Innovative Metrics for Economic Development: Supplemental Report

Infrastructure impact analysis using the REMI model

SRI International

November 30, 2017

This report was developed through a cooperative agreement between EDA and SRI International

Impacts of Infrastructure Grants

In addition to the work on a logic model and econometric model to assess the impacts of EDA's Non-Infrastructure Grants portfolio, SRI conducted a national-level assessment of the impact of EDA infrastructure grants using REMI's PI+ model. REMI, or Regional Economic Models Inc., is an economic modeling organization that produces a variety of modeling products and services that can assess the impact of public policy actions. Their PI+ model generates year-by-year estimates of the effects of a given policy initiative, and is used broadly by governments, consulting firms, nonprofits, and universities. The model has been thoroughly vetted and verified and is considered a reliable tool for estimating public policy impacts.[1]

Before explaining the results of the impact model, it is important to note how EDA funding supports infrastructure projects. EDA makes a substantial number of infrastructure grants directly to organizations and communities across the nation, to support projects to improve roads, highways, water supplies, and other critical infrastructure components. While these grants provide a substantial amount of funding to such projects, they generally do not fully fund the project costs, and as such recipient organizations find additional funds to cover the remaining project costs. These additional funds come from a variety of sources – state and local governments, other federal grants, economic development organizations, and private sources of funding – and combined with the EDA grants, directly fund the infrastructure projects.

In addition to these direct funds, EDA-supported projects also mobilize additional private investment. This includes incremental private sector investment above and beyond the funds used for project construction, and could be investment for site improvements, new plants and equipment, and other such improvement or expansion activities. EDA grant recipients are required to report on the impact of the grant, including the impact on private investment leveraged, on job creation and on job retention, at 3-, 6-, and 9-year intervals after grant award.

In many situations, EDA funds act as the primary catalyst for other funding – that is, without the support and funding of EDA, many projects would struggle to attract the necessary capital. EDA grants act as a signaling mechanism to validate the project and mobilize outside investment.

For this analysis, therefore, we wanted to not only analyze the impact of EDA funds themselves, but to also include the additional funds that EDA grants helped mobilize. Table 1 below presents the data on these funds, showing three variables from 2000 to 2010: total EDA spend, which is the aggregated amount of EDA infrastructure grants per fiscal year; total additional project funds, which is the amount of additional funding obtained to directly fund project costs; and total estimated private investment reported by the grantees at 6 years, reflecting the estimated amount of additional private investment generated by EDA-supported projects.[2]

[1] For more information on the REMI model, see: http://www.remi.com/wp-content/uploads/2017/03/2013-REMI-Brochure.pdf.
[2] Data was provided to SRI by EDA staff, and represents the total spending on infrastructure grants across the United States.

Table 1: EDA and private investment spending, 2000 to 2010

Year	Total EDA Spend	Total Additional Project Funds	Total Estimated Private Investment, after 6 years
2000	$297,638,299	$347,211,663	$4,214,309,847
2001	$379,316,525	$361,100,378	$5,523,613,041
2002	$259,721,490	$328,513,723	$3,755,346,896
2003	$236,800,503	$260,859,615	$7,618,677,163
2004	$230,041,408	$293,002,127	$5,428,796,687
2005	$205,397,477	$269,313,918	$5,345,175,060
2006	$183,680,447	$305,482,535	$3,308,866,484
2007	$188,493,643	$285,578,593	$3,282,106,311
2008	$194,914,891	$258,884,699	$3,121,414,183
2009	$433,698,301	$367,577,306	$5,624,706,609
2010	$465,113,000	$386,361,265	$6,673,953,517
Yearly Avg.	$279,528,726	$314,898,711	$4,899,724,163

As the table shows, there was considerable variation in the amount of funding for infrastructure projects by both EDA and other sources across the 10-year time period. (This variation is visualized in Figures 1 and 2 below). However, on average, EDA provided approximately $279 million in funding for infrastructure projects and those projects secured an additional $314 million in direct funding, and mobilized $4.9 billion in additional private investment, each year. Thus, on average, we estimate that every dollar EDA invested in infrastructure projects mobilized $1.12 in direct project funding and $17.5 in additional private investment; combined, this represents $18.6 in additional funds catalyzed each year for each dollar invested by EDA.

