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Do entrepreneur-focused facility incentives create economic impacts? Evidence from Indiana

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Abstract

Purpose – As a component of a benefit-cost analysis into the efficacy of publicly funded facility incentives, the purpose of this paper is to examine the county-wide impact of business incubators, makerspaces and co-working spaces on employment, proprietor's employment and the average wage per job. The period under analysis is 1971 through 2015 across Indiana's 92 counties.

Design/methodology/approach – Using a unique data set on facility incentives in Indiana, a spatial panel model, which includes a unique identification strategy to account for underlying conditions identified as a source of incubator success in earlier studies, is developed.

Findings – This study finds no statistically significant impact of these facilities on total employment or average wage per job during this period. There is a statistically meaningful impact of co-working spaces on proprietor's employment, but the effect is an economically insignificant one-time increase of 2.3 jobs in the typical county, which can be interpreted as shifting employment from traditional employment to proprietorship employment.

Originality/value – This is the first empirical estimate of the contribution of modern facility incentives on measures of local economic activity.

Keywords Business incubator, Makerspace, Co-working space, Regional economic development

Paper type Research paper

Introduction

Business incubators, co-working spaces and more recently makerspaces are a type of entrepreneurial "business facility" incentive designed to increase entrepreneurial activity and ultimately economic performance in regions. Beginning as low-cost places for nascent entrepreneurs to access inexpensive physical space and share resources, by the 1980s business incubators were common in the USA (Qian *et al.*, 2011). Traditional business incubators are organizations that assist entrepreneurs to translate ideas into business ventures and typically provide some combination of workspace, consulting services, assistance in finding suppliers and distributors, access to venture capitalists and direct financial support (Kolympiris and Klein, 2017).

Over the past two decades, new jargon has attached itself to modifications of the incubator. These co-working spaces and makerspaces, which serve most of the same functions as business incubators, have developed across many urban settings. Though there is a broad tautology of these activities, in practical terms the differences are modest between these facilities. Traditional business incubators served a wide variety of firms. In recent years, there has been a movement toward specialization. Today co-working spaces typically promote service sector employment; makerspaces target small-scale manufacturing or arts related firms. Both are viewable as specialized incubators in that their design is to promote entrepreneurial success.

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Co-working spaces consist of shared workplaces typically used by knowledge professionals, typically freelancers working in various knowledge industries (Gandini, 2015). At these facilities, workers can rent a desk and a Wi-Fi connection and interact with professional peers often working in the same or complementary sectors.

The Maker Movement began during the 1990s as an extension of the do-it-yourself culture. Anderson (2012) defined makerspaces as "shared production facilities" (p. 18). Anderson is most interested in makers who use digital tools such as digital printers to design and prototype new products and collaborate with others online; however, makers also include traditional crafts and electronics. A variety of university, non-university and combined maker spaces exist and cover a variety of functions including engineering and design. University facilities promote hands-on learning for students and support coursework. They also provide community outreach, promote team building and multidisciplinary collaboration skills, and may integrate tools from traditional machine shops with a variety of technologies (such as 3D printers) and prototyping approaches (Forest *et al.*, 2014).

Anecdotally, these makerspaces may serve a wide array of firms from relatively traditional firms, to non-profits and individual artisans and writers. One such facility in Muncie, Indiana includes a brewery and bar, a university led bookbinding class, a commercial printmaker, a self-employed local writer, a non-profit arts group and a dozen part-time local artists (Ohlenkamp, 2018). This eclectic mix of activities in a facility designed and publicly funded to house small scale manufacturing startups does not appear to be unusual, though reasonably effective data on the mix of tenant firms in other places is not readily available.

Business incubators, makerspaces or co-working spaces typically serve three functions. They provide office or working space with shared equipment, internet access and other amenities; they assist in capital access, and they provide specialized business support services such as accounting and marketing (Osman, 2014). Though in practice these types of services can develop in private real estate and consulting markets, in practice the public sector is heavily involved in the development and operation of these "business facility" incentives.

