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An Introduction to the Bartik Benefit-Cost Model of Business Incentives

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ABSTRACT

This short report provides an introduction to a new model of the benefits and costs of business incentives to promote state economic development. This model provides potential users—anyone interested in evaluating an incentive project or incentive program in their state—with a model that can be used for practical evaluation purposes, such as deciding whether or not a project should be undertaken, whether or not to expand or terminate a current incentive program, or how an incentive program could be improved by reforms to have higher net benefits. What is most distinctive about the model is that it focuses on how incentives potentially affect the real after-tax incomes per capita of state residents. Effects on per capita incomes are calculated for different income types and different income groups. Positive effects, such as increasing earnings per capita, are included, as well as potential negative effects, because growth may increase local costs, and because paying for incentives may have negative economic effects. This introduction is backed up by a lengthier report (Bartik 2023), which gives further model details.

JEL Codes: R15, R23, H71

Key Words: Business incentives; benefit-cost analysis; local labor markets

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INTRODUCTION

This short report provides an introduction to a new model of the benefits and costs of state and local economic development incentives. More details are in a lengthier report (Bartik 2023).

The model is designed to calculate the benefits and costs for a specific incented project. An example of an incented project is state job creation credits provided to a new battery plant, or local property tax abatements provided for an expansion of a corporate headquarters. Benefits and costs are defined as effects on the per capita real incomes of a state's residents.

This short report

- outlines the logic of this benefit-cost model;
- explains how the model works and how to enter data into the model;
- presents some illustrative output;
- shows how model benefits vary in different local labor markets and with different policy choices.

This new model is designed to evaluate incentive benefits with more realism compared to current commonly used models of incentive benefits. Yes, incentives can create jobs and thereby boost earnings, boost property values, and provide state and local governments with more revenue. But incentives also have negative effects: jobs may go to in-migrants rather than state residents; higher housing prices boost overall prices and local costs, which hurts residents on fixed incomes and drives away some businesses; growth brings needs for more public spending as well as new revenue. In evaluating incentives, we should consider both the positive effects and the negative effects.

This shorter report introduces the model to potential users, who include anyone in state government, or concerned with state government, who wants to evaluate either a specific incented project or an overall incentive program. Such users include state audit bureaus, economic development agencies, legislative committees, journalists, and interest groups.

RETHINKING INCENTIVE BENEFITS

This new model of incentive benefits differs from models often used by state economic development agencies. These state models exaggerate benefits and omit important feedback effects.

In many state models, incentives are assumed to be 100 percent effective: any jobs created by a firm given an incentive would not have been created in the state "but for" the incentive. Multiplier effects of these jobs—effects on jobs in local suppliers and retailers—are measured by input-output models, which trace how incented firms and their workers spend money on goods and services produced by other local firms. Input-output models ignore "price effects," such as what happens if job growth leads to higher local wages, property prices, or other local costs.

In these state models, economic benefits are often measured as the increase in total state personal income or output. Population change is ignored, even though the population increase reduces effects on per capita incomes. Fiscal benefits are often measured by estimating how increased state personal income or output increases state government revenues. Growth-induced needs for more public spending are ignored. If state revenue increases exceed the incentive costs, the incentives are assumed to pay for themselves.

Perhaps because incentives are assumed to pay for themselves, state models often ignore any economic effects of paying for the incentives. State tax increases or spending cuts to pay for incentives are ignored.

The new model uses more realistic assumptions. The "but for" of incentives is less than 100 percent. The new model's "but for" is based on how large incentives are relative to the incented firm's overall costs.[1] Because typical incentives are modest, as a percent of overall business costs, the "but for" is often less than 25 percent (Bartik 2018).

For each incented project, the new model calculates induced jobs as the incented jobs times the calculated "but for" percentage. Someone might argue that either the incentives induced the location or expansion decision or they did not. But we do not know whether the decision was induced unless we can read the minds of the firm's decisionmakers. However, based on the research literature on how business taxes and incentives affect business location and expansion decisions, we can assign a probability that the incentive was decisive. This probability is used to calculate the *expected* number of jobs induced by the incentive. The new model's benefit-cost analysis is then evaluating the incentive policy's *expected* benefits. On average, this expectation will be correct. As we consider more projects, our estimates of the number of induced jobs will increasingly come closer to the true number of induced jobs.

Multiplier effects of jobs, due to how the incented firm and its workers spend, are still part of the new model. But the new model also calculates how local growth will increase local costs. These higher local costs will reduce job growth in other firms. The negative effects of higher local costs often offset most of the extra multiplier effects.

[1] As explained in the full report, users can also impose a "but for". This option is useful in allowing users to determine the minimum "but for" needed for an incented project or program to have net benefits.

In the new model, the outcomes of interest are the real incomes per capita of a state's residents. More state income, if it is accompanied by population growth of the same percentage, should not count as a benefit, because it does not really benefit state residents. Therefore, the model traces effects of job growth on increasing a state's employment to population ratios (employment rates) and wages, which increase earnings per capita. The effects of jobs on employment rates—the ratio of jobs to population—also implies effects on state population. Increased population in turn increases housing prices and property values, which yields capital gains for state residents who own property. Higher housing prices also increase overall prices, which reduces real incomes for state residents on fixed incomes. Because state population often increases quite a bit (see below for why), the resulting increase in employment rates and earnings per capita are far less than the overall increase in jobs and earnings.

The new model's fiscal benefits include both increases in state and local tax revenue and the effects of a larger population with increasing needs for greater public spending. For example, as population goes up, public schools will need to add more teachers in order to keep class size ratios and school quality constant. As a result, an incentive program's "fiscal benefits"—increased tax revenue minus increased public spending needs—are often only a small percentage (less than 10 percent) of the revenue increase. Fiscal benefits rarely come close to covering incentives' direct budget costs.

