Indiana’s 21st Century Research & Technology Fund

Research and Analysis by

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Introduction

Federal, state and local financing of firm research and development efforts has a lengthy pedigree in the United States. By the 1990s, federal and state governments had developed a number of programs focused on R&D support and early stage venture capital (see Lerner, 1999 and Hicks and Devaraj, 2010). Underlying these programs is the assumption that small firms either lack adequate market-based financing (the externality argument), or that focused financing could influence other funding agents of knowledge-based firms to support this activity (the asymmetric information problem). We think that a third implicit consideration is also at issue; the belief that firms will be more likely to choose locations based on available funding. Also, implicit in the evaluation of these studies is the belief that public dollars do not crowd out private investment in these examples.

The success of these programs would then be linked to the differential performance of firms who receive this support, along with their likelihood of attracting additional capital (avoiding crowding-out) and whether or not they choose to remain (and survive) in the jurisdiction offering financing.

This study evaluates the hypothesis that firms receiving state R&D financing perform differently from firms that do not. Due to data limitations and to the relative newness of the program, we are not yet able to offer an effective test of the asymmetric information and regional impact questions at the firm level.

To undertake this analysis, we first review briefly existing history of such programs, and discuss the challenges to estimating the differential influence of R&D awards on firm performance. We then craft an empirical model, testing it on a unique dataset which combines firm-specific R&D investments in Indiana with a longitudinal data set. We end with a brief summary and policy recommendations.

Terms

21st Century Research and Technology Fund (21st Century Funds): Startup capital awarded by the State of Indiana to accelerate growth and job creation through research and technology in pre-revenue and early revenue Hoosier companies. Investment, services, investment support and outreach are performed by Elevate Ventures.

Elevate Ventures Inc.: Provides business analysis and advisory services to Indiana’s firms and nonprofits. Manager of Indiana’s 21st Century and Angel funds, among others.

Indiana Angel Network Fund (Angel Funds): Seed money provided by the State of Indiana to empower Hoosier entrepreneurs in business creation and improvement. Managed by Elevate Ventures Inc.

Indiana High Growth Fund (IHGF): Funds issued to private lending corporations, who then issue loans to high growth opportunity businesses by leveraging them into further private funding mechanisms.

Indiana Seed Fund Holdings (Seed Fund): A pre-venture capital fund designed to promote business formation and growth of Indiana based companies, which are at a preliminary stage of operation. Investments usually made over a 2–3 year period. Managed by Elevate Ventures Inc.

REMI: Common abbreviation for Regional Economic Models Inc., an economic estimation tool that incorporates the strongest aspects of four major modeling approaches: input-output, general equilibrium, econometric, and economic geography.

SBIR/STTR: Abbreviations for two similar grants – Small Business Innovation Research and Small Business Technology Transfer. Grants by the U.S. Department of Energy’s Office of Science to support scientific excellence and technological innovation in small, for-profit firms.

State Small Business Credit Initiative (SSBCI): Program from the U.S. Treasury to support state-level programs that lend funds to small businesses and that leverage private lending with the intent of job creation and business expansion.
History and Previous Findings

The U.S. Small Business Administration undertook debt and equity investments through the Small Business Investment Company Program beginning in the late 1950s. This program continued through the late 1990s and was joined by at least 21 different federal and more than 50 state programs by the turn of the century (Lerner, 1999). By 2010, states had created at least 23 different tax credits and 46 separate funds which offered both debt and equity financing targeting firms at the angel and venture capital phase (Hicks and Devaraj, 2010). The American Recovery and Reinvestment Act of 2009 added more than $19 billion in technology and R&D in fiscal 2009 and 2010 (NSF, 2012).

Evaluating these programs against their stated claim to increase knowledge spillovers faces one daunting task; the disentanglement of the direction of causation or ‘endogeneity’. The inherent selection criterion of the programs means that firms were not selected at random for participation biases a direct comparison between the participant and non-participant firms. This is inherently not a randomized trial, so effectively structuring a control for inclusion into the R&D program offers some considerable challenge. It is to that issue that most of the salient research has focused attention.

An important paper (Klette, Moen, and Griliches, 2000) evaluated the evidence of impacts from five separate, high-quality micro-econometric studies which took into account the selection bias of the recipient firms. They outline a number of improvements in method which might be helpful in identifying the treatment and control group in these studies. They note, as do others (Lerner, 1998, 1999; Baum and Silver, 2004; Hicks and Devaraj, 2010) that research findings tend to support the presence of knowledge spillovers, and thus both justification and effectiveness of limited venture capital programs.

