safety valve prioritizes the concerns of energy consumers over the potential returns for investors in low-carbon technologies. Recently, concerns about the tradeoff between cost containment and incentives for technological change have led climate change policy designers to explore the use of price collars.

Explicit cost containment mechanisms put firm limits on the fluctuation of emission allowance prices rather than leaving program managers to respond to unexpected price spikes or persistently low prices. From a cost perspective, an explicit safety valve or a price collar with a tight emission allowance price range should lower program costs in comparison with a strict cap-and-trade program. A very high price ceiling (relative to the expected allowance price) might only guard against price spikes, whereas a price ceiling at or below the expected allowance price will be a dominant factor in the secondary market. Symmetrically, a price floor may be very low or may determine the market price if cap compliance is very easy. In practice, a price ceiling could trigger the sale of allowances and a price floor could lead to the purchase of allowances by the government. Price limits may or may not affect the integrity of the overall emissions cap. As a result, one advantage of a price collar is that the possibility for undershooting the cap is, in theory, just as likely as the risk of exceeding the emissions target.

The impact of a safety valve on allowance prices is straightforward. Given a price constraint, the scheduled escalation of the ceiling and/or floor and the rate of inflation are likely to control the allowance price and directly influence the cost of compliance for regulated entities seeking to purchase emission allowances. Though a firm price floor may appear in future legislative proposals, cost containment has mostly focused on the potential for high allowance prices. Environmental Protection Agency modeling of the 2007 Low Carbon Economy Act suggests that the highest expected allowance price is approximately two and a half times higher without a price ceiling. The act’s mandated cap level was the least stringent of all the proposals that we examined. With a more stringent cap, the disparity between the expected price with and without price limits could be even starker.

**Allowance Banking**

Allowance banking is often referred to as a cost-containment measure, though this report analyzes it separately. Unlike other policy instruments, there is near-consensus on the desirability of allowance banking. Almost every cap-and-trade proposal explicitly states that emission allowances do not decrease in value over time, though that does not mean that a policy could not be designed with allowances that depreciate or expire. In fact, the Wisconsin renewable portfolio standard rules stipulate that renewable energy credits — a tradable commodity analogous to emission allowances — do expire after four years. By providing flexibility in the use of emission allowances across time, banking aids the scheduling of emissions reductions. If emitters have an ongoing choice about whether to cut emissions or hold allowances, then the ability to utilize allowances held from a previous compliance period expands their options. In terms of cost, banked permits may allow regulated entities to avoid more expensive compliance scenarios by lowering the costs passed on to consumers.

Allowance banking can also smooth price volatility and provide an incentive to make emissions reductions in the present rather than put them off. It also has the benefit of generating and maintaining political support for an increasingly stringent program among the holders of banked permits. However, one possible problem is that market manipulation could take hold over time through the accumulation of emission allowances by colluding entities. It is perhaps with this eventuality in mind that all federal cap-and-trade proposals note that emission allowances do not constitute property rights.

Despite the advantages of banking, analyses by the Massachusetts Institute of Technology demonstrate the potential cost increases resulting from banking. Allowance prices in 2015 are projected to be three to four times higher with unlimited banking compared to those situations with no banking. By 2020, the unlimited banking scenarios indicate allowance prices that are 35 percent to 100 percent higher than scenarios without banking. By contrast, analysis suggests that allowance banking holds down allowance prices in the latter years of a cap-and-trade program when emissions reduction targets are more aggressive.

A corollary to this insight is that a longer modeling time-frame will include more of the higher costs of a radically carbon-constrained economy. If a planner believes that later-year targets are credible, then the economywide compliance decisions in those years become relevant to contemporary planning. If a regulated entity anticipates and trusts that the market value of emissions permits will appreciate, then there is an incentive to bank more permits and further reduce emissions in the early cap years. In particular, regulated utilities with an indefinite obligation to serve may view long-term compliance with greater concern than industrial facilities, refineries, or independent power producers. As a result, prices in the present would rise as the modeling referenced above predicts.
Relevant Methods Generate Varying Distributional Consequences

The concept of revenue recycling refers to the decisions that governments face when they prioritize the spending of the proceeds of auctioning emission allowances. Policymakers must decide whether to use auction revenues to reinforce greenhouse gas mitigation goals. Climate policy proposals envision that allowance auction revenue and fines will be distributed for three broad purposes:

- return money collected to vulnerable ratepayers, current taxpayers, or future taxpayers through deficit reduction,
- invest in low-carbon and energy efficiency technologies, and
- aid adaptation to climate change.

Looking to 2018, most of the cost impact of these government decisions will result from willingness to cushion the transition for vulnerable consumers and businesses.

Revenue-recycling choices disperse benefits differently across geography, demographics, and time. Revenues may be refunded directly to residents, ratepayers, or taxpayers. Different methods generate varying distributional consequences. For example, using auction revenue to lower corporate income taxes tends to favor high-income families that own a large proportion of company stocks, while equal lump-sum rebates favor lower-income households. Investment in research, development, demonstration, and deployment of new technologies applies current public revenues to the long-term challenge of achieving steep reductions in greenhouse gas emissions with manageable costs. Investments intended to bring down the cost of solar energy technologies or to demonstrate the viability of the capture and storage of carbon dioxide are examples of forward-looking allocations of revenue. Finally, adaptation aid seeks to help human and natural communities prepare for and deal with the changes to natural systems believed to be exacerbated by climate change. For instance, the 2008 Climate Security Act allocates proceeds from the sale of emission allowances to improving firefighting capabilities at the U.S. Bureau of Land Management and the Forest Service.