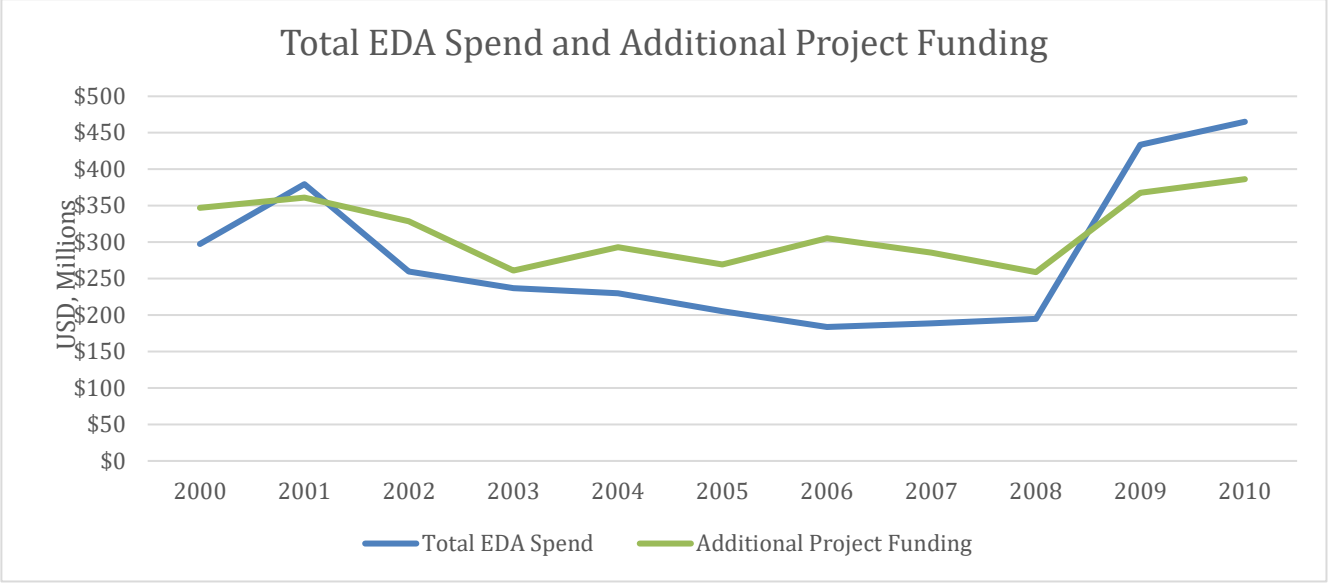

Figure 1: Total EDA spend and additional project funding, 2000-2010

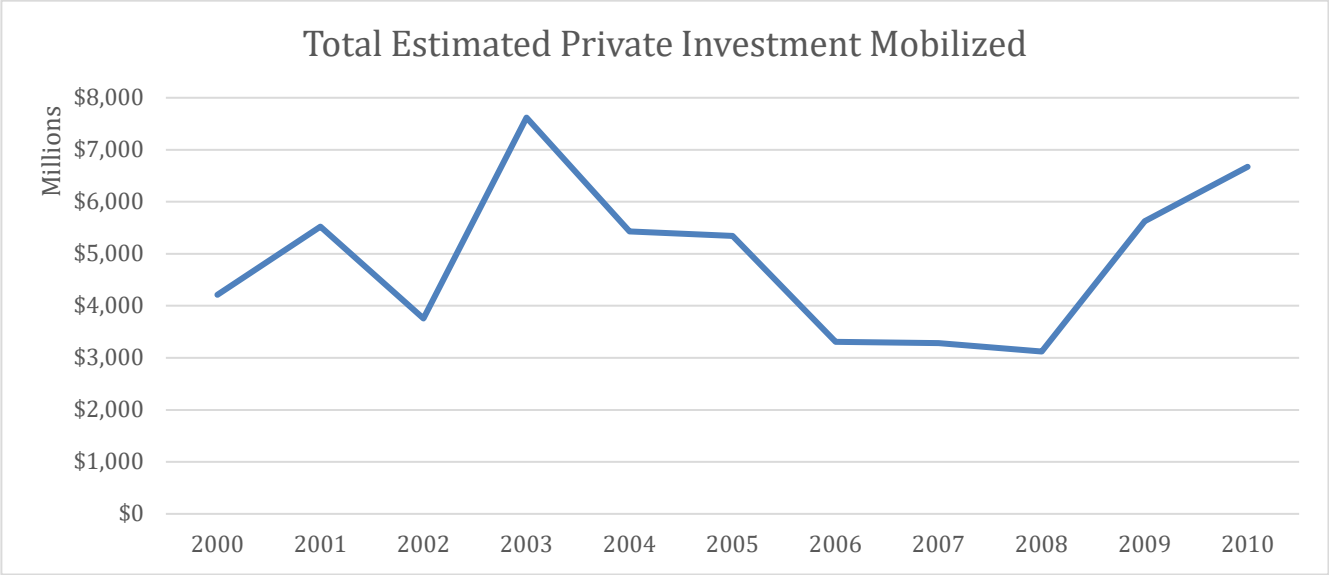

Figure 2: Total estimated private investment mobilized, 2000-2010

The funding varies from year to year, at times due to disaster supplemental or stimulus funding, such as the American Recovery and Reinvestment Act in 2009.