A later study (Duch, Montolio and Mediavilla, 2009) matched public R&D recipient firms in Spain, with non-recipient firms based upon a propensity score matching process that linked pre-receipt firm characteristics for the treated, recipient group and the control, non-recipient group. They report an impact of firm value-added (a productivity measure in this example) caused by the receipt of public sector R&D funding.

Afcha and Garcia-Quevedo (2014) analyzed national and city venture capital subsidies on the composition of recipient firms in Spain. Their study employed techniques that controlled for the selection bias created when firms choose to apply for public R&D funding, and for the endogeneity bias which occurs from the selection process implemented by the funding agencies. This study was made possible due to very detailed firm level data available in Spain. Their study rejected a frequent concern that public dollars ‘crowd-out’ private investment, and most importantly, receipt of public sector R&D funding increased the number of employees engaged in R&D at the firm level.

There is an abundant literature of the effects of R&D on firm performance and crowding-out. However, the studies cited here form the bulk of studies which examine these issues while controlling for selection bias and endogeneity in the analysis. We believe the frontier of analysis of these issues must control for these problems in an empirical setting. So, we proceed without a detailed review of findings that are outside the quasi-experimental approach.
Empirical Analysis

Indiana Economic Development Corporation (IEDC) funds firms to stimulate research and development efforts in the state of Indiana through 21st century Funds and Angel Funds. We conduct this study by examining firms that were either awarded or rejected by Indiana Economic Development Corporation (IEDC) in Indiana. We obtained the award recipient (treated group) information from IEDC. We also obtain information about the firms that IEDC did not invest (control group) due to management, terms, market, product, and also due to the projects that are not in the IEDC investment pipeline. Importantly here, while the decision at this juncture might be made using considerations regarding the quality of the firm’s business plan, it was primarily due to differences in non-performance features, especially with regards to the line of investment the state wished to pursue (i.e. firms related to end stage commercialization from state universities).

The information for the control group was obtained by IEDC from their own tracking databases, subscription-based and publicly available deal databases (such as pitchbook.com, crunchbase.com). It contains the name of the firms, money raised and the last available funding date of those firms that IEDC chose not to invest.

We then match the treated and control group firms with the National Establishment Time Series data (NETS) to obtain their employment and sales information pre- and post-award. For the control group, we use the last financing date as the pseudo-post award period so that the unobserved trends that are correlated with both the treated and control group can be accounted for.

We limit the time period of our analysis from 2001 to 2013 (the most recent year of data available). Our treated group consists of 15 firms (61 establishment-years) and control group consists of 43 firms (193 establishment-years). Overall, our final sample has 254 establishment-year observations across 58 firms.

In a separate analysis we attempt to test the potential for ‘crowding-out’ of private venture capital funding by public investment. To do this, we test the impact of state R&D funding on private funding in this the sample of firms 58 firms. In this test, if we find a positive impact of state R&D funding on private funds, we have evidence of ‘crowding-in’ or increase private funding due to state awards. If the effect is negative, then we could conclude there is evidence of crowding-out, where public funds displace private investment. And, if the effects are not different from zero, that there is no relationship between public funds and private funding. We caution that data limitations on private investment render this test as suggestive, not definitive with respect to crowding out. However, in our earlier study of this fund (Devaraj and Hicks, 2010) we reported evidence of crowding in of private funds.

Control Group
(Firms the IEDC rejected or were not in their investment pipeline)
193
establishment years
43
# of firms

Treated Group
(Award recipients)
61
establishment years
15
# of firms

Final Sample
254
establishment years
58
# of firms
Aggregate Effects

We find that the receipt of an IEDC award contributed to 30.4 percent increase in employment, 68.6 percent increase in sales and 29.1 percent increase in productivity, cumulatively in the years following the award when compared to those not receiving an award. All these results are statistically significant. Age of the firm while receiving the award was positive and significant for employment, sales and productivity. See technical appendix for detailed results.

Based on the results, we could estimate the aggregate effects of the investment rate of return expressed in sales as follows: The average IEDC award amount for our treatment group (award recipients) is $664,423. The average annual sales of such firms after receiving IEDC award is $404,301. The conservative estimate (see Table A3, Model 5) of the effects of the award on the sales of the treatment group is 39.1 percent. Therefore, IEDC award’s contribution to average firm sales is $404,301 x 0.391 = $158,082. Thus, the average annual rate of return expressed in average firm sales to average award investment is $158,082 ÷ $664,423 = 23.79 percent annually.