Revenue recycling is a subset of the broader notion of distributing “allowance value,” which takes account of the value embedded in the free allocation of emission allowances. From this perspective, whether emission allowances or auction revenues are the vehicle through which the government aids a particular group is irrelevant. However, the transfer of value is more complex when the allowances are distributed through free allocation. The federal proposals that have garnered the most support freely allocate most emission allowances in the early years of the program. The Waxman-Markey bill would distribute allowance value to electric and gas consumers via lump-sum rebates. This policy design attempts to preserve the incentive for energy conservation by letting the price per kilowatt hour rise, though it is questionable how coherent this price signal will be for consumers.

High-Impact Scenarios

Though all of these policies could have major impacts on the cost of climate policy, no one particular policy mechanism can drive consumer costs to intolerable levels if policymakers are determined to use other policy levers to compensate. For instance, a very stringent emissions cap can be alleviated by allowing greater use of offsets, aggressively seeking energy efficiency opportunities, and channeling a large portion of allowance value to consumers. Looking at a longer time horizon, a stringent cap may be more difficult to counteract in Wisconsin due to the twin technological challenges of deploying sufficient low- or zero-carbon baseload electric generation and dramatically reducing automobile tailpipe emissions. Other external drivers are:

- population and economic growth that drives business-as-usual emissions,
- the evolution of climate science and perceptions of climate change,
- the price of fuels such as oil and natural gas,
- the extent and nature of international action to reduce greenhouse gas emissions, and
- decisions of the Wisconsin Public Service Commission.

Scenarios that promise the highest costs typically link policy decisions with external drivers. Table 1 lists these drivers and the mechanisms affecting costs for each.

To recognize combinations of events that would have a relatively large effect on Wisconsin consumers, we constructed scenarios that involve key policy mechanisms and cost drivers external to policy formation that together could plausibly coexist and raise costs substantially for Wisconsin consumers. As envisioned, climate change mitigation policy will be in place for several decades. What seem to be unlikely events now may not remain so for the duration of the period in which the United States and other countries adapt to a carbon-constrained world.
an explicit cost containment mechanism with a tightening emissions cap. A shift of allowance value away from consumers could happen with the expansion of allowance auctions and the diversion of auction revenues to budget deficit reduction. Constrained access to offsets could be a consequence of high demand and/or a crisis in the legitimacy of certain types of offsets. The absence of explicit cost containment could be a byproduct of the lack of tolerance for any policy that does not absolutely ensure a firm cap on emissions. Weak progress toward energy efficiency targets could result from difficulty in coordinating the many actions and actors involved in eliminating waste from the use of billions of devices in millions of homes and businesses. In this scenario, costs for Wisconsin consumers (on electric bills) would hinge on the ability of electric utilities inside and outside Wisconsin to decarbonize their generation portfolio. External drivers could exacerbate an already challenging set of policy circumstances. High and sustained economic growth would raise business-as-usual emissions and increase the level of abatement required at given cap levels. Likewise, continued high demand for gasoline would put greater pressure on the electric sector to reduce emissions. The potential confluence of policy choices and plausible economic trends threatens to derail efforts to mitigate climate change at a palatable cost.

The Waxman-Markey bill has laid the groundwork for landmark climate change mitigation legislation. The bill seeks to balance a firm commitment to greenhouse gas emissions reductions with strong cost containment measures. The cap in the early years requires major reductions, but not as steep as critics would like. Its offsets provisions are generous, particularly for international credits. A strategic reserve of allowances allows for economywide borrowing of allowances from future cap years. Energy efficiency provisions are numerous, and some are quite aggressive. However, an external shock, such as a dramatic event that changes global perceptions of the pace and seriousness of global warming could strain even a well-designed policy. A climate shock would likely trigger tighter emissions caps in the United States and elsewhere. Quick changes in required abatement levels would increase demand for offsets, pressuring the market for reductions outside of capped sectors. A strategic reserve could be depleted if it relies in part on international offset credits to be re-stocked. In addition, updated notions of the need for long-term emissions reductions could lead to expectations of even tighter targets, putting a premium on allowance banking for future years and further raising allowance prices. As a society, we must recognize that a politically feasible climate change mitigation policy may underestimate the premium we should pay to insure ourselves against dangerous global warming.

As the U.S. Congress continues to negotiate energy and climate legislation, implementation details will continue to be subjects of vigorous debate. Policymakers would be remiss if they consider only the stringency of emissions reduction targets; conversely, debating the dozens of provisions risks paralyzing the legislative process. This analysis indicates that policymakers should focus on the five key policy mechanisms.