Because incentives do not pay for themselves, the new model traces the economic effects of a state paying for these incentive costs via higher taxes or lower public spending. Both higher taxes and lower public spending have demand-side effects of reducing jobs in a state—increased taxes take income away from households and reduce consumer demand, and public spending cuts directly reduce jobs in both the public sector and its private contractors. Higher business taxes also have “supply side” effects in reducing jobs in other businesses. In addition, the model allows “supply side” effects of K–12 spending cuts. K–12 spending is productive because higher per-student K–12 spending increases lifetime earnings of former students. These productivity effects, based on rigorous research, are quite large: a 10 percent increase in K–12 spending, maintained for all 13 K–12 years, will increase future earnings by 7.7 percent (Jackson, Johnson, and Persico 2016). Furthermore, based on research, higher educational skills development by some local workers has spillover benefits on the productivity of the overall local economy, sufficient to almost double the direct effect on former students.[2] Therefore, if incentives lead to K–12 budget cuts, this will significantly reduce earnings of former students and other local workers. The model’s default is that incentives are paid for half through higher taxes and half through lower public spending. The default percent financed by K–12 cuts is equal to the percent of all state and local public spending that goes to K–12, which typically is around 20 percent. But policy choices can alter these defaults. The proportion of incentive costs that are financed by education cuts makes a major difference to an incentive policy’s net benefits.

Table 1 compares the two different models for evaluating incentive benefits: the common model currently used by many states and this new model.

Table 1 Two Models of Incentive Benefits

	Common evaluation model	This model
Incented jobs	100% “but for”	“But for” < 100%
Multiplier jobs	Based on input-output model	Allows for negative feedback from higher local costs
Economic outcomes	Total state personal income or output	Per capita income of state residents; allows for population response
Fiscal outcomes	Increase in state or state/local revenue	Includes revenue, but adds in spending needs due to increased population
Effects of paying for incentives	Ignored or assumed away	Incentives lead to higher taxes or lower spending, which have effects

[2] See calculations in Bartik, Hershbein, and Lachowska (2016), based on Moretti (2004). Spillover benefits occur through various mechanisms. For example, my employer may be better able to introduce new technology if a higher proportion of my co-workers have more skills, so my employer’s productivity per worker, and therefore my wage, may depend not just on my skills but also on the skills of my co-workers.

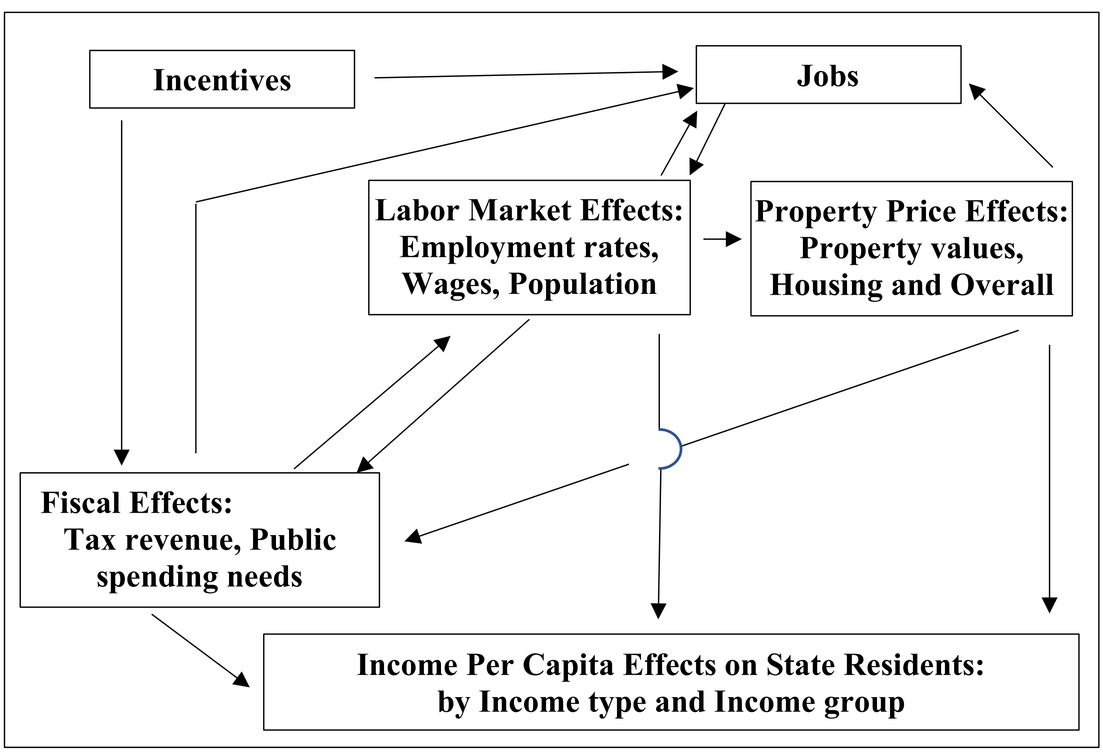
As this new model reflects, a key feature of local labor markets is that local job growth has large effects on local population. In an average area, in the "long run"—after 10 years—an increase in state jobs by some percentage will lead to a percentage boost in population that is over 80 percent as great. In other words, for every 100 jobs created in a state economy due to an incentive policy, over 80 of these jobs will ultimately be reflected in population in-migration, and fewer than 20 of these jobs will lead to a net increase in employment for state residents (Bartik 2020).

This empirically verified finding is counterintuitive. Based on our intuition, someone might reason as follows: "Surely the average incented firm fills more than 20 percent of its job openings with local residents." But what this intuition overlooks is that local job openings can only be filled by three types of hires: state residents who are employed, state residents who are not employed, and in-migrants. If the hire comes from already-employed state residents, this creates a job vacancy, which is filled in the same three ways. Ultimately, this job vacancy chain is only terminated where every new job either leads to a job for an otherwise nonemployed state resident or for an in-migrant. The initial effect on the hiring of state residents versus in-migrants is not the ultimate effect.

Along this job vacancy chain, whether jobs are filled by in-migrants or the local nonemployed depends in part on the local labor market's current employment rate. If the local employment rate is lower—the local labor market is distressed—more local nonemployed tend to be hired, as more of them are available to be hired. In distressed local labor markets in a state, 100 new jobs may lead to 40 nonemployed state residents being hired. In booming local labor markets, 100 new jobs may lead to 10 jobs for nonemployed state residents. As a result, job creation's benefits, in higher employment rates and higher earnings per capita, are far greater in a distressed local labor market, and therefore the benefits of incentives are potentially greater in a distressed local labor market.