In our ‘crowding-out’ test, we evaluated two separate specifications. One did not include a control for county specific characteristics, the other did (these are referred to as fixed effects). We included age, a time trend, and industry and year variables in both equations. In the first model, we found that there was a positive impact of state R&D funding on private capital at the firm level. The elasticity of this effect is roughly a 0.1, meaning that a $100 public investment leads to an additional $10 private investment. In the second model, the magnitude of the impact remained positive, but the statistical significance of the estimate dropped beneath the traditional levels of significance. Taken as a whole, these results reject the ‘crowding-out’ hypothesis. However, data imperfections and the statistical significance under alternative specifications only hint at the possibility of ‘crowding-in’ which is an increased investment from the private sector following public investments.

### IEDC Award % Increase

- **In the years following the award**
  - **29.1%** Increase in Productivity
  - **30.4%** Increase in Employment
  - **68.6%** Increase in Sales

### Aggregate Effects of the Investment Rate of Return Expressed in Sales

- Average IEDC Award Amount: $664,423
- Average Annual Sales After Receiving IEDC Award: $404,301
- IEDC Award’s Contribution to Average Firm Sales: $158,082
- Average Annual Rate of Return Expressed in average firm sales to average award investment: 23.79% annually
Discussion, Limitations, and Policy Impact

Our approach to evaluate the 21st Century Fund performance at the firm level depends on data availability that allows to longitudinally examine firms over the sampled time period and to distinguish a treatment and control group. Insofar as we know this is the first study of this kind on state venture capital, with earlier examples outside the United States (Duch, Montolio and Mediavilla, 2009 and Afcha and Garcia-Quevedo, 2014). We use the National Establishment Time Series for Indiana through 2013, matched to the firm who a) received 21st Century Fund equity, b) applied but did not receive 21st Century Fund equity and c) firms which applied, but were not considered for 21st Century Fund equity. This allows us to apply a well-known method to isolate the time and cross-sectional effects of the program at the firm level against two separate control groups. This extended the work of previous authors by combing two types of quasi-experimental design.

The results are robust. Across the two different control groups (and aggregated control group), examining employment, sales and sales per worker (productivity) we find that participation in the 21st Century Fund showed positive impacts on firm employment, which were large, but statistically in only two of the three models. Across both total sales, and sales per capita, we found very strong impacts, which enjoyed a high degree of statistical certainty.

The employment effect range from zero (not statistically significant to 30 percent growth, while the sales impact ranged from nearly 40 percent to almost 70 percent growth and the productivity impact ranged from 27 percent to 29 percent across these models. Overall, in terms of firm performance, the annualized rate of return of this investment was roughly 23.8 percent. In the context of other state and federal tax incentive programs, we or others have evaluated that this is a large impact. Since we can reject crowding-out here, the benefits of the program do not appear to be simply a displacement of private sector funding.

There are potential concerns with our analysis that bear mentioning. We were unable to match roughly 46 percent of firms participating in the IEDC program to the NETS data. We believe this is due to two potential reasons. First, they may not have completed their state corporate registration at the time of the request for funds, and second, they may have been bought by another firm. The data set largely rules out other issues, such as exit or relocation. This may bias our study, but since most of these were in the control group, we imagine the bias impact on the coefficient of interest would be to reduce it from a higher (unknowable) level. So, this omission would understated the impact.

A second and more serious concern remains the presence of endogeneity. While we believe the treatment and control groups are sufficiently similar across employment and sales domains to identify this model, it is possible that endogeneity bias remains. If so, it is necessarily due to the selection process of participating firms. So, if uncontrolled endogeneity remains, it is clear that the 21st Century Fund administrators are effectively choosing firms that succeed better than their non-recipient cohort. However, if this is the case, then only the knowledge spillover component of the 21st Century Fund program would be called into question. The remaining issues (informational asymmetry and location choice) would still offer justification for this program. That brings us to further research needs.

The newness of this program and the recent programmatic changes make it too early to fully evaluate two important questions regarding the 21st Century Fund. First, we do not yet know whether the public investment in these firms reduces lending costs for private equity managers, who will then deploy resources at a higher level to recipient firms. This informational asymmetry test will require more and lengthier data collection. Second, we do not yet know whether the knowledge spillovers have developed local economic activity greater than would be expected in the regions in which the 21st Century Fund was active. That too will require a lengthier assessment period (but not necessarily more data). This leads to research and policy recommendations. Elevate Ventures does perform both pre- and post-award support for firms participating in the 21st Century Fund program. This may help stimulate knowledge spillovers from the program, but the effect is too early to detect in this type of study.