### Table 1: Influences on the Cost of Climate Policy

<table>
<thead>
<tr>
<th>Policy Drivers</th>
<th>Core Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cap Stringency</td>
<td>Without challenging caps, compliance is easy, allowance prices low, and cost containment irrelevant</td>
</tr>
<tr>
<td>International Offsets</td>
<td>Potential large pool of inexpensive abatement options exist outside capped sectors</td>
</tr>
<tr>
<td>Safety Valve or Price Collar</td>
<td>Constraints on volatility of allowance prices may allow excess emissions</td>
</tr>
<tr>
<td>Banking</td>
<td>Banking allows for pricing of future compliance risks</td>
</tr>
<tr>
<td>Disposition of Allowance Value</td>
<td>Policy design can protect vulnerable groups, including low-income consumers</td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td>Higher business-as-usual energy demand requires more costly abatement</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External Drivers</th>
<th>Core Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population and Economic Growth</td>
<td>Higher growth rates drive up baseline emissions, require more actual abatement</td>
</tr>
<tr>
<td>Climate Science</td>
<td>Science drives broad policy framework, including level and time path of caps; public perception is crucial</td>
</tr>
<tr>
<td>Fuel Prices</td>
<td>Oil and gas prices create or constrain options and influence conservation behavior</td>
</tr>
<tr>
<td>Low-, Zero-Carbon Baseload</td>
<td>Options are limited for replacing coal and eventually gas, the current notion of baseload may not survive</td>
</tr>
<tr>
<td>Transport Emissions</td>
<td>Major reductions could relieve pressure on electric sector</td>
</tr>
<tr>
<td>International Action</td>
<td>Other countries’ policies may affect sustainability of U.S. policy and availability of offsets</td>
</tr>
<tr>
<td>Public Service Commission Decisions</td>
<td>State regulatory body influences generation and mitigation decisions that directly affect Wisconsin consumers</td>
</tr>
</tbody>
</table>
Despite substantial research, the true nature of the relationship between income and health remains elusive. While a strong link between low income and poor health has been demonstrated, much less is known about the overall health effects of an increase in income, whether greater income prompts people to choose healthier behaviors or whether they achieve better health outcomes. Issues of reverse causality and the presence of unobserved factors related to income and health plague efforts to reliably document this relationship.

Relative to the general U.S. population, American Indians face a health and mortality disadvantage at each life stage, with acute disparities in infant mortality, life expectancy, and age-specific mortality resulting from higher rates of infectious and chronic diseases. American Indians tend to have lower education attainment and much higher poverty rates relative to all other U.S. subpopulations.

The legalization and institution of casino gaming in American Indian communities provides an opportunity to assess the income-health relationship and to analyze the effectiveness of legal casino gaming as an antipoverty, health-improving policy strategy. We estimate the income effects of legalized casino gaming and the effect of these income increases on the health status, health-care utilization, and health-related behaviors of American Indians, one of the nation’s most impoverished and vulnerable populations.

We conjecture that American Indians who are members of tribes with casinos have higher levels of income, improved access to care, and better health behaviors and outcomes than members of tribes without gaming. We compare differences in these outcomes between individuals in tribes with and without gaming facilities. In addition, for members of tribes that introduced gaming during the period under study (1988-2003), we compare differences in health-related outcomes from before to after the initiation of casino gaming.

Beginning in the early 1980s, American Indian tribes initiated gaming enterprises consisting largely of social gaming for minimal prizes and bingo. Following passage of the Indian Gaming Regulatory Act in 1988, the prevalence of lucrative casino-style gaming facilities increased rapidly. As of 2005, approximately 360 American Indian gaming establishments existed in the United States. Approximately 220 out of 562 federally recognized tribes operate these casinos.

The National Indian Gaming Commission, the federal regulatory agency charged with overseeing tribal gaming, estimates the revenue from all tribal gaming operations to have grown from $9.8 billion in 1999 to $25.08 billion in 2006. From 2001 to 2003, American Indian gaming operations reporting revenue of $100 million or more represented about 13 percent of the total number of American Indian gaming operations and accounted for approximately 65 percent of total gaming revenue. Most casinos are on reservations or tribal trust land subject to variations in state-negotiated compact regulations. There is broad regional variation in the duration of established gaming operations, with the Upper Midwest having the majority of casinos in existence for more than 10 years; recent casino growth is concentrated in Western states.

The revenues from gaming enterprises are associated with substantial increases in tribal budgets, spending on social services, and (for some tribes) direct income transfers to members. These impacts appear to be reflected in the income of tribal members; from 1990 to 2000, real median income on American Indian reservations with gaming increased by 35 percent compared to 14 percent on reservations without gaming (calculation excludes Navajo tribes).

The Income and Health Effects of Tribal Casino Gaming on American Indians

By Barbara Wolfe, Jessica Jakubowski, Robert Haveman, and Marissa Courey

_**Barbara Wolfe** and Robert Haveman are faculty members at the La Follette School of Public Affairs. **Jessica Jakubowski** is a Ph.D. candidate in sociology at the University of Wisconsin-Madison who works for the Northwestern Juvenile Project at Northwestern University. **Marissa Courey** is a Ph.D. student in the Department of Population Health Sciences at the University of Wisconsin-Madison funded by the Jack Kent Cooke Foundation. The authors acknowledge the support of the Robert Wood Johnson Foundation and thank Bill Evans and Julie Topoleski for sharing the casino data they had collected. The authors thank Arie Kapteyn, Michael Grossman, Paul Frijters, and attendees at seminars at Australian National University, the Australian Health Economics meetings, Queensland University of Technology. Special thanks to Hannah Goble who gathered and assembled the detailed county data used in the study. Research related to this paper was funded in part by a Guggenheim Foundation award given to professor Wolfe._
The National Indian Gaming Association reported in 2008 that American Indian gaming created 670,000 jobs, of which 75 percent are filled by non-American Indian employees. In 2000, total American Indian employment related to gaming (about 150,000 persons) was about 7 percent of the total American Indian labor force.