Another way to describe the model's logic is to follow the flow of effects, as shown in the attached figure. As the figure shows, incentives induce some portion of the incented jobs, and this in turn has multiplier effects, which together increase overall local jobs. These jobs have labor market effects, including higher employment rates, real wages, and population. This increased population pushes up property prices. The higher costs, due to both higher wages and higher property prices, feed back and cause some negative effects on local jobs. The incentives, together with the labor market and property market effects, in turn have fiscal effects on state and local government. State and local governments must raise taxes or cut public spending. These higher taxes and reduced spending reduce jobs, which in turn will feed back into effects on the labor market and property market. The cuts in education spending also directly reduce wages and hence earnings.

Figure 1 How Incentives Affect State Residents' Incomes



Finally, the labor market effects, property market effects, and fiscal effects, all affect state residents' real after-tax per capita incomes. The model distinguishes between effects by income type (e.g., effects on labor earnings versus capital gains on property values). And the model then goes on to divide up these income type effects by different income groups (e.g., low-income state residents versus middle-income state residents versus upper-income residents).

OPERATIONALIZING THE MODEL

The most transparent version of the model is implemented as an Excel workbook.[3] The model also is implemented in a Python version. The Python version makes it easier to automate running hundreds of incentive simulations. The Excel workbook makes it easier for users to see the intermediate calculations, which aids in understanding the model's workings.

As the Excel workbook shows, the user at a minimum enters in data on the number of incented jobs and the incentives. The user also enters in other data about the project, including the state and starting year. In addition, although the model has various defaults, the user can also alter various economic assumptions. These inputs on the incented project, and on the assumed workings of the local economy, are then used to trace out effects on jobs, employment rates, population, real wage rates, property values, state and local revenues, spending needs, and many other variables. Inputs on one worksheet link to other worksheets, where further calculations are made, and then output to other worksheets. The inputs on state and starting year are used to bring in state- and year-specific information on many baseline variables, which affect the model results. Eventually, output is translated into effects on real after-tax incomes of various types for state residents, and how this is divided up by income groups.

[3] To run, the model requires that the Excel version support the XLOOKUP formula. This requires an Excel version more recent than Excel 2019.

More specifically, the user must at a minimum add in data for the dollar incentives provided, for years 1 through 80 of the project. For most projects, the term of the incentives would not last longer than 20 years. The user must also add in the number of incented jobs, not only during the term of the incentive agreement, but up to year 80 after the initial year in which incentives were provided and jobs were created. These incented jobs could be new jobs at a new facility. Alternatively, these incented jobs could be the number of added jobs for incentives provided for a facility expansion

The analysis can be performed on a current and future project, which tells us net benefits if the project is completed as planned. The analysis can also be performed on a past project. In that case, the user would enter data on incentives actually provided and jobs actually created up to today. Then the user would enter in projections that go up to 80 years after the project started.

How does the user determine how incented jobs evolve for up to 80 years? On the one hand, some new facilities or facility expansions will be further expanded in the future. On the other hand, some new facilities or expansions will eventually contract or close down. If a facility closes down, its building might be filled by some other business, reducing the net job loss. A "neutral" assumption is that the incented jobs continue at the same level after the incentive term. This assumption is neutral in that it is in between optimistic cases where further expansions occur and pessimistic cases of future downsizings. If users want, they can also consider more pessimistic or optimistic future scenarios.[4]

In addition to entering in incented jobs and incentive dollars over 80 years, the user must enter in some state or starting year. Other variables that must be entered include industry of project and assumed input-output multiplier for project. The assumed input-output multiplier can

[4] The issue of how, on average, incented jobs evolve is a needed topic for future research.

be derived from information from IMPAN or the RIMS model of the U.S. Bureau of Economic Analysis. Alternatively, research suggests that a plausible state/local input-output multiplier would be close to two (Bartik and Sotherland 2019).[5,6] In addition, the full report mentions other project inputs that can be altered, and how to do so.[7]

For this short report, I assume that the user opts for a model where just one set of data on jobs and incentives is used to get the model going. The user would need to indicate this on the "Incentive inputs" worksheet.[8] As detailed in the full report, more complicated scenarios would allow the "but for" calculations to be based also on the wage rate of incented jobs or would allow the user to choose between using either "planned" or "actual" jobs and incentive data for calculating the "but for." For this short report, I assume that for a current or future project, the project will proceed as planned. For a past project, we will use its actual data up to the present, and then do some projections going forward.

Finally, in the full report, I explain how users can alter the economic assumptions about the project. These include assumptions about using local data on baseline economic characteristics rather than state average data to drive the model, how the incentive is financed, and the various "response elasticities" in the model. For this shorter report, I initially assume that

[5] The full report details exactly where this information is entered in, for these and other possible input variables. But more specifically, I recommend that users enter in data on the "Template for incentive inputs" worksheet. State would be at cell B120; Starting year at Cell B121; Actual jobs for each of 80 years at cells C129:C208; Nominal incentives for each of 80 years at cells D129:D208; a zero-one variable with only one industry or industry group getting a one at cells B124:CM124; the multiplier at cell B125. The "Template" worksheet contains defaults for other inputs, which for this report are not discussed but are discussed in the full report. Then the user would copy and paste cells A120:CM208 as a link into the analogous cell range of the "Incentive inputs" worksheet.

[6] Bartik and Sotherland's (2019) results suggest an average input-output multiplier of perhaps 2.4 at the state level and 1.8 at the local level.

[7] These include whether the project pays a wage premium, whether the incented firm is locally owned, the incentive effectiveness to cost ratio, and the percentage of incented firms that are export base. For the purposes of this short report, we assume what is typically the case, and what the default is on the "Template" worksheet: zero wage premia; the firm is not locally owned; the incentive effectiveness to cost ratio is one; and 100 percent of incented firms are export-base.

[8] Specifically, cell B6 on that sheet would be set to use scenario one.

the user is making the following assumptions: the incented project is located in a local labor market whose economic baseline variables are at the state average; the incentive is financed half by tax increases and half by spending cuts, with the K–12 spending cut depending on the share of state/local K–12 spending in total state/local public spending; the user adheres to all the model's baseline elasticities of how different variables respond to each other.