We believe that IEDC should maintain data, and survey both recipients and non-recipients for additional performance and equity infusions for as much as 15 years after the application for funds. That would allow a series of follow-up studies of the private equity impacts and regional growth effects of the 21st Century Fund as well as a more robust analysis of the crowding-out hypothesis in future.

We believe the short-term performance of this fund is significantly better than other federal, state and local development incentives. It is a low-cost fund and compares very well with private sector performance measures though it is targeting a very different venture capital market that traditionally does not observe significant private sector participation. We recommend the 21st Century Fund continue as currently structured through at least 2020 when additional analysis will be available to assess its efficacy.
Credits

Research and Data


Hicks, Michael J., and Srikant Devaraj. 2010. Comprehensive Examination of the Performance of the Indiana 21st Century Research and Technology Funds. Muncie, Ind.: Center for Business and Economic Research, Ball State University.


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About Ball State CBER
The Center for Business and Economic Research (CBER) is an economic policy and forecasting research center at Ball State University. CBER offers economic data through a suite of web tools available online at http://cberdata.org.

In addition to research and data delivery, CBER serves as a business forecasting authority in Indiana’s east central region—holding the annual Indiana Economic Outlook and quarterly meetings of the Ball State University Business Roundtable.
Technical Appendix: Identification Strategy and Model

We now estimate the impact of IEDC awards on the annual sales, employment and productivity of firms that received the award in Indiana. To do so we confront the endogeneity problem outlined above by using a difference-in-difference method to isolate the IEDC award’s impact from contemporaneous changes in the firms. We start by creating a treatment group of those firms who’d received the IEDC awards, and treatment groups of those who applied, but did not receive funds from the state. We compare the treatment group (IEDC award recipient firms) with the control group of applicant non-recipients. Our identification strategy relies on the assumption that the firms in the control group will account for the unobserved time-varying factors that would have led the firms in the treatment group to experience differential outcomes after receiving the IEDC award. In other words, we do not believe the difference between the award and non-award groups should be modest, varying primarily over their readiness to accept venture or angel investment in the year in which they applied. So, empirically evaluating outcome differences over time should reveal the impact of the 21st Century Fund contribution to the firm’s performance.

Our model specification is as follows:

\[
Y_{it} = \alpha + \beta Treat_i + \gamma Time_t + \delta (Treat \times Time)_{it} + \theta Age_i + \tau Trend + Year_i + Industry_i + County_i + \epsilon_{it}
\]

where subscripts \(i\) and \(t\) represents firms and years respectively. \(Y\) represents outcome variable of interest such as firm employment, firm sales, and firm productivity. The firm sales are adjusted for inflation using 2015 dollars. The firm’s productivity is measured as total sales divided by total employees at the firm in a year. \(Treat\) is a binary variable (= 1) for treatment group of firms that received IEDC award. \(Time\) is a binary variable (= 1) for the period after the firms received the award (for treatment group) or for the period after the firms’ last financing date (for the control group).

The interaction of \(Treat\) and \(Time\) captures the average impact of IEDC awards to firms by comparing the outcomes post-award to outcomes before the award among the treated group (firms that received the award) relative to the control group (firms that did not receive the award). Age represents age of the firm at the time when award / last finance was received.

We also include linear time trends, \(Trend\), to capture firm-specific unobserved factors that vary linearly over time and are correlated with the outcomes. We include year fixed effects to account for unobserved factors that cause year-to-year changes. We also include industry fixed effects to eliminate variation caused by factors that vary across industries. Finally, we also include county fixed effects to eliminate all variation in outcomes caused by unobserved factors that vary across counties. \(Table A1\) shows the descriptive statistics of our entire sample. We use robust standard errors for all our analysis.
Results

Table A2 shows the difference-in-difference estimation results for the overall sample. Model (1) shows the impact of IEDC awards on total employment. Model (2) shows the impact on total sales and Model (3) shows the impact on productivity (expressed as sales per worker). These results appear robust in that modest specification differences seemed not to alter the effects, which persisted across all three similar specifications.

We find that the receipt of an IEDC award contributed to 30.4 percent increase in employment, 68.6 percent increase in sales and 29.1 percent increase in productivity, cumulatively in the years following the award when compared to those not receiving an award. All these results are statistically significant. Age of the firm while receiving the award was positive and significant for employment, sales and productivity.