Prior research on the relationship between socio-economic status and health outcomes suggests that income increases associated with tribal gaming may lead to better health-related outcomes for American Indians. However, beyond anecdotal reports of potential health-promoting benefits of casino-related income increases (e.g., funding of health centers and new public health initiatives), few studies have rigorously tested this relationship. An exception is a 2003 study published in the *Journal of the American Medical Association* that examines effects on the prevalence of psychological problems of children.

**Data and Variables**

To support our estimation of the effects of casino gaming on American Indian income and health, we compiled data on individual American Indians and their characteristics, linking them to tribes, tribal gaming operations, and broader community health resources. Our data on income, health, and basic socio-demographic and socioeconomic characteristics are drawn from other studies, the U.S. Census Bureau, and the Behavioral Risk Factors Surveillance System (BRFSS). We assume tribal affiliation based on county of residence and include information on the availability and aggregate utilization of health resources and facilities, population, and economic data for each county. Among American Indians in our sample, about 15 percent lived in a county with a gaming tribe. Of those BRFSS respondents living in counties that eventually had a gaming tribe, 41 percent had casinos for two or more years.

Table 1 shows overall averages for the individual variables for all American Indians in our full sample. We break out those whose tribe did not have gaming facilities at the time that they were observed (Non-Gaming Sample). Table 1 also provides similar statistics for American Indians affiliated with a tribe with a gaming facility at some time during our period of observation (Gaming Sample), which is broken into two

### Table 1: Effect of Casinos on American Indian Household Income and Health Indicators

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Americans Indians (Full Sample)</th>
<th>Americans Indians with No Casino in Home County (Non-Gaming Sample)</th>
<th>American Indians with Casino (Gaming Sample 1988-2003)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Mean</td>
<td>Number</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household Income$^*$</td>
<td>21,342</td>
<td>$33,207</td>
<td>18,030</td>
</tr>
<tr>
<td><strong>Gaming Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associated with Gaming Sometime during 1988-2003</td>
<td>24,079</td>
<td>15%</td>
<td>20,378</td>
</tr>
<tr>
<td><strong>Health Risk Behaviors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>24,021</td>
<td>36%</td>
<td>20,327</td>
</tr>
<tr>
<td>Binge Drinking (days)</td>
<td>3,425</td>
<td>4.75</td>
<td>2,821</td>
</tr>
<tr>
<td><strong>Health Indicators</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight</td>
<td>23,309</td>
<td>36%</td>
<td>19,727</td>
</tr>
<tr>
<td>Poor/Fair Health</td>
<td>21,763</td>
<td>24%</td>
<td>18,240</td>
</tr>
<tr>
<td>Hypertension</td>
<td>20,357</td>
<td>21%</td>
<td>17,260</td>
</tr>
<tr>
<td>Diabetic</td>
<td>24,029</td>
<td>10%</td>
<td>20,338</td>
</tr>
<tr>
<td>High Cholesterol</td>
<td>10,843</td>
<td>30%</td>
<td>9,204</td>
</tr>
<tr>
<td>Asthma</td>
<td>13,494</td>
<td>11%</td>
<td>11,620</td>
</tr>
<tr>
<td>Disability</td>
<td>4,760</td>
<td>24%</td>
<td>3,900</td>
</tr>
<tr>
<td><strong>Health Care Utilization</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Plan</td>
<td>22,904</td>
<td>75%</td>
<td>19,296</td>
</tr>
<tr>
<td>Fornage Care</td>
<td>20,006</td>
<td>17%</td>
<td>16,855</td>
</tr>
<tr>
<td><strong>Mental Health</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor Mental Health (days)</td>
<td>19,163</td>
<td>4.72</td>
<td>16,026</td>
</tr>
<tr>
<td>Depression (days)</td>
<td>2,038</td>
<td>4.45</td>
<td>1,594</td>
</tr>
<tr>
<td>Anxiety (days)</td>
<td>3,275</td>
<td>6.73</td>
<td>2,533</td>
</tr>
</tbody>
</table>

Notes:  
* in 2000 dollars  
$^a$ Chi-squared test for mean differences by gaming, p<.05  
$^b$ T-test for mean differences by gaming, p<.05  
samples. The first is people observed before the casino existed in their county (Pre-Gaming Sample). The second is those observed after the casino existed for more than two years (Post-Gaming Sample). For context, Table 2 presents overall statistics on the demographic and county characteristics for American Indians and all county residents.