Once the user has entered in incentive inputs information in the "Incentive inputs" worksheet, the "outputs" of the model will appear on the "Economic inputs and outputs" worksheet. A wide variety of output is produced.[9]

For this short report, two types of outputs will be emphasized.[10] The first type of output provide estimates of effects of incentives on changes in the present value of real after-tax income for different income groups of state residents. These income groups are five different income quintiles, where households are ordered by household income, adjusted for household size, and then divided into five groups with equal population in each group. If income was completely equally distributed, each income quintile would have 20 percent of total income, but in the real world, the lowest income quintile has about 5 percent of total income, and the top income quintile has about 50 percent of total income. The present value of income calculations use as inputs the income change of different income types for each of the income quintiles for each of the 80 years, and then use a discount rate to sum up the "present value," as of year one, over all 80 years, for each income type and quintile.

The second type of output incudes a calculation of year-by-year totals of different per capita income gains or losses. These year-by-year totals are reported both in tables and in

[9] The full set of outputs is on cells A58:AN345 on the "Economic inputs and outputs" worksheet.
[10] The full report describes other outputs.

figures. These time paths give some sense of how a short-term or long-term perspective makes a difference depending on what income types for what groups are of most interest.

To illustrate, the next section considers a hypothetical scenario.

A HYPOTHETICAL PROJECT

To illustrate the potential power of the model, this report next considers a hypothetical incented project, financed by a hypothetical incentive program.

The incented project is assumed to start up in Michigan in 2024. We assume that the project provides 10,000 jobs. Incentives are assumed to be $5,000 per job per year, provided with a 1-year lag, for 15 years. (This does not correspond to any current Michigan incentive program, but similar incentive subsidy levels have been provided in the past in Michigan and are currently provided in other states.) Accordingly, the incentive data shown in Table 2 would be entered into the model.[11]

Table 2 Hypothetical Project and Its Incentives

Calendar year	Simulation year	Full-time equivalent jobs	Nominal incentives ($)
2024	1	10,000	—
2025	2	10,000	50,000,000
2026	3	10,000	50,000,000
2027	4	10,000	50,000,000
2028	5	10,000	50,000,000
2029	6	10,000	50,000,000
2030	7	10,000	50,000,000
2031	8	10,000	50,000,000
2032	9	10,000	50,000,000
2033	10	10,000	50,000,000
2034	11	10,000	50,000,000
2035	12	10,000	50,000,000
2036	13	10,000	50,000,000
2037	14	10,000	50,000,000
2038	15	10,000	50,000,000
2039	16	10,000	50,000,000
2040 and following	Years 17–80	10,000	—

SOURCE: Author's calculations.

[11] At cells A128 through D208 of the "Incentive inputs" worksheet, which would be done by pasting and linking in from the "Template for incentive inputs" worksheet.

I also assume an input-output multiplier of 2.0 for this project. Furthermore, to make this example more general, rather than assuming a specific industry, I treat this project as if it is in an "average" export-base industry.[12,13]

Among the outputs of the model is a table that shows effects on the present value of per capita real income of different types, both overall and for different income quintiles (Table 3).

Table 3 Present Value of Per Capita Income Benefits of Hypothetical Project

		Quintile				
Income distribution	Total	1	2	3	4	5
Quintile income share (%)	100.00	5.08	9.24	13.72	20.00	51.96
Total net benefits ($)	200.0	(2.9)	30.9	89.4	(10.8)	93.3
Net local budget costs ($)	(307.4)	(32.7)	(38.3)	(47.7)	(60.2)	(128.5)
Labor market benefits ($)	737.8	86.3	126.2	191.8	98.8	234.6
Property value benefits ($)	165.4	5.3	8.2	11.0	19.9	121.1
Education cutbacks ($)	(227.9)	(54.0)	(50.4)	(43.9)	(40.4)	(39.2)
Local business effects ($)	(29.2)	(0.6)	(0.7)	(1.0)	(1.9)	(25.0)
Real value of non-labor income ($)	(138.7)	(7.2)	(14.2)	(20.8)	(26.9)	(69.6)
Pure incentive costs ($)	(511.1)	(54.3)	(63.6)	(79.4)	(100.1)	(213.6)
Benefit-cost ratio	1.391	0.947	1.485	2.127	0.893	1.437

NOTE: All figures in millions of dollars except for quintile share and benefit-cost ratio. Negative numbers are in parentheses. Quintiles sum to totals, and different income type effects, from "Net local budget costs" to "Real value of non-labor income," sum to "Total net benefits." "Pure incentive costs" are a component of "Net local budget costs."
SOURCE: Author's calculations.

Focusing first on the bottom-line totals, the project overall boosts the present value of state residents' per capita incomes by $200.0 million (first column of numbers, "Total net benefits"). This boost is clearly far less than one would get simply by adding up the incented firm's payroll. For example, if the jobs averaged pay of $50,000 annually, an extra 10,000 jobs would boost overall earnings by $500 million annually—and that's not even counting the multiplier effects. But in this model, only a portion of incented jobs are actually induced, and the

[12] Export-base is jargon for industries whose output is sold in a way that any resulting reduced sales of competing businesses are in out-of-state businesses. This would be so if the industry sold to an out-of-state customer, or to an in-state customer, but the in-state customer would have alternatively made this purchase from an out-of-state business. If instead the output reduces sales of competing in-state businesses, for example, sales to local households that substitute for sales of other local businesses, then this reduces the net job effects of any positive effects on the incented firm. The model can adjust for that, as explained in the full report.

[13] The model allows an assumption of "average export-base" by an indicator of 1 in cell C124 of the "Incentive inputs" worksheet.

induced jobs increase per capita earnings only to the extent to which they boost employment rates and real wage rates per hour.

This boost to overall per capita incomes corresponds to a benefit-cost ratio of 1.391. The incentive costs of $50 million per year for 15 years have a present value of $511.1 million, which is lower than simply summing because future incentive costs are discounted. Benefit-cost ratios by convention are ratios of a program's gross benefits before netting out incentive costs, divided by incentive costs, with incentive costs treated as a positive number. Therefore, the ratio 1.391 is equal to (net benefit of $200.0 million plus incentive costs of $511.1 million) divided by incentive costs of $511.1 million. So, benefits are 39.1 percent in excess of costs.