The rationale for public sector involvement with business facilities incentives is related to the broader economic benefits believed to emanate from these facilities. These benefits include job creation, technology transfer, commercialization of new technologies, creating wealth (Al-Mubaraki and Busler, 2013), supporting small- and medium-sized enterprises and generating new jobs (Autio and Klofsten, 1998), stimulating and supporting entrepreneurship (Grimaldi and Grandi, 2005), aiding in the early stage growth of companies (Allen and Rahman, 1985), increasing the probability of new business success (Lumpkin and Ireland, 1988), and promoting entrepreneurship development and technological innovation in small and medium enterprises (Adegbite, 2001).

These business facility incentives have been the focus of a considerable amount of managerial and entrepreneurial research (Sherman and Chappell, 1998; Phillimore and Joseph, 2003; Hackett and Dilts, 2004; Amezcua, 2010). This research has focused on firm-specific outcomes, the process of innovation and documenting managerial practices at these facilities. Surprisingly, there is a paucity of analysis of the regional economic impacts of "business facility" incentives or more rigorous welfare analysis of these incentives. Indeed, as late as 2013, one study reported "[t]o our knowledge, there are no studies examining the impact of incubators on regional growth" (Osman, 2013, p. 7).

To address this rather glaring omission in public policy research, a model is developed to examine the effect of "facility incentives" on broad measures of economic activity within a region. Facilities incentives in Indiana are the focus because Indiana is a representative place for these types of activities, and data on the number of government-sponsored facilities incentives by type is available.

Since the early 1960s, Purdue University has used business incubators with a technology focus to commercialize its engineering and science research. Today most universities operate one or more such facilities. Figure 1 illustrates the growth of these facilities in Indiana.

This research does not examine the level of funding for individual businesses within these facility incentives, individual firm performance in the context of these activities, or the types of firms or industry mix within facilities. This research focuses on publicly sponsored facilities (university or local government) not private sector activities. There are two reasons for this. First, data limitations largely make identifying wholly for-profit incubators impossible. Second, this research seeks to address a component of welfare analysis explainable by the impact of public spending on facility incentives. The research does not examine the effectiveness of private sector incubators, co-working spaces or makerspaces. Finally, this study does not address programmatic differences across these facilities. Locations with facility incentives that provide distinct small business or entrepreneurial services may generate different outcomes and research on these issues is worthy of future analysis.

The remainder of the paper organization is as follow. The next section includes a review of relevant research. In the following section, the estimation method, including an identification strategy based on educational attainment at the beginning of our sample period, is developed. Regions with higher levels of educational attainment might enjoy significantly different economic conditions than other places. Therefore, if growing and prosperous places choose to engage in facilities incentives, they might capture growth, which would otherwise have occurred. If struggling communities rely on these incentives, then estimated growth might suffer a downward bias. To address this, we outline the specification of a model of regional impacts and explain econometric considerations that accompany this method. The final section reviews and summarizes the model results and discusses implications.

Previous studies

Peer-reviewed analysis of facility incentives by state or local governments is sparse, while direct empirical estimates of the effect of facility incentives remain non-existent. While there are a number of studies examining individual firm performance within incubators and other facility incentives, that work is troubled by selection bias (Colombo and Delmastro, 2002; Cheng and Schaeffer, 2011). Among the more heavily cited studies of incubators in the