The SRI team used these data on investments in infrastructure projects and, leveraging the REMI model, estimated the impact of these investments across the US on three outcome variables: employment, wages and salaries, and personal income.[3] As was explained earlier, SRI wanted to assess the full impact of EDA infrastructure grants, meaning both their direct funding and their role as a signal and catalyst for the generation of additional funding and private investment. As such, the team input both the value of the total project cost and that of the estimated private investment at 6 years into the REMI model to generate the impact estimates. Following the advice of REMI staff, the project cost and estimated private investment data were input as an increase in "Exogenous Final Demand –

[3] Information on how SRI input this data to run the REMI model can be found in the Appendix.

Construction Industry" – representing the fact that the funding flowed through the recipient organizations and ultimately stimulated the construction industry. Additionally, also following the advice of REMI staff, SRI included a negative adjustment for "Government Spending" in the model, set to the amount of EDA funding each year, to account for any budgetary offset of the grant funding.

SRI ran the model to estimate three economic outcomes: employment, wages and salaries, and personal income. The REMI model uses data from the Bureau of Economic Analysis to forecast all three of these variables. The definitions of the variables are presented below. [4]

> **Employment:** Employment comprises estimates of the number of jobs, full-time plus part-time, by place of work. Full-time and part-time jobs are counted at equal weight. Employees, sole proprietors, and active partners are included, but unpaid family workers and volunteers are not included.
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> **Wages and Salaries:** The sum of wages and salaries for private non-farm industries, state and local government, federal civilian, federal military, and farm sectors.
>
> **Personal Income:** Income received by persons from all sources. It includes income received from participation in production as well as from government and business transfer payments. It is the sum of compensation of employees (received), supplements to wages and salaries, proprietors' income with inventory valuation adjustment (IVA) and capital consumption adjustment (CCAdj), rental income of persons with CCAdj, personal income receipts on assets, and personal current transfer receipts, less contributions for government social insurance.

SRI ran the model twice. The first time, the team input just the amount of EDA funding spent on infrastructure grants. These results are shown in Table 2. The team ran the model a second time using the combined value of the total project cost and the estimated private investment, to assess the full impact of the EDA grants. (Note: total project cost includes the EDA funding for infrastructure grants). These results are shown in Table 3.

[4] Definitions taken from the REMI model software.

Table 2: Increase in outcome variable per year, from EDA spend only

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total Employment	4,558	5,931	4,026	3,220	2,574	1,832	1,260	1,106	1,083	3,451	3,712
Total Wages and Salaries (millions)	$193	$270	$207	$181	$158	$124	$96	$86	$84	$217	$246
Total Personal Income (millions)	$250	$347	$262	$229	$197	$155	$119	$107	$105	$279	$315

Table 3: Increase in outcome variables per year, from total project cost plus private investment

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total Employment	71,075	93,472	64,229	108,426	70,990	59,776	27,453	20,266	14,878	40,698	50,828
Total Wages and Salaries (millions)	$2,972	$4,199	$3,253	$5,483	$4,085	$3,686	$2,148	$1,720	$1,367	$2,729	$3,422
Total Personal Income (millions)	$3,866	$5,416	$4,143	$7,007	$5,159	$4,639	$2,656	$2,125	$1,691	$3,493	$4,388

The REMI model estimates impact by running a simulation using the policy data and comparing it against a national control, and presents impacts as the difference between the simulation and the control. As such, the first cell in Table 2 indicates that in the year 2000, there was an additional 4,558 jobs in the economy due to increased industry demand from EDA grants. Inevitably, the results from the combined project cost and private investment are much larger than the results from the EDA spend by itself. As was discussed earlier, EDA grants are intended to catalyze funding by third parties, as well as directly fund projects; thus, it is important to acknowledge the full scope of impact of the grants. Considering only the results from the direct EDA funding would neglect to capture a critical role played by EDA grants in regional economies.