Turning to types of income, we first see that there are some fiscal benefits. Net budget costs of $307.4 million are a little over $200 million less than pure incentive costs, which mostly reflects that state and local revenue increases by more than the required public services to support an expanded population.[14]

The largest benefits of the program are for local labor markets, due to higher employment rates and real wages. These total $737.8 million. Capital gains from higher property values also produce gains for state residents but are less at $165.4 million. Furthermore, these higher property values are also reflected in higher housing rents and higher overall local prices, which reduces the real value of non-labor incomes (e.g., Social Security checks, interest, and dividends income) by $138.7 million.

[14] As explained in the full report, another fiscal offset is that some incentive costs are shifted via business taxes to out-of-state business owners. In the present example, net budget costs are reduced by $46 million due to shifting to out-of-state business owners, and the fiscal benefit due to state/local revenue exceeding spending needs is $158 million. The total fiscal offset is then $204 million, which is the difference between incentive costs and net budget costs.

Education cutbacks have considerable costs, at $227.9 million. This is so even though only half of the project's incentive costs are financed by public spending cuts (the other half by increased taxes), with only 20 percent of those spending cuts due to K–12 spending cuts.

Finally, a minor factor is that the increased costs of the program reduce profits of some businesses owned by local residents. The model assumes that higher local costs are passed on to local consumers for goods and services sold locally, so higher local costs do not matter to the profits of locally owned businesses that serve a local market. But some locally owned businesses sell out of state, and these businesses are not able to pass on their higher costs to customers, as these customers are part of a national market with nationally set prices.

Overall, the model suggests that although local labor market effects are the major benefits of many incented projects, effects on state and local budgets, property values, and educational services also have considerable importance.

Turning now to effects by income quintile, note that although the incented project has net benefits overall, this is not true for all income groups. The project causes net losses for the lowest income quintile (minus $2.9 million) and for the second-highest income quintile (minus $10.8 million). Equivalently, the benefit-cost ratio is less than one for both these groups (0.947 and 0.893). The group that makes out the best is the middle income quintile—it gains $89.4 million in net benefits, which is around 45 percent of overall net benefits of $200.0 million, even though its baseline income share is only 13.72 percent. The second from lowest income quintile also clearly gains disproportionate benefits of $30.9 million—over 15 percent of overall net benefits compared to its baseline income share of 9.24 percent. The highest income quintile also gains considerably, at $93.3 million, but this gain of around 47 percent of overall net benefits of $200.0 million is slightly less than its baseline income share of 51.96 percent. Overall, this project redistributes away from the lowest income quintile and the second-highest income quintile, with the largest beneficiary being the middle income quintile.

As to why these income distribution effects occur, this pattern is largely due to the relative size of the effects on different income types, and how these different income types are distributed by income quintile. Net local budget costs tend to be distributed regressively, with lower income quintiles paying more than their baseline share of income. For example, the lowest income quintile pays over 10 percent of net budget costs ($32.7 million out of $307.4 million), even though its baseline income share is 5.08 percent. Labor market benefits are distributed progressively, with the bottom three quintiles getting a greater share of labor market benefits than their baseline income shares—it is these bottom three income groups that include most of the nonemployed who benefit from higher employment rates. Property value benefits are distributed highly regressively, with most of the benefits going to the top income quintile. Education cutbacks are distributed highly regressively. Children in all income groups get similar earnings benefits from school, and lower income quintiles tend to have more children per household. Local business effects are also mainly in the upper income quintile, but they are a minor factor for this project. Finally, the effects of higher local prices on the real values of non-labor incomes are distributed similarly to baseline income shares, as lower income quintiles tend to get more Social Security income, but upper income quintiles get more income from dividends and interest from out-of-state sources.

Looking at this overall pattern, the lowest income quintile loses because although it has considerable labor market benefits, this lower income quintile also bears a disproportionate share of both direct budget costs and the indirect costs due to earnings losses from the resulting education cutbacks. The costs of paying for incentives must be considered, not just their benefits.

The second-highest income quintile loses because it does not gain as much from labor market benefits, but, unlike the highest income quintile, does not sufficiently offset this with capital gains from higher property values. The middle income quintile gains the most because it does benefit a lot from higher employment rates, and although it loses a lot from budget costs and education cutbacks, these costs are not as disproportionate to its initial income share as it is for the lowest income quintile.

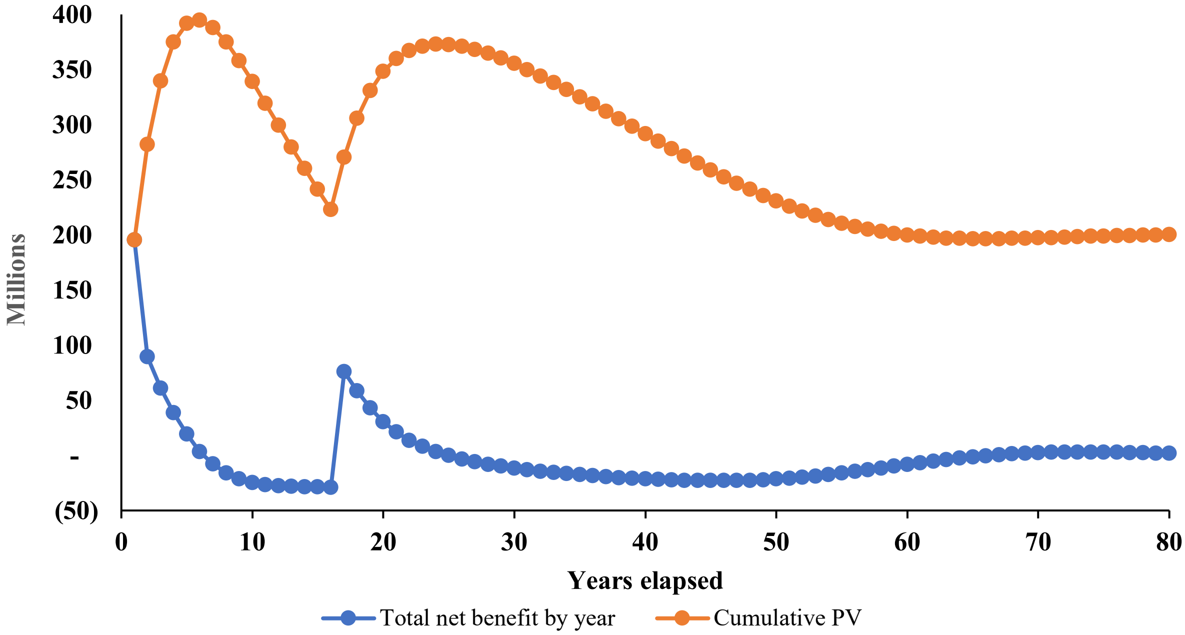
Questions sometimes asked about this model are: Why calculate incentive benefits and costs over 80 years? Doesn't this excessively strain credibility when we don't know what the world will be like in 80 years? Why not consider a shorter time period?