**Results of Statistical Analyses**

We study the effects of casino gambling on household income and on a variety of health indicators. As a baseline, we note that the mean household income for the full sample of 21,342 American Indians is $33,207, calculated in 2000 dollars from data for 1988-2003. Mean household income is $31,820 for the 8,973 American Indians living in counties with gaming during some years of the period studied, 1988-2003. About 36 percent of the full sample smoke, 63 percent are overweight, and 24 percent are in poor or fair health; on average, individuals reported that they drank five or more drinks in a day nearly five times per month. Seventy-five percent reported having some sort of health insurance, while 17 percent indicated that they had forgone medical care because of cost.

In our statistical analyses, the central variable of interest represents the presence of one or more gaming tribes in a respondent’s county of residence in a particular year. Individual control variables include respondent age, gender, education, marital status, and employment status. Our statistical analyses identify the effects of casino gaming activities on the income and health-related behaviors and outcomes of American Indians.

---

### Table 2: Demographics of American Indians and County Context

<table>
<thead>
<tr>
<th>Total Americans (Full Sample of 24,079)</th>
<th>American Indians with No Casino in Home County (Non-Gaming Sample of 20,378)</th>
<th>American Indians with Casinos (Gaming Sample 1988-2003)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>43b</td>
<td>43</td>
</tr>
<tr>
<td>Female</td>
<td>57%</td>
<td>57%</td>
</tr>
<tr>
<td>Education: Less Than High School</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Education: High School or GED</td>
<td>16%</td>
<td>16%</td>
</tr>
<tr>
<td>Education: Some College</td>
<td>61%</td>
<td>60%</td>
</tr>
<tr>
<td>Education: College Graduate</td>
<td>16%</td>
<td>15%</td>
</tr>
<tr>
<td>Marital Status: Married</td>
<td>46%</td>
<td>46%</td>
</tr>
<tr>
<td>Marital Status: Divorced</td>
<td>18%</td>
<td>18%</td>
</tr>
<tr>
<td>Marital Status: Widowed</td>
<td>6%</td>
<td>8%</td>
</tr>
<tr>
<td>Marital Status: Separated</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>Marital Status: Never Married</td>
<td>20%</td>
<td>19%</td>
</tr>
<tr>
<td>Marital Status: Cohabiting</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Employment Status: Working</td>
<td>60%</td>
<td>60%</td>
</tr>
<tr>
<td>Employment Status: Not Working,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economically Active</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>Employment Status: Not Working,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economically Inactive</td>
<td>28%b</td>
<td>28%</td>
</tr>
</tbody>
</table>

**Overall County-Level Contextual Variables (Only Counties with American Indian Residents)**

<table>
<thead>
<tr>
<th>Total County Population</th>
<th>Counties without Casinos</th>
<th>Counties with Casinos, 1988-2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age</td>
<td>Mean</td>
<td>Mean Age</td>
</tr>
<tr>
<td>Mean Female</td>
<td>Mean</td>
<td>Mean Female</td>
</tr>
<tr>
<td>Mean Education: Less Than High School</td>
<td>Mean</td>
<td>Mean Education: Less Than High School</td>
</tr>
<tr>
<td>Mean Education: High School or GED</td>
<td>Mean</td>
<td>Mean Education: High School or GED</td>
</tr>
<tr>
<td>Mean Education: Some College</td>
<td>Mean</td>
<td>Mean Education: Some College</td>
</tr>
<tr>
<td>Mean Education: College Graduate</td>
<td>Mean</td>
<td>Mean Education: College Graduate</td>
</tr>
<tr>
<td>Mean Marital Status: Married</td>
<td>Mean</td>
<td>Mean Marital Status: Married</td>
</tr>
<tr>
<td>Mean Marital Status: Divorced</td>
<td>Mean</td>
<td>Mean Marital Status: Divorced</td>
</tr>
<tr>
<td>Mean Marital Status: Widowed</td>
<td>Mean</td>
<td>Mean Marital Status: Widowed</td>
</tr>
<tr>
<td>Mean Marital Status: Separated</td>
<td>Mean</td>
<td>Mean Marital Status: Separated</td>
</tr>
<tr>
<td>Mean Marital Status: Never Married</td>
<td>Mean</td>
<td>Mean Marital Status: Never Married</td>
</tr>
<tr>
<td>Mean Marital Status: Cohabiting</td>
<td>Mean</td>
<td>Mean Marital Status: Cohabiting</td>
</tr>
<tr>
<td>Mean Employment Status: Working</td>
<td>Mean</td>
<td>Mean Employment Status: Working</td>
</tr>
<tr>
<td>Mean Employment Status: Not Working, Economically Active</td>
<td>Mean</td>
<td>Mean Employment Status: Not Working, Economically Active</td>
</tr>
<tr>
<td>Mean Employment Status: Not Working, Economically Inactive</td>
<td>Mean</td>
<td>Mean Employment Status: Not Working, Economically Inactive</td>
</tr>
</tbody>
</table>

**Note:**

*Chi-squared test for mean differences by gaming, p<.05*
*T-test for mean differences by gaming, p<.05*

All of our estimates associate higher household income with the presence of tribal gaming. In addition, higher income and the presence of tribal casino gambling correlate with better health, fewer risky health behaviors, and fewer barriers to health-care utilization.