To further evaluate our identification strategy, we split the control group to those firms that were not in IEDC’s investment pipeline and those who were intentionally passed by IEDC due to various other reasons. This offers us the use of a second control group from which to compare results.

Table A3 presents those results. Models (1) through (3) show results pertaining to the former control group and Models (4) through (6) [our conservative estimate] correspond to the latter control group. We find that IEDC award has statistically insignificant effect on total employment, but has statistically significant effects of 39.1 percent increase in sales and 27.4 percent increase in productivity (sales per worker). This leads us to discuss the aggregate effect of the program.

Table A4 contains the summary estimation results from the crowding-out hypothesis. There are two models, differentiated by the inclusion of county fixed effects. Otherwise the specification is identical. We note that the log of observations includes adding the number 1 to include the zero valued observations in the model. The values of funds can therefore be interpreted as elasticities.

Table A1: Descriptive Statistics (n=254 establishment years across 58 firms)
Source: Author calculations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>emp</td>
<td>Annual employment</td>
<td>10.13</td>
<td>13.56</td>
<td>1</td>
<td>65</td>
</tr>
<tr>
<td>lnemp</td>
<td>Log of annual employment</td>
<td>1.92</td>
<td>0.92</td>
<td>0.6931</td>
<td>4.19</td>
</tr>
<tr>
<td>sales_adj</td>
<td>Annual sales adjusted for inflation using 2015 dollars</td>
<td>$1,147,716</td>
<td>$1,955,140</td>
<td>$0</td>
<td>$13,300,000</td>
</tr>
<tr>
<td>lnsales_adj</td>
<td>Log of annual sales</td>
<td>12.93</td>
<td>1.62</td>
<td>0</td>
<td>16.40</td>
</tr>
<tr>
<td>salesperworker</td>
<td>Sales per worker (productivity)</td>
<td>$107,958</td>
<td>$113,359</td>
<td>$0</td>
<td>$669,320</td>
</tr>
<tr>
<td>lnsalesperworker</td>
<td>Log of sales per worker</td>
<td>11.26</td>
<td>1.04</td>
<td>0</td>
<td>13.41</td>
</tr>
<tr>
<td>Time dummy</td>
<td>Post-award time period dummy</td>
<td>0.44</td>
<td>0.50</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Treatment</td>
<td>Treatment group dummy (who received IEDC award)</td>
<td>0.24</td>
<td>0.43</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Age of Firm</td>
<td>Age of firm when award/last finance was received</td>
<td>3.35</td>
<td>7.92</td>
<td>0</td>
<td>66</td>
</tr>
</tbody>
</table>
### Table A2: Estimation results of overall sample

*Source: Author calculations*

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) lnemp</th>
<th>(2) lnsales_adj</th>
<th>(3) lnsalesperworker</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time dummy</strong></td>
<td>-0.366*</td>
<td>-0.675**</td>
<td>-0.243***</td>
</tr>
<tr>
<td></td>
<td>(0.191)</td>
<td>(0.265)</td>
<td>(0.191)</td>
</tr>
<tr>
<td><strong>Treatment dummy</strong></td>
<td>-0.499**</td>
<td>-0.540</td>
<td>0.0314</td>
</tr>
<tr>
<td></td>
<td>(0.249)</td>
<td>(0.327)</td>
<td>(0.0720)</td>
</tr>
<tr>
<td><strong>Time dummy x Treatment</strong></td>
<td>0.304*</td>
<td>0.686***</td>
<td>0.291***</td>
</tr>
<tr>
<td></td>
<td>(0.184)</td>
<td>(0.262)</td>
<td>(0.0807)</td>
</tr>
<tr>
<td><strong>Age of Firm</strong></td>
<td>0.0226**</td>
<td>0.0329**</td>
<td>0.00654***</td>
</tr>
<tr>
<td></td>
<td>(0.00899)</td>
<td>(0.0320)</td>
<td>(0.00243)</td>
</tr>
<tr>
<td><strong>Linear time trend</strong></td>
<td>-0.0757***</td>
<td>-0.101***</td>
<td>-0.0160</td>
</tr>
<tr>
<td></td>
<td>(0.0230)</td>
<td>(0.191)</td>
<td>(0.0278)</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>4.752***</td>
<td>16.76***</td>
<td>11.84***</td>
</tr>
<tr>
<td></td>
<td>(0.416)</td>
<td>(0.768)</td>
<td>(0.745)</td>
</tr>
</tbody>
</table>