It is true that it is hard to predict exactly what the world and the economy will be like in 40, 50, or 60 years. But in making decisions today, we need to include some estimates of the expected *change* in the economy due to these decisions 40, 50, or 60 years from now *if* it is plausible that our decision is likely to have large effects 40, 50, or 60 years from now. Our estimated effects of these changes due to the project may be imprecise, but some estimate of the expected value in the far future is better than ignoring such effects, which implicitly treats these future expected values as zero.

In the present model, the main reason for going so far into the future is that education cutbacks do indeed have effects that are substantial 40 or more years into the future. Labor market benefits also go into the future, but most of these effects occur within a 10-year window after the incentive period

Figure 2 shows the net benefits of this hypothetical project by the year of the project.

Figure 2 Hypothetical 15-Year Incentive Program, Net Benefits and Cumulative Present Value of Net Benefits by Year



SOURCE: Author's calculations.

As this figure shows, net benefits start out high and then become negative before shooting up again at year 17. Then net benefits go down again and turn negative in year 27. Net benefits continue to be negative until year 67, before becoming very slightly positive for the last 13 years of the 80-year time period.

As a result, if one was evaluating the cumulative present value of net benefits, terminating the analysis at any period before year 60 might be misleading, because only at that time does the cumulative present value of net benefits settle down to a long-run level.

What is going on here? The incentives are credited with creating some proportion of the 10,000 incented jobs. The model assigns a "but for" probability and asserts that only some percentage of the incented jobs are actually induced jobs. These induced jobs create some immediate benefits, principally in the labor market but also in the property market. But then the incentives must be paid for over time. The capital gains on property values are a one-time gain, and the labor market benefits also decline over time, but more slowly. The incentive payments are a direct cost to state residents, and they also have some negative demand-side effects on state jobs. This eventually turns benefits negative, as the incentive payments continue through year 16.

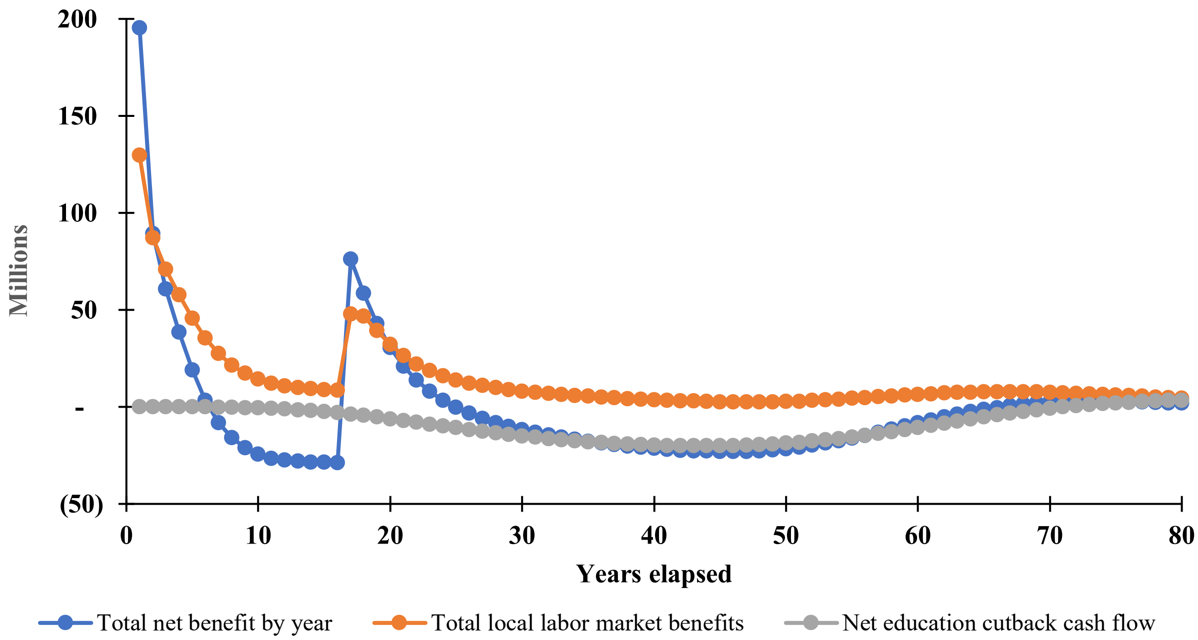
As soon as incentive payments are terminated, this immediately shoots net benefits up in year 17—due to fewer direct costs for state residents, and also due to positive effects of lower budget costs on demand for goods and services in the state and hence on jobs. The resulting property market benefits quickly dissipate, and the labor market benefits dissipate more slowly. But then the negative effects of the education cutbacks begin to be felt. These education cutback effects are particularly large 40 or 50 years later, when the children who were in K–12 school during the incentive payment years are close to their peak earnings years. But as this cohort of students ages, these education cutback effects also are reduced and die out by the end of the 80 years.

This story is confirmed in Figure 3, which looks at net benefits by year and two components of net benefits: local labor market benefits and education cutback effects.

As can be seen in Figure 3, labor market benefits decline over time after the initial shock to jobs, and the shock to jobs that occurs once the negative demand-side effect of paying for incentives is eliminated at year 17. These labor market benefits dissipate about 10 years later. The negative education cutback effects begin somewhat at year 20 but continue to go up until a little after year 40, before gradually declining to zero as the most affected cohort of students ages, retires, and dies.