Our analysis suggests that total mean income is $1,200 to $1,750 more in households in counties with casinos, a 4 to 5.3 percent increase. On average, American Indians who live in counties linked to a gaming tribe report higher income than American Indians living in counties not linked to gaming tribes by 2003. These findings support our conjecture that tribal casino gaming is associated with higher income for American Indians, taking account of comparisons with and without and before and after gaming.

We also examine the relationship between the presence of casinos and health in two ways. The first is the direct effect of casinos on health. The second is the indirect effect of casinos on health through the income-increasing effect of gaming. The sum of these measurements is the total effect of gaming on health. The health variables are organized in four groups: health behaviors, health indicators, health-care utilization, and mental health.

Our estimates indicate that tribal gaming reduces the prevalence of behaviors that are believed to be detrimental to health, specifically smoking and binge drinking. In both cases, the direct effect of gaming dominates the indirect income effect and hence accounts for most of the total effect reported.

With some exceptions, casino gaming also appears to improve the indicators of health status. Gaming correlates with lower levels of obesity, poor/fair self-reported general health, hypertension, diabetes, asthma, and disability. All of these associations are statistically significant. The exception is high cholesterol; cholesterol levels do not decline for American Indians who live in counties with casinos. Health status also improves as income increases, and many of the relationships are statistically significant. For example, American Indians associated with gaming tribes on average have an 8 percent lower probability of having a diabetes diagnosis and a 12 percent lower probability of reporting a disability than American Indians without such an association.

We also estimate the effect of gaming on two variables related to obtaining health care — having any form of health insurance and having a self-report of forgone care, not seeing a doctor when needed because of cost. The presence of gaming is positively and significantly associated with individuals having health insurance. The estimates also suggest a statistically significant decrease in the probability of forgoing health care when needed, about 2 percent. Both the direct effect of casinos and the indirect effect of income correlate to greater health-care coverage.

Our analysis of the effect on mental health outcomes reveals a mixed picture. American Indians who are in counties with gaming reported slightly more days of poor mental health in the previous 30 days but slightly fewer days of anxiety and depression (See Table 1). For all three indicators, our estimates suggest that the effect of income is a statistically significant reduction in poor mental health days. The direct influence of the presence of a casino on mental health days is to increase days of poor mental health and depression and to decrease days of reported anxiety. Other analyses support these findings and, in some cases, show stronger relationships between gaming and the health-related variables.

Conclusion

Our results identify the potential health and income implications of the stimulation of local economic development through gaming, an important and publicly contentious social policy and poverty-alleviation approach. Three caveats remain: First, we base our income measure on categorical data; second, we assign American Indians to tribes with gambling according to county of residence. These conventions suggest the possibility of measurement error, and could lead to an underestimate of the influence of gaming on both income and health/health-related behaviors. Last, our samples do not follow the same individuals over time.

Overall, our results suggest that a person’s association with a tribe with gaming leads to higher income, fewer risky health behaviors, better physical health, and increased access to health care. The only exceptions are the probability of reporting high cholesterol and increases in reported days of poor mental health and depression. Our estimation of these effects contributes to the ongoing debate regarding the impact of gaming on the overall well-being of the American Indians affected by the presence of casinos.

Our findings also provide evidence regarding the link between income and health. We find clear evidence of improvements in health and access to health in response to the increase in income. More income appears to lead to a decrease in smoking; a decrease in poor and fair health; a decrease in hypertension, obesity, asthma, and disability; and a decrease in the probability of forgoing needed health care.

To suggest the potential magnitude of the effect of the increase in income associated with gaming, consider the implications of the change in income related to gaming — $6,000 — found in another study. The results of this simulation suggest that the revenues from casino gambling are likely to have had a substantial influence on risk-taking behaviors (smoking), reducing the probability of smoking by more than 7 percent; on numerous indicators of health, including diabetes, disability, poor/fair general health, and hypertension that all change by more than 5 percent; and on improved health-care access (a reduction in forgone care of about 8 percent and an increase in insurance coverage of 3 percent). This simulation thus suggests that economic development can indeed significantly improve the health of a low-income population.
Numerous studies have found that expansions in the Earned Income Tax Credit (EITC) led to increases in employment for single mothers. Less is known about the possible effect of the EITC on longer-term earnings growth for those women — that is, do single mothers who are pulled into employment by the EITC improve their labor market outcomes through increased wages and earnings over time or do they remain stuck in low-paying jobs? On the one hand, we might expect increases in earnings over time. Evidence suggests that even among less-skilled groups, the payoff of working is large. On the other hand, we might not expect increases in earnings over time if the available employment opportunities are limited to “dead-end” jobs that have little potential for earnings growth.

This study examines the effect of EITC expansions that took place in early 1990s on the earnings growth of single mothers, a group likely to receive the credit. As with previous studies, disentangling the effects of the EITC from those of welfare reform and a changing work environment is a challenge.

We use a nationally representative sample to examine the one-, three-, and five-year earnings growth rates for single mothers with two or more children in years prior to and following the EITC expansions. We compare these growth rates with those for single mothers with one child over these same years. Is the growth in earnings for mothers with multiple children due to the policy expansion greater or smaller than those of mothers with one child? By 1997, one year after the EITC expansions, single mothers with two or more children increased their employment rates relative to single mothers with one child. Their one-, three-, and five-year growth rates in earnings also increased relative to single mothers with one child. We find no evidence that the EITC led single mothers to take “dead-end” jobs.