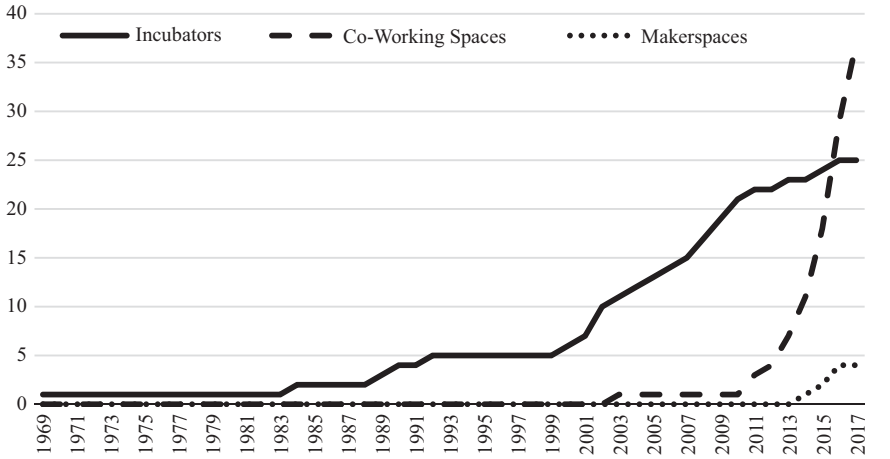

Figure 1.
The number of business facility incentives in Indiana

economic development literature is a critique of an earlier analysis (Molnar *et al.*, 1997) funded by the Economic Development Administration and conducted by the National Business Incubator Association (Bearse, 1998). In his critique, Bearse (1998) reviews the problems of selection bias of participating firms, the absence of rigorous firm comparisons and a dozen additional criticisms of empirical methods and research hypotheses. This paper is the most exhaustive critique available in the peer-reviewed literature. A broad reading of the literature reveals focus on firm-level impacts of participating or tenant firms and the accompanying services provided to them (Theodorakopoulos *et al.*, 2014).

Research focused on the regional impacts, or economic development effects of facilities incentives represents a narrow literature, devoid of spatial analysis, quasi-experimental design or identification strategies. None of these approaches, which might isolate the impact of these incentives on regional economic performance, are reported in the literature. While it may be necessary for facility incentives to affect participant firms, this is not a sufficient condition to establish regional benefits, much less general welfare effects.

Tamasy (2007) reviewed the literature on technology-oriented incubators with a focus on public sector policy involvement. Reviewing 53 studies on the effectiveness of these incubators on firm-level growth, she concluded that the evidence is strongly against positive welfare effects. She reported no meaningful evidence that these facilities boost firm survival, innovativeness or growth, and only provide a "[…] minor stimulus for individuals starting a business" (p. 10). She concluded that public sector support for technology incubators should be withdrawn, and that their continued existence should rely upon private sector decisions. Her work echoed an earlier review of science parks, which included incubators, that concluded they played little role in regional growth (Phillimore and Joseph, 2003).

Amezcua (2010) examined the effects of incubators on firm births and deaths in all US states and reported sobering results. His review of this work opened with "[r]esearch on business incubation is scant, especially peer-reviewed studies that empirically evaluate the impact of business incubation on new venture performance" (p. 1). His empirical work reported that the growth and survival rates of incubated firms are lower than that of all new startups nationwide. He also found that incubators associated directly with universities perform better than those that were not, confirming other research on the issue (Audretsch *et al.*, 2006). However, much of this work is an extension of university-sponsored research and development. Amezcua's work suggests that underlying regional conditions, such as the presence of a research university, dominates measures of regional economic growth. He also reported that low "graduation rates" at many publicly funded facilities resulted in a public subsidy to the firms, rather than a traditional incubator process.

Examining regional development, Liargovas (2013) reported that regional factors such as education, infrastructure and other institutional factors largely determines the impact of facility incentives on regional economies. This is not a controlled empirical study, but this result echoes Amezcua's analysis suggesting regional factors matter more than facilities incentives.

Examining incubators in California, Osman (2013) concluded that incubator research offers no evidence of links between incubators and regional growth. This work is useful because it focused heavily upon a single state's experience in light of existing research.

Studies which assess the impact of facility incentives without directly addressing endogeneity may be informative, but do not address the central hypothesis for government intervention. Do facilities incentives change local economic performance? Examples of useful studies that do not address this issue include Markley and McNamara (1995), Barber *et al.* (2012), Reese and Ye (2011) and Qian *et al.* (2011). Ogutu and Kihonge (2016) reported that a higher level of incubator development correlated with GDP in a cross-national descriptive study. An early review by Hackett and Dilts (2004) is also informative regarding recent research focus on incubators.

The research literature examining the suite of facility incentives is broad, but does not convincingly address whether the presence of these facilities alters economic performance in regions. This is especially worrisome from a policy perspective because state and local governments are deploying these facilities at an accelerating rate (as illustrated in Figure 1). To address this issue, a model of business facility incentives, which corrects for endogeneity and differentiates by putative impact and type of facility, is developed.

Theoretical considerations

How would a business incubator, co-working space or makerspace affect regional economic development? Over the past several decades, local governments and universities have taken an increasing role in local economic development (Betz *et al.*, 2012; Lendel and Qian, 2017). The direct benefits of business incubators, co-working spaces and makerspaces are the jobs created through the startup firms located in the facility.