The lesson: if incentives affect any public service, such as education, with long-run productivity effects, focusing on incentive effects after 15, 20, or even 30 years misses much of these negative effects. Yes, there is uncertainty about *exactly* how cutbacks in education spending will affect earnings 40 or 50 years from now. But treating this effect as zero biases us toward pursuing projects that may not be in the best long-term interests of state residents.

Figure 3 Net Benefits by Year Driven by Labor Market Benefits and Education Effects



SOURCE: Author's calculations.

MODEL RESULTS VARY DUE TO MANY DESIGN FEATURES, INCLUDING PROJECT LOCATION AND INCENTIVE FINANCING

The model can reflect many aspects of project design. The full report describes many possible model tweaks. In this short report, I highlight two possible tweaks. First, the model can be adjusted to reflect the likely effects of where the project is located within a state. Second, the model can be adjusted to reflect the effects of differences in how incentives are financed.

Location

An incented project's benefits will mainly vary with location due to a location's labor market distress. If a local labor market has a higher proportion of nonemployed persons, then more jobs will tend to go to the local nonemployed. This will directly increase benefits by increasing positive effects on earnings per capita. In addition, because population will go up less, there will be less pressure on public spending needs and more fiscal benefits due to revenue exceeding spending needs. These greater fiscal needs in turn reduce the magnitude of cutbacks in K–12 education spending and the resulting losses in future earnings.

To illustrate this, suppose we consider the exact same project that was described in the prior section but with one change: the baseline employment rate is assumed to be 5 percentage points lower for all 80 years of the model's simulations.[15] As shown in Bartik (2022), state economies often have employment rate differences of this size or greater across different urban and rural labor markets. Table 4 shows the results.

Table 4 Benefits If Project Is in Location with 5 Percentage Point Lower Employment Rate

		Quintile				
Income distribution	Total	1	2	3	4	5
Quintile income share (%)	100.00	5.08	9.24	13.72	20.00	51.96
Total net benefits ($)	599.4	46.6	98.7	187.2	46.8	220.2
Net local budget costs ($)	(266.2)	(28.3)	(33.1)	(41.3)	(52.1)	(111.3)
Labor market benefits ($)	1,066.9	124.8	182.5	277.4	142.9	339.2
Property value benefits ($)	161.6	5.2	8.0	10.8	19.4	118.3
Education cutbacks ($)	(200.4)	(47.5)	(44.3)	(38.6)	(35.5)	(34.5)
Local business effects ($)	(28.4)	(0.6)	(0.6)	(1.0)	(1.8)	(24.3)
Real value of non-labor income ($)	(134.1)	(7.0)	(13.7)	(20.1)	(26.0)	(67.3)
Pure incentive costs ($)	(511.1)	(54.3)	(63.6)	(79.4)	(100.1)	(213.6)
Benefit-cost ratio	2.173	1.859	2.552	3.358	1.467	2.031

SOURCE: Author's calculations.

As Table 4 shows, compared to Table 3 net benefits nearly triple, from $200 million in Table 3 to $599 million in Table 4. The benefit-cost ratio increases by over 50 percent, from 1.391 to 2.173.

[15] As explained in the full report, the employment rate that is used to drive effects of job shocks on local economies is the prime-age employment rate—that is, the ratio of employment to population for those aged 25–54. Using this rate in the model helps control for employment rate differentials across locations that mainly are due to the area economy's age mix, not local demand conditions.

Of this net benefit increase of $399 million, most is due to higher labor market benefits: $1,067 million in Table 4 compared to $738 million in Table 3. More residents get jobs. But net budget costs also decline, from $307 million in Table 3 to $266 million in Table 4. As a result, the costs of education cutbacks also decline, from $228 million in Table 3 to $200 million in Table 4. For a project in a more distressed local labor market, incentives not only have greater benefits in getting residents into jobs, they also impose less budget-related costs on residents in both the short run and long run. These lower budget costs are due to the greater effects on employment rates and hence incomes, which boosts tax revenues relative to public spending needs.

Net benefits and benefit-cost ratios go up not only overall but for all income quintiles. All income quintiles now benefit from the project, whereas before the lowest income quintile and the second-highest income quintile had net losses from the project. The lowest income quintile actually gains more than its share of net project benefits. The lowest income quintile's net benefit of $47 million is 7.8 percent of total benefits of $599 million. Because this 7.8 percent exceeds this quintile's baseline income share of 5.1 percent, the lowest income quintile tends to gain a higher share of income as a result of the project.

The greater gains for the lower income quintile are due to how this project tweak affects different income types. Greater labor market benefits tend to disproportionately benefit the lowest income quintile. Reducing local budget costs and education cutbacks also disproportionately benefits the lowest income quintile.

Project Financing

A project's benefits will vary mainly with how it is financed due to how it affects cutbacks in education spending. The more the cutbacks, the lower a project's net benefits and the less the project benefits lower income quintiles.

To illustrate this, we return to considering a project with the baseline employment rate assumed in Table 3. We then make a simple change: we change the project's financing so that rather than 50 percent coming from higher taxes and 50 percent from lower public spending, the project is 100 percent financed by lower public spending. Furthermore, we note that with Michigan's baseline K–12 spending, about 20.0 percent of this lower public spending comes from lower K–12 spending. Therefore, this change has the effect of doubling the negative effect on K–12 spending, from 10 percent of incentive costs to 20 percent.

Table 5 shows the results. These results should be compared with the baseline table, Table 3.

Table 5 Benefits If Project Is Totally Financed by Public Spending Cuts

		Quintile				
Income distribution	Total	1	2	3	4	5
Quintile income share (%)	100.00	5.08	9.24	13.72	20.00	51.96
Total net benefits ($)	(214.9)	(97.7)	(58.4)	7.0	(79.2)	13.5
Net local budget costs ($)	(404.4)	(57.5)	(59.7)	(66.4)	(74.8)	(146.0)
Labor market benefits ($)	691.8	80.9	118.4	179.9	92.7	220.0
Property value benefits ($)	155.9	5.0	7.7	10.4	18.7	114.1
Education cutbacks ($)	(501.5)	(118.8)	(111.0)	(96.5)	(88.9)	(86.3)
Local business effects ($)	(27.3)	(0.6)	(0.6)	(1.0)	(1.8)	(23.4)
Real value of non-labor income ($)	(129.4)	(6.7)	(13.2)	(19.4)	(25.1)	(64.9)
Pure incentive costs ($)	(511.1)	(72.7)	(75.4)	(83.9)	(94.5)	(184.5)
Benefit-cost ratio	0.580	(0.344)	0.225	1.083	0.162	1.073

SOURCE: Author's calculations.