Across the 11 years of analysis, using the combined impact of project costs and private investment generated from the REMI model analysis, EDA-supported projects and the investment they attracted generated an average of an additional 56,554 jobs, $3.187 billion in wages and salaries, and $4.053 billion in personal income each year.[5] From these results, SRI calculated that EDA spending per job created ranged from $2,184 to $13,101, averaging $6,368 across the 11 years (see Table 4 below).

SRI compared the estimates of jobs created generated by the REMI model to the reported actuals by EDA grantees in their Government Performance and Results Act (GPRA)[6] reports at 6 years in order to assess the differences between the two sources. Across the 11-year period, GPRA reports jobs created ranges from 12,486 to 49,806, averaging 27,822 jobs per year. The fact that GPRA reported figures are lower than the REMI estimates can be accounted for by two primary distinctions between the two reporting methods. The first is that the REMI estimates are national level estimates, and include indirect and induced job creation; GPRA reported figures, however, capture the direct jobs created in the regions that received grants, and therefore do not account for the indirect and national effects of the EDA grant funding.

The second distinction contributing to the difference in estimates is that the REMI model estimates both full- and part-time jobs, whereas EDA grantees report on full-time jobs in accordance with GPRA requirements. However, in reviewing full- and part-time jobs data for the years during the analysis, SRI determined that approximately 20% of jobs in the economy were part-time in any given year. [7]

Discounting the REMI results by 20% to only reflect full-time jobs generates a new average of approximately 45,243 additional jobs per year, a figure that is closer to the GPRA reported number of additional jobs, that still reflects the expanded scope of the REMI model. Ultimately, this comparison supports both methods as valid, as they do not present wholly different estimates of the impact of EDA infrastructure grants. The fact that GPRA estimates require supporting documentation and are tractable through 6 years after completion of the project, implies that GPRA estimates represent a 'floor' for jobs for any EDA project. It's probable that these numbers represent the most conservative reflections of the ultimate impact of the grant funding.

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[5] As the REMI model generates impacts on a year-by-year basis, it is incorrect to add up the impacts from each year a generate a total number across the years. Some of the impacts in year 2 overlap in year 1, etc., and since it's not a net change from the previous year, but from the control model, the only way to interpret the model results is on a year by year basis.

[6] EDA collects and reports on performance measures in compliance with Government Performance and Results Act of 1993 that, as amended by the GPRA Modernization Act of 2010, establishes requirements for all agencies to collect, analyze and report on their performance. For more information, please visit eda.gov.

[7] U.S. Bureau of Labor Statistics, Labor Force Statistics from the Current Population Survey. Data reviewed was from 2002-2015. See https://www.bls.gov/cps/lfcharacteristics.htm#fullpart.

Table 4: EDA spend per job

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Jobs	71,075	93,472	64,229	108,426	70,990	59,776	27,453	20,266	14,878	40,698	50,828
EDA Spend (thousands)	$297,638	$379,316	$259,721	$236,800	$230,041	$205,397	$183,680	$188,493	$194,914	$433,698	$465,113
EDA Spend/Job	$4,188	$4,058	$4,044	$2,184	$3,240	$3,436	$6,691	$9,301	$13,101	$10,657	$9,151
Average EDA Spend/Job	$6,368										

Limitations

While the REMI model is widely validated and a helpful tool for estimating impacts, it is important to note a few limitations of this analysis. The first limitation is that while the model treats the project costs and private investment amounts as discrete injections that occur fully in the year of award, the reality is that this funding tends to be dispersed over time. Infrastructure projects typically span several years. There is no standard or typical schedule that models the timing of the disbursement of EDA and project funding into the construction industry; therefore, there is no clear way to address this discrepancy. However, given that the analysis is considering a range of 11 years, the impact of this limitation is largely mitigated due to year-over-year overlaps; that is, funding that is attributed to the year 2001 but may be spread out over the years 2002-2004 is likely balanced out by funding that is attributed to the year 2002, but should have similarly been spread out across years. Therefore, while the estimates for each year may not be exact, across the full range of the analysis, the model provides a good estimate of the impacts of EDA-funded infrastructure projects.

A second key limitation to note is that the model used for this analysis was a national-level model, and EDA grants were aggregated across the country when entered into the model. As such, the results from this analysis may be muted since EDA grants are not distributed uniformly across the country. Figure 3 below presents a visualization of the geographic distribution of EDA infrastructure grants in FY 2010. The visualization shows that some regions receive more EDA grants than other regions, while there are plenty of regions that do not receive any EDA grants at all.