Other potential impacts of facility incentives are linked to the benefits associated with firm clustering. The benefits of clustering include sharing intermediate inputs and knowledge spillovers (O'Sullivan, 2012). These agglomeration economies—sharing of intermediate inputs and knowledge spillovers—generate higher productivity and lower production costs so that firms in clusters expect to experience more rapid employment growth. At their essence, business incubators, co-working spaces and makerspaces are clusters of firms. Co-location within a common facility allows these firms to share intermediate inputs related to the facility itself such as conference space and administrative support, which lowers operating costs and provides opportunities to interact with other firms in close proximity.

Perhaps the strongest agglomeration effect comes from knowledge spillovers among the firms in the facility. Knowledge spillovers, a type of human capital externality, are the benefits that accrue from shared knowledge among people. Social interactions among creative people tend to increase innovation and productivity (Moretti, 2013). The collaboration and experimentation among firms in these facilities has the potential to create successful businesses that grow into larger firms and provide direct and indirect jobs spurring the regional economy.

Likewise, the lack of impact of these facilities on regional economic development can be linked to a variety of factors. Local government or university focus on or funding of the incubator, makerspace or co-working space may crowd out other activities that may have a larger impact on economic development. Kolympiris and Klein (2017) find that research quality and quantity as measured by patent applications and citations actually decrease after the formation of university sponsored incubators and suggest that these incubators drain resources (or crowd out) other university research activity.

These sorts of facilities suffer from the same special-interest problem as other government programs: the benefits associated with the facility are concentrated among few people while the costs remain widely dispersed among many people (Wilson, 1974). The beneficiaries of these facilities include the firms that locate there, public officials who can point to the facility as an accomplishment of their administrations, construction firms that build the facility, perhaps downtown interests if the facility is located in a downtown area with excess space, etc. The costs of such facilities are dispersed among taxpayers if local governments provide funding. This situation provides an incentive for beneficiaries to pursue the activity and lobby for government funding to support it, while taxpayers have little incentive to organize opposition.

In the economic development arena, most local governments do not have a strong record of picking "winners." This results in part from imperfect information about the costs and benefits related to the facility itself, and in situations where firms operating within the facility go through a selection process, imperfect information about the firms,

raising questions about the efficacy of government intervention in market activities. A review of the literature on local economic development incentives targeting firms reveals no or limited effects of these incentives on economic outcomes (Anderson and Wassmer, 2000), that local governments often offer incentives to compensate for negative attributes of the local area (Byrnes *et al.*, 1999) and relatively small fiscal benefits compared to the costs (Kang *et al.*, 2016).

Data and empirical strategy

Data on the facilities incentives, collected from the *Indianapolis Business Journal*'s list of business incubators in Indiana and the Indiana Economic Development Corporation's list of makerspaces and co-working spaces, were used in this analysis. The types of services that each facility offers and purely private sector facilities, which exist in the state, are not included in the analysis. The focus is on public (or quasi-public) facility incentives.

As identified in the literature, the most convincing research suggests the impact of business facility incentives on a regional economy largely depends upon the underlying conditions within the region. Places with favorable tax and capital environments, and most especially stronger human capital might observe associated economic benefits of facility incentives. However, this observation suggests significant risk of endogeneity bias in modeling the impacts of facility incentives. To address this, a sparsely parameterized model of the economic effects of business facility incentives is developed.

Specifically, the effect of business facility incentives on total employment, proprietor employment and the average wage per job in Indiana counties from 1971 through 2015 is tested. The basic model takes the following form:

$$N_{i,t} = \alpha + \alpha_i + \gamma Z_{i,t} + \pi R_{i,t} + \rho \widehat{W} N_{j,t} + \varphi T + \theta \delta_{i,t} + \varepsilon_{i,t} \tag{1}$$

where N, the dependent variable, is employment, proprietor's employment or real average wage per job (adjusted for inflation using the Consumer Price Index); α is a common intercept, and α_i is a county specific intercept, or county fixed effect; Z is the count variable for a facilities incentive (incubator, co-working space or makerspace). A recession dummy ($R = 1$ if one month during a year is recession, 0 otherwise) is included to control for business cycle activity. Spatial effects are captured with a first order contiguity matrix, $\widehat{W}$. This first order contiguity matrix is the population-weighted value of the dependent variable for the n contiguous counties, thus:

$$\widehat{W} = P \begin{bmatrix} 1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & 1 \end{bmatrix}$$

where the diagonal trace size varies by the number of contiguous counties, j, to county i.