With this change in financing, total net benefits become negative, at $214.9 million. This compares with the positive $200.0 million in the baseline financing of half taxes and half public spending. Increasing the financing by public spending cuts from 50 percent to 100 percent reduces net benefits by $415 million. The benefit-cost ratio goes from 1.391 to 0.580.

Of this $415 million reduction, most is directly due to losses in earnings due to education cutbacks. These education cutbacks now reduce earnings by $501.5 million, compared to the loss in Table 4 of $227.9 million, so the loss goes up by $274 million, which is almost two-thirds of the total decline in benefits of $415 million. But there also are indirect effects of the education cutbacks. The education cutbacks result in some loss of fiscal benefits, because with lower earnings there are lower tax revenues. Net budget costs thus increase to $404.4 million, from $307.4 million in Table 3.[16] These lower fiscal benefits and the lower earnings also result in some demand-side effects on jobs, due to reduced state resident purchasing power. As a result, labor market benefits are lower. Labor market benefits are now $691.8 million, down from $737.8 million in Table 3.[17]

Although there are net overall income losses, the middle income quintile and the highest-income quintile still gain on net. The middle income quintile's labor market benefits are still enough to outweigh their losses, direct and indirect, from education cutbacks. The upper income quintile's gains from higher property values also still outweigh these other losses. But the project is now much worse for the other quintiles, and in particular the lowest income quintile. The lowest income quintile's labor market benefits are now far outweighed by the losses from education cutbacks.

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[16] As explained more in the full report, this shift in financing also reduces the amount of financing costs shifted to out-of-state business owners. Of the increase in budget costs of $97 million ($404.4 million minus $307.4 million), $51 million is due to reduced fiscal benefits, and $46 million is due to a loss of exporting to out-of-state business owners.

[17] Another factor, explained more in the full report, is that shifting financing away from taxes toward spending has somewhat greater negative demand-side effects on the economy. Public spending is more localized than private spending.

CONCLUSION

This new model is meant to be a practical tool for evaluation purposes. With this model, evaluations of incentive projects or programs, both proposed or historical, can be performed by state audit agencies, state economic development agencies, state legislative committees, and outside interest groups and journalists. The model enables these evaluators to answer a key question: What are the benefits and costs of this incentive project or program for state residents?

The model undercuts exaggerated claims for incentive benefits—claims that overlook some key limitations and trade-offs that are inherent in incentive policies. Not all incentives tip location decisions. Job creation increases local costs, which reduces multiplier effects. Not all jobs go to state residents. Due to increased population, incentive policies increase public spending needs as well as tax revenues. Incentives are not a free lunch; they must be paid for, which has economic effects. It is only in an imaginary world that incentives are all decisive, that multiplier effects are at their maximum, that all increases in state income result in per capita income increases, and that incentives pay for themselves. In such an imaginary world, virtually any incented project would have benefits much greater than costs. By undercutting this imaginary thinking, this new model may help prevent some unwise incented projects from being adopted, and lead some unwise incentive programs to be cutback or terminated.

But more importantly, the model may lead to reforms of incentive design and project selection that may increase benefits for state residents. The current report outlines two such design improvements that help state residents: targeting more incentive projects at a state's more distressed local labor markets, and minimizing adverse effects of incentive financing on productive public services such as education. The full report suggests other possible reforms, including reducing local cost effects by allowing easier building of new housing, and combining economic development policies with workforce policies that can target more of the new jobs at nonemployed state residents.

Perhaps of greatest importance is that this new model helps concentrate the attention of policymakers and "policy influencers" on the key issue: as a result of incentive policies, how do state residents' per capita incomes change, and how are these benefits from higher per capita incomes distributed across different individuals and groups? The term "economic benefits" is not a magical buzzword that automatically attaches to higher state personal incomes or gross state product; instead, economic benefits only mean something if they are reflected in increases in the real economic well-being of individuals. That should be the focus: do individual state residents benefit in the sense that their per capita income goes up? And who among state residents reaps those per capita income benefit increases, and who loses? Once we focus on this key issue—benefits or costs for individual state residents—we are prepared to make better decisions. Better policy requires keeping our eyes on the prize.

REFERENCES

Bartik, Timothy J. 2018. "'But For' Percentages for Economic Development Incentives: What Percentage Estimates are Plausible Based on the Research Literature?" Upjohn Institute Working Paper No. 18-289. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research. https://doi.org/10.17848/wp18-289

———. 2020. "Using Place-Based Jobs Policies to Help Distressed Communities." *Journal of Economic Perspectives* 34(3): 99–127. https://doi.org/10.1257/jep.34.3.99

———. 2022. *How State Governments Can Target Job Opportunities to Distressed Places*. Upjohn Institute Technical Report No. 22-044. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research. https://doi.org/10.17848/tr22-044

———. 2023. *Bartik Benefit-Cost Model of Business Incentives: A User's Guide.* Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

Bartik, Timothy J., Brad Hershbein, and Marta Lachowska. 2016. "The Merits of Universal Scholarships: Benefit-Cost Evidence from the Kalamazoo Promise." *Journal of Benefit-Cost Analysis* 7(3): 400–433. https://doi.10.1017/bca.2016.22

Bartik, Timothy J. and Nathan Sotherland. 2019. "Local Job Multipliers in the United States: Variation with Local Characteristics and with High-Tech Shocks." Upjohn Institute Working Paper 19-301. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research. https://doi.org/10.17848/wp19-301

Jackson, C. Kirabo, Rucker C. Johnson, and Claudia Persico. 2016. "The Effects of School Spending on Educational and Economic Outcomes: Evidence from School Finance Reforms." *Quarterly Journal of Economics* 131(1): 157–218. doi: 10.1093/qje/qjv036

Moretti, Enrico. 2004. "Estimating the Social Return to Higher Education: Evidence from Longitudinal and Repeated Cross-Sectional Data." *Journal of Econometrics* 121(2004): 175–212. doi: 10.1016/j.jeconom.203.10.015