Background
Established in 1975, the EITC is a refundable tax credit that provides cash to lower income working parents and individuals through the federal income tax system. Between 1994 and 1997, the 1993 Omnibus Budget Reconciliation Act increased the credit for single mothers with two or more qualifying children relative to the credit for single mothers with only one child. Today, the program is a major component of federal efforts to reduce poverty. In 2007, EITC refunds (the amounts by which credits exceeded tax liabilities) were $38.3 billion. That year, food stamp outlays were $34.9 billion and Temporary Assistance for Needy Families outlays were $16.9 billion, according to the U.S. Office of Management and Budget. Neither food stamps nor the EITC have any direct effect on a family’s official poverty status, as defined by the Census Bureau, as neither are included in income.

The amount of credit the worker receives is based on the earnings and income of the tax paying unit, number of children, and marital status. In 2007, the maximum EITC was $428 for workers with no children, $2,853 for working families with one child, and $4,716 for working families with two or more children. The amount of the credit initially increases as earnings increase until the maximum credit is achieved. After earnings exceed a certain level, the amount of the credit remains constant and then decreases.

Prior to the EITC expansions of the early 1990s, the treatment of parents with one child was virtually identical to those with two or more children. In 1994 the EITC increased for both groups, but more so for those with two or more children. From 1994 to 1997, the EITC continued to increase for parents with two or more children and remained relatively unchanged (in real terms) for those with one child.
Figure 1 shows how the amount of the credit varies with earnings and the number of children and how the value of the credit differentially changed for those with more children between 1994 and 1997. For example, in 1994 the maximum credit available to single mothers with one child was $2,819 (in 2007 dollars) while that available to single mothers with two or more children was $3,497. By 1997, the maximum credit available to single mothers with one child increased to $2,847 (in 2007 dollars) while the maximum credit available to single mothers with two or more children increased by substantially more — $1,212 to $4,709. The differences in policy toward mothers with multiple and only one child enable us to test the long run earnings effect of the policy.

The Effects of the EITC on Employment

Prior research has found that the EITC, by increasing the returns to work, unambiguously encourages employment for low-income single parents, in particular single mothers with little education. Prior examinations found that the 1987 EITC expansion increased labor force participation, but not hours of work, between 1991 and 1996 among women with children relative to women without children. An examination of welfare recipients in California found that the EITC expansion of the early 1990s increased the employment of single mothers with two or more children relative to those with one child in the late 1990s.

Additional research examines whether individuals who gain employment in response to government programs tend to take “dead-end” jobs. One study finds that low-skilled workers who were placed into temporary jobs by state employment agencies had worse labor market outcomes than workers placed into other jobs. Other research finds that women placed in temporary work do as well as women placed in other jobs.

Data and Methods

We measure the annual earnings of single mothers by using administrative earnings records from the Social Security Administration linked to several panels of the Survey of Income and Program Participation (SIPP). We define earnings to include wage and salary earnings, tips, self-employment earnings, and other forms of compensation. We merged detailed demographic information from the 1993 and 1996
panels of the SIPP with longitudinal earnings records from the Social Security Administration’s Detailed Earnings Records. Our sample is widowed, divorced, or never married women ages 19 to 44 who are not disabled and not in school with at least one child. We drew a sample of single mothers from each year from 1993 to 1999. We then matched those women to their earnings records, obtaining earnings and demographic information from 1984 to 2005.

We use the change in the EITC from 1993 to 1996 — with its larger impact on mothers with multiple children than on single mothers with one child — as the basis for identifying the effect of the EITC expansions on labor market outcomes. One can think of our strategy as using single mothers with two or more children as the treatment group and single mothers with one child as the control group. In making this comparison, we control for a set of individual level variables — including marital status, race/ethnicity, education, presence of children under age 6, and age — the year in which demographics are measured, and a set of state indicator variables.

Results

Our results show that, in response to the 1993-1996 expansions in the EITC, earnings growth among single mothers with two or more children increased faster than earnings growth among single mothers with one child. The larger increases in growth among single mothers with two or more children following the expansions of the EITC occur whether we examine one-, three-, or five-year growth rates.

Our results suggest that between 1992 and 1993, prior to the EITC expansion, the earnings growth rates of single mothers with two or more children did not differ from those with one child (after controlling for demographic characteristics). From 1992-1993 to 1996-1997, the annual growth rate in earnings increased by 19 percentage points more for single mothers with two or more children than it did for single mothers with one child. This larger increase in the one-year earnings growth rate for single mothers with two or more children relative to those with one child is also evident in 1998 and in 2000.

Our results also suggest that the EITC expansions of 1994-1996 led to an increase in the employment rates of single mothers with two or more children relative to those with only one child. Had that increase in employment been the result of single mothers becoming employed in “dead-end” jobs, we might expect to see a relative decline in the year-over-year earnings growth of single mothers with two or more children compared to single mothers with exactly one child. Instead we see a relative increase in the earnings growth of this group.