A time trend, T, and δ, an autocorrelation term of order 1, are also included. Finally, a white noise error term, ε, clustered cross sectionally and assumed i.i.d., $N(0, \sigma^2)$ is included. The subscripts i and j denote county cross sections, and t is time specific over the panel period of 1971–2015. The coefficient of interest is γ.

Parameterizing the model in this way is undertaken within the context of a parsimonious identification strategy motivated by the observation that "a region's endowments base differentiates its ability to benefit from additive effects generated by the presence and operation of business incubators" (Liargovas, 2013, p. 2).

To test effects, the broadest measure of regional economic activity is examined: total employment. In addition, proprietor's employment, which is a proxy for small firm growth,

is used. Finally, job quality in affected counties is tested by examining the real average wage per job. Descriptive statistics are shown in Table I.

The business facility count variable, Z_{it}, used in the model is likely endogenous. In the model, we are testing the hypothesis that counties with more business facilities incentives have higher employment growth, but counties with higher employment growth are also likely to have more business facilities incentives. We use a two stage instrumental variable approach to address this endogeneity concern. The identification strategy employed here includes the share of the population with a bachelor's degree in 1970 to adjust the facility incentive count. The 1970 bachelor's degree share is likely to be correlated with the number of business facilities incentives but not employment in successive years. The first-stage model takes the form:

$$Z_{i,t} = \gamma + \beta BA_{1970} + \omega_{i,t} \tag{2}$$

The share of adults with a bachelor's degree or higher in 1970 acts as a strong predictor of the number of incubators, makerspaces or co-working spaces, though there were not more than two in Indiana until the 1980s. The model results for the identifying equation appear in Table II.

This estimate passed a weak instruments test with $\omega_{i,t}$ using the method suggested by Stock and Yogo (2005). The test statistics for the weak instrument test appear in Table II. Implementing this identification strategy involves substituting the adjustment to the count value of facility incentives such that the estimated equation takes the form:

$$N_{i,t} = \alpha + \alpha_i + \gamma\left(Z_{i,t} - \omega_{i,t}\right) + \pi R_t + \rho\widehat{W}N_{j,t} + \varphi T + \theta\delta_{i,t} + \varepsilon_{i,t} \tag{3}$$

To control for population differences among counties, the dependent variable and spatial autocorrelation variable are scaled by population.

Table I. Summary statistics

	Mean	Median	SD	Source
Makerspaces (count variable)	0.000694	0	0.026334	IBJ, IEDC
Business incubators (count variable)	0.077475	0	0.308356	IBJ, Top 25 list 2012–2016
Co-working spaces (count variable)	0.02	0	0.220065	IBJ, IEDC
Sum of facilities (count variable)	0.11	0	0.450323	IBJ, Top 25 list, IEDC
Total employment	33,685.9	14,513.5	71,588.03	BEA
Proprietors employment	5,365.6	3,270	7,882.285	BEA
Average wage per job (real, $1,000)	40.75	40.03	8.37	BEA
BA share in 1970	6.46%	5.6	3.292551	Census
Recession	0.297	0	0.457376	NBER

Table II. Selected results of the first stage estimate (facility type on intercept and BA 1970, with *F*- and *t*-statistics for weak instrument tests)

$n = 4{,}508$	C (t-statistic)	β (t-statistic)	F-statistic null is $\chi^2 = 0$
Incubators	−0.09 (−9.6)	0.028447 (20.16)	406.82***
Co-working space	−0.033 (−4.62)	0.008929 (9.04)	81.88***
Makerspaces	−0.0014 (−0.87)	0.000595 (2.66)	7.125***

Notes: T-statistics in parentheses. ***Statistical significant to the 0.01 level using standard F-statistic or t-statistic

Results and discussion

The model results include 12 estimates on four dependent variables, testing the effects of the number of facility incentives (co-working spacers, business incubators, makerspaces and their sum) on total employment, proprietor's employment and the inflation adjusted average wage per job in Indiana counties from 1971 through 2015.