Robust standard errors in parenthesis. Year fixed effects, industry fixed effects and county fixed effects included in the analysis. ***p<0.01, **p<0.05, *p<0.1

### Table A3: Estimation results for different control groups

*Source: Author calculations*

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) lnemp</th>
<th>(2) lnsales_adj</th>
<th>(3) lnsalesperworker</th>
<th>(4) lnemp</th>
<th>(5) lnsales_adj</th>
<th>(6) lnsalesperworker</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time dummy</strong></td>
<td>-0.879**</td>
<td>-1.168**</td>
<td>-0.173</td>
<td>-0.551***</td>
<td>-0.809***</td>
<td>-0.130</td>
</tr>
<tr>
<td></td>
<td>(0.409)</td>
<td>(0.574)</td>
<td>(0.141)</td>
<td>(0.192)</td>
<td>(0.283)</td>
<td>(0.0811)</td>
</tr>
<tr>
<td><strong>Treatment dummy</strong></td>
<td>-1.087***</td>
<td>-1.129**</td>
<td>0.101</td>
<td>-0.0301</td>
<td>-0.0180</td>
<td>0.0160</td>
</tr>
<tr>
<td></td>
<td>(0.372)</td>
<td>(0.553)</td>
<td>(0.149)</td>
<td>(0.221)</td>
<td>(0.290)</td>
<td>(0.0727)</td>
</tr>
<tr>
<td><strong>Time dummy x treatment</strong></td>
<td>0.543*</td>
<td>0.887**</td>
<td>0.244*</td>
<td>0.0510</td>
<td>0.391*</td>
<td>0.274***</td>
</tr>
<tr>
<td></td>
<td>(0.292)</td>
<td>(0.438)</td>
<td>(0.139)</td>
<td>(0.153)</td>
<td>(0.222)</td>
<td>(0.0862)</td>
</tr>
<tr>
<td><strong>Age of firm</strong></td>
<td>0.0183**</td>
<td>0.0284**</td>
<td>0.00737***</td>
<td>0.0754***</td>
<td>0.0758**</td>
<td>-0.0151</td>
</tr>
<tr>
<td></td>
<td>(0.00782)</td>
<td>(0.0117)</td>
<td>(0.00300)</td>
<td>(0.0236)</td>
<td>(0.0351)</td>
<td>(0.0120)</td>
</tr>
<tr>
<td><strong>Linear time trend</strong></td>
<td>-0.0287</td>
<td>-0.0112</td>
<td>0.0175</td>
<td>0.00279</td>
<td>-0.0470*</td>
<td>-0.0484***</td>
</tr>
<tr>
<td></td>
<td>(0.0412)</td>
<td>(0.0597)</td>
<td>(0.0147)</td>
<td>(0.0149)</td>
<td>(0.0252)</td>
<td>(0.0116)</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
<td>4.155***</td>
<td>15.19***</td>
<td>11.01***</td>
<td>1.371***</td>
<td>10.10***</td>
<td>8.969***</td>
</tr>
<tr>
<td></td>
<td>(0.683)</td>
<td>(1.132)</td>
<td>(0.488)</td>
<td>(0.438)</td>
<td>(0.679)</td>
<td>(0.273)</td>
</tr>
</tbody>
</table>

Robust standard errors in parenthesis. Year fixed effects, industry fixed effects and county fixed effects included in the analysis. ***p<0.01, **p<0.05, *p<0.1
Table A4: Estimation results for Crowding Out Hypothesis

Source: Author calculations

Robust standard errors in parenthesis. Year fixed effects, industry fixed effects and county fixed effects included in the analysis

***p<0.01, **p<0.05, *p<0.1

Note: log values include a numeraire to retain their value of zero

<table>
<thead>
<tr>
<th>Variables</th>
<th>Log(Private funds)</th>
<th>Log(Private funds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log (IEDC Award)</td>
<td>0.0900** (0.0373)</td>
<td>0.0124 (0.0712)</td>
</tr>
<tr>
<td>Age of Firm</td>
<td>0.0760 (0.0882)</td>
<td>0.0485 (0.123)</td>
</tr>
<tr>
<td>Trend</td>
<td>0.240 (0.172)</td>
<td>0.0737 (0.238)</td>
</tr>
<tr>
<td>Constant</td>
<td>7.404* (3.860)</td>
<td>11.70* (5.720)</td>
</tr>
<tr>
<td>Industry dummies</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year dummies</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>County dummies</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.605</td>
<td>0.831</td>
</tr>
</tbody>
</table>