The analysis of three-year and five-year growth rates in earnings among single mothers in 1993 finds no difference in the two years immediately after the EITC expansion between those with two or more children and those with one child. However, the change in earnings growth from the time before to two years after the policy expansion relative to earnings growth in both the subsequent 1-3 years and the subsequent 1-5 years was about 18 percentage points higher among single mothers with two or more children than among single mothers with exactly one child.

Thus, the EITC appears to have induced single mothers to take jobs with substantial earnings growth potential over at least a five-year period.

Conclusions

The EITC has repeatedly been found to increase the employment rates of single mothers. We find no evidence that the single mothers who went to work as a result of the EITC expansions that between 1994 and 1996 took “dead-end” jobs. If anything, these women exhibit larger increases in earnings growth than other similar women.

One puzzle is that most of the employment and earnings growth effects do not take place until 1997 and later. The expansions began in 1994 and continued until 1996. This lag may be due, in part, to the EITC expansion not being fully implemented for families with two or more children until 1996.

Our finding that EITC recipients who were induced to take jobs experience subsequent earnings growth should be useful information for any cost-benefit analysis of future expansions of the EITC. To the extent that the jobs taken by EITC recipients have low potential for earnings growth, the “bang for the buck” of the EITC is reduced. Moreover, in the absence of subsequent earnings growth, EITC recipients might continue to receive the credit for many years, driving up the costs of the program. If, through earnings growth, recipients quickly move onto the “phase-out” range of the credit or off the credit entirely, the cost of the EITC in terms of forgone tax revenues is diminished.

Our results suggest that once a single mother becomes employed, she will develop the skills needed to increase her earnings. The EITC encourages work among single mothers, and that work continues to pay off through increases in earnings. ◆
evaluating the impacts of social programs and policies and fully accounting for their costs. In addition, as the authors explain, the application of a comprehensive, normative framework such as cost-benefit analysis to social policies requires predicting the effects of society’s investment of scarce resources, often far into the future, and monetizing these effects in present-value dollars. And further complicating these analyses, they point out, effects of a given social policy frequently spill over into other policy domains, and their timing, duration, and magnitude may be difficult to forecast.

Vining and Weimer’s work on improving the application of cost-benefit analysis in the social policy arena has been pioneering, particularly in the development and use of “shadow prices” — the opportunity cost of an activity or program to a society, where in computing the cost, the actual price is not known or does not fully reflect the true cost — in valuing policy effects. The authors of each of the essays that follow reckon (at least implicitly) with this important issue in their research. JP Muller and Greg Nemet, for example, consider the impacts of policies that aim to put a price on greenhouse gas emissions for Wisconsin. They explain that the details of implementation will be “significant cost drivers and their configuration will depend on how policymakers decide to move ahead in a highly uncertain environment.” Indeed, the uncertainty associated with the prediction of effects and opportunity costs is what makes the use of a comprehensive framework such as cost-benefit analysis, along with rigorous statistical and simulation methods, so critical to accurate assessments of policy impacts.

In their study of the income and health effects of tribal casino gambling, Barbara Wolfe, Jessica Jakubowski, Robert Haveman, and Marissa Courey consider effects on income and both direct and indirect effects of casinos on the health of American Indians. Clearly, revenues from gaming enterprises augment tribal budgets that are spent on health care and social services and provide for direct income transfers in some tribes. Fully accounting for the impacts of casino gambling, however, also requires making assumptions about their effects on individual behaviors, such as smoking, binge drinking, and other aspects of household consumption. And some of these behavioral responses will positively influence tribal well-being, while others, such as risky behaviors, will counter those effects. Simulation and the estimation of probabilities are an essential part of any analysis that attempts to fully account for these potential effects.

The article by Molly Dahl, Thomas DeLeire, and Jonathan Schwabish that considers both short- and longer-term effects of the expansion of the Earned Income Tax Credit (EITC) on the employment and earnings growth of single mothers illustrates the challenges of establishing causality in the evaluation of social policies. The EITC clearly has a direct effect on income of these families who are working, but did it affect these mothers’ decisions to enter employment in ways that affect their longer-term labor market outcomes? Did some jump into “dead-end” jobs to get the credit, to the detriment of their earnings growth potential? The authors take advantage of a provision in the 1994 EITC expansion that offered a larger credit to mothers with two or more children. This difference allows the authors to compare mothers with only one child to those with two or more children (before and after the policy change) to assess the implications of more generous benefits. They find that the EITC expansion appears to increase earnings growth among single mothers, alleviating a concern that inducing mothers to more quickly enter the job market might lead to lower quality jobs and depressed earnings over time.

The importance of a longer-term perspective for social policy evaluation is also evident in each of the articles in this Policy Report. Currently, however, public sector performance management systems rely primarily on short-term measures to regularly monitor and assess program outcomes, without reference to a counterfactual (that is, an estimate of what would have been the outcome in the absence of the program) and without a comprehensive framework such as cost-benefit analysis that provides for a fuller accounting and valuation of potential effects across multiple policy domains. In fact, one of the more disconcerting discoveries of recent efforts to promote evidence-based policymaking may be a greater awareness of how tentative, limited, and sometimes erroneous the bases of our information and evidence are. Then again, at a policy school like La Follette, this finding just provides more impetus for us to continue our research!
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