The estimated coefficients for the spatial and temporal autocorrelations or the recession dummy are of little interest in this analysis. The coefficient, γ, provides the estimate of the marginal effect of the count of the facility incentives on the dependent variable. Both the OLS estimates and those from the model using the educational attainment identification strategy to correct for endogeneity are reported (Table III). Full results for the later model (endogeneity correction) are available upon request. The strong correlation between the number of facilities incentives and the initial share of adults in a county with a BA degree implies endogeneity bias. Quite simply, places with better-educated workers are more likely to have these facilities, biasing any observation of growth resulting from them. However, the OLS estimates suggest that the magnitude of this bias is not sufficient to alter the policy recommendations.

The OLS estimates (Table III columns I through III) show no casual effects between the various measures of facilities incentives and the measures of economic activity. Again, the concern over endogenous choice of adopting a facility incentive motivated our identification strategy. The results appear in Table III columns IV through VI.

Column IV shows the relationship between business facilities incentives and the broadest measure of regional impact: county total employment. Recall that the employment data are scaled by population as in Basker (2005). In no instance are these estimates near traditional levels of statistical significance. Taken separately or jointly, these estimates reject the hypotheses that the number of makerspaces, business incubators or co-working spaces change aggregate employment in the county in which they are located.

Testing the impact of these facilities on proprietor's employment (column V), makerspaces or business incubators show no effect. The estimates for co-working spaces and the sum of these facility incentives are statistically significant at generally accepted levels. However, the magnitude of these coefficients indicates very modest effects, with each new co-working space adding roughly 2.3 new sole proprietor jobs in a county. For the sum of facility incentives, the creation of proprietor jobs is only 1.3 in the typical county. Though these values are statistically significant, the economic consequences of these facility incentives are a trivial one-time event.

Likewise, the effect of these facilities on the average wage per job (column VI) is not statistically meaningful at any traditional level of significance. The statistical power of these estimates is fairly strong with 92 observations, and 47 years of data (46 estimated, given the AR1 specification). This yields a sample of 4,232 observations.

Rapid growth in facilities incentives since the early 2000s motivated a final set of analysis, by repeating the full set of estimates on a shorter time period (2000–2015). Those results appear in Table IV.

These estimates largely mimic the results in Table III (estimates VII, VIII and IX). We find no statistically significant effect of facilities incentives on total employment. The total number of facilities incentives in a county does have a positive and statistically significant impact on proprietor's employment but magnitude of the sum of facilities on proprietor's employment is far too small to rise to the level of economic meaning. Though statistically significant, the coefficient suggests that one new facility would create roughly 2.3 additional proprietorship related job. This, by any standard is not a relevant impact on the regional economy.

Two coefficients are significant in the 2000–2015 period for average wage per job (Table IV). These too are small, with an additional facilities incentive or a single

Table III.
Estimation results, 1971–2015 sample

	OLS estimation results for γ (Z_{it})			Estimation results for γ ($Z_{it}-\omega_{it}$)		
	I	II	III	IV	V	VI
$n = 4{,}232$	Total employment (t-statistic)	Proprietor's employment (t-statistic)	Average wage per job (t-statistic)	Total employment (t-statistic)	Proprietor's employment (t-statistic)	Average wage per job (t-statistic)
Business incubators	−0.00197 (−1.09)	0.00037 (1.12)	0.15 (0.66)	−9.88E-04 (−1.09)	0.00018 (1.13)	0.07887 (0.67)
Co-working space	−0.00019 (−0.09)	0.00036 (1.14)	−0.013 (−0.06)	−6.21E-05 (−0.06)	0.000495** (2.11)	0.01997 (0.17)
Makerspaces	0.00902 (0.82)	−7.37E-05 (−0.21)	−0.209 (−0.19)	0.004512 (0.82)	−3.68E-05 (−0.19)	−0.10464 (−0.20)
Sum of facilities	−0.00107 (−0.69)	0.00049 (1.41)	0.08 (0.78)	−0.00051 (−0.66)	0.00029* (1.68)	0.05 (0.64)

Note: t-statistics in parentheses. *,**Statistical significant at the 0.10 and 0.05 levels, respectively

co-working space raising the average wage per job by roughly $150 to $180 per year or roughly 0.4 percent. This would result in an additional facilities incentive raising the average county total wages by roughly $6.6 m. However, these estimates are very sensitive to the period under analysis. Adjusting the start date for the co-working spaces regression by four years in either direction reduces the statistical significance to well below acceptable levels. If we test just the post-recessionary period, 2010–2015 (552 observations), we lose all statistical significance.