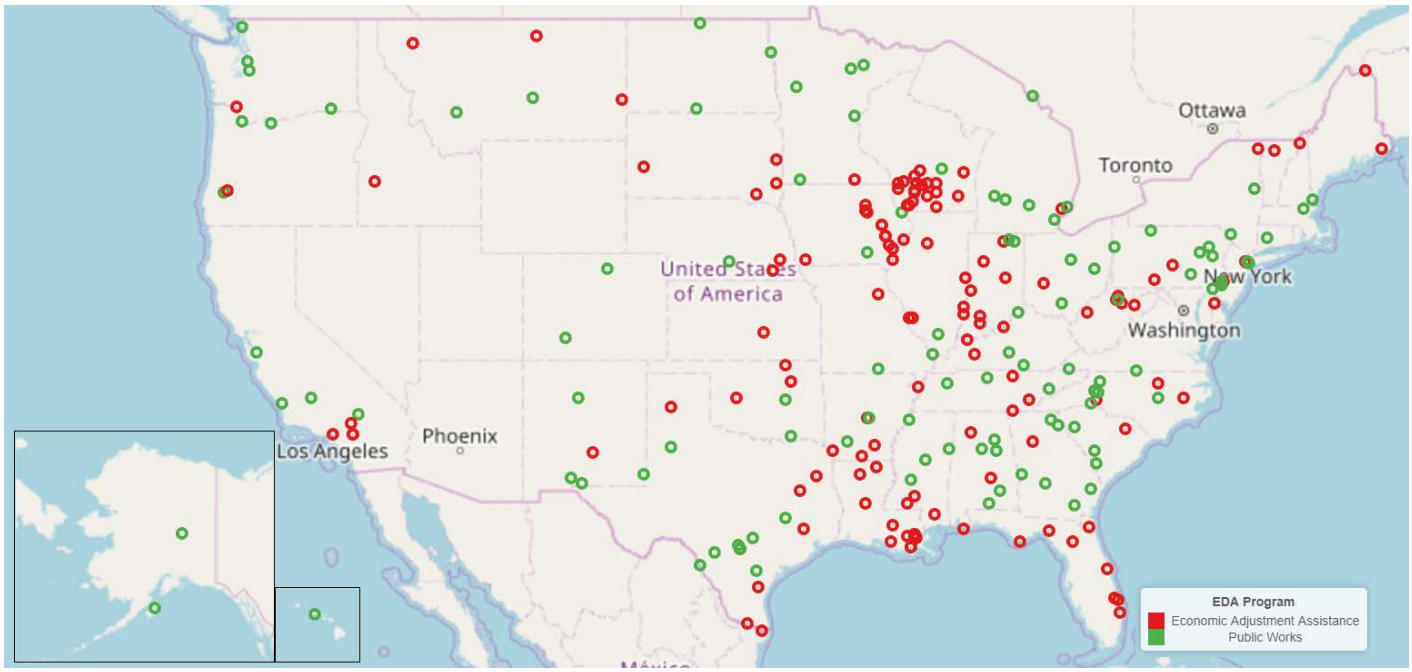

Figure 3: Geographic distribution of EDA grants

However, the REMI model used for this analysis was not able to tailor the impact according to geographic distribution of grants; thus, the impacts of EDA-grant heavy regions were tempered by the results in regions that did not receive EDA grants.

A third limitation is the counterfactual question regarding the other investments mobilized by EDA activity. In some cases, it may be that these investments would have been made anyway. The degree to which this is the case could be discovered by a large-scale survey of grantees; however, there was not sufficient time or resources for this kind of investigation under the scope of this project. However, if we imagine that private sources are the first recourse for those looking for investment, we may also suppose that seeking EDA investment only occurs when private support is not forthcoming. In short, the fact that a grantee turns to the EDA suggests that nothing would happen absent EDA intervention.

Appendix

REMI Model Specifications

SRI consulted with REMI staff on the best way to model EDA grants and private sector investments using the REMI model to generate estimated impacts. Per their recommendations, SRI did the following:

- Using an East/West model, SRI input EDA spending data, project costs, and private investment, year by year, into the model and used REMI's spreader tool to allocate the spending across the Eastern and Western regions of the United States by population.
- SRI input the spending, project cost, and investment data as "Exogenous Final Demand" in the Construction Industry. REMI staff explained that government spending as an input variable in the REMI model largely refers to service spending, i.e. health, education, etc. They said it was a better modeling approach to use the data on the demand side, as the funds are given to organizations who then increase the demand of the Construction Industry.
- SRI input the amount of EDA spending in as a negative government spending variable, to account for any budgetary outset.