Another consideration might be increased probability of false negative (type II error) in our proliferation of tests (we conducted 36 reported regressions and 3 additional estimates discussed in the next paragraph, but not reported). Moreover, longer time series are generally better for analyzing these types of shocks, since they incorporate more information about trends and business cycle activity that would otherwise be unavailable in a shorter analysis.

Finally, all of these estimates are insensitive to the exclusion of a county fixed effect variable, except for estimates on proprietor employment for co-working spaces and the sum of facility incentives (model V). In both instances, the size of the estimate and the statistical significance decline when cross-sectional (county) fixed effects are eliminated. This is important, because if there is some correlation between the share of BA graduates in a county in 1970 and employment and wages in later years, this would most likely be captured in a cross-sectional control. This does not change the conclusion that these facilities incentives have no economically relevant impact on a local economy.

Conclusions and implications

This is one of the first research efforts to model the impact of facility incentives, while acknowledging the identification problem of incentive location. Our results suggest no meaningful effect, either statistically or in observed magnitude (depending on the model), for facilities incentives as a mechanism for improving economic outcomes in regions. Though the more expansive model (1971–2015) shows increases in new proprietor employment, the effect is far too small to justify even minimal public investment (a one-time increase of proprietor employment of roughly 2.3 jobs, which could be interpreted as shifting employment from non-proprietor employment. Analysis of the models for the more recent period (2000–2015) shows statistically significant but economically unimportant effects on proprietor employment and very small effects of facilities incentives on average wage per jobs. However, this result is not robust to even modest changes in the temporal specification of the model.

The model results presented here suggest that the benefits of clustering are not particularly apparent in business facilities incentives. The lower costs and innovation that result from the sharing of intermediate inputs and knowledge spillovers in a cluster do not have statistically discernable effects on regional employment for incubators or makerspaces.

	Estimation Results for γ $(Z_{it}-\omega_{it})$		
	VII	VIII	IX
$n = 1{,}472$	Total employment (*t*-statistic)	Proprietor's employment (*t*-statistic)	Average wage per job (*t*-statistic)
Business incubators	0.0007 (1.04)	0.00035 (1.51)	0.00035 (1.51)
Co-working space	−6.21E-05 (−0.06)	0.00037 (1.48)	0.181752* (1.75)
Makerspaces	0.00444 (0.81)	−9.44E-05 (−0.30)	−9.44E-05 (−0.30)
Sum of facilities	0.000779 (1.18)	0.000416** (2.14)	0.159589** (2.40)

Note: *,**Statistical significant at the 0.10 and 0.05 levels, respectively

Table IV. Estimation results, 2000–2015 sample

The impact of co-working spaces is not economically discernable. Given the low incubator graduation rates reported in other studies, these results are not surprising. The data used in this analysis do not provide information about the industry mix of firms in the facility or distinguish between facilities focused on technology or other sectors. Additional analysis of facility characteristics might show favorable results.

While public officials often tout the benefits of the newest types of facilities incentives—co-working spaces and makerspaces—this analysis does not find meaningful differences in the economic impacts of different types of facility incentives. Thus, the current rush to subsidize co-working spaces and makerspaces as novel adjuncts to business incubators is unwarranted. While not the focus of this analysis, public spending on facilities incentives may crowd out spending on other functions like infrastructure, public safety or education that might have had a larger impact on the regional economy.

Finally, studies examining the impact of local economic development incentives such as property tax abatement and tax increment financing have found these incentives to have no to small impacts on various economic outcomes. Business facilities incentives show similar results. Business incubators and makerspaces have no impact on total employment, proprietor's employment or average wages in any of the models examined. Co-working spaces have positive effects on proprietor's employment and average wages but the magnitude is so small that the costs (subsidies) associated with these facilities are likely to be larger than the benefit (increase in wages).

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