Analysis of Induced Institutional Innovation Alternatives For Provision of Local Government Services

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Disciplines
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ANALYSIS OF INDUCED INSTITUTIONAL INNOVATION
ALTERNATIVES FOR PROVISION OF LOCAL
GOVERNMENT SERVICES

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Abstract

An induced innovations framework was used to develop and test a model of factors affecting county government's decisions to adopt alternative service delivery methods. Size measures of population and tax base, fiscal measures of tax revenues, the share of tax base in agriculture and access to human capital were significantly related to county use of innovations.
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Many local government units in rural areas of the nation are being confronted with fiscal stress from several sources. These sources include structural change in the local economic base, demographic shifts, reduced intergovernmental revenues, and declining property values. The range of possible choices appear to encompass some combination of economic development efforts, raising effective tax rates, reducing services, or restructuring institutions to provide services more efficiently.

Institutional restructuring or innovation refers to internal restructuring, functional consolidation, geographical consolidation, and/or privatization. It is often presumed that community choice regarding institutional innovation is related to a variety of economic and social factors.

In this study, we develop a theoretical model that relates selected economic and social factors to institutional innovations. Second, we develop an empirical model to test the existence of these hypothesized relationships using observed institutional innovations. Finally, we outline the conclusions and implications resulting from the empirical analyses of community choice.

Previous work by Deaton (1983) applied the induced institutional innovations framework approach of Ruttan-Hayami to analyze the local response to a shift in intergovernmental revenue for the case of public education (Ruttan). The framework developed by Ruttan-Hayami provides...
a set of axioms under which institutional innovations are likely to occur:

a) The benefits derived from new income streams generated by institutional innovations needs to exceed the costs of establishing and using new institutional arrangements.

b) The rate of change in the supply of institutional innovations will be determined by the marginal costs of mobilizing the economic and political resources needed to design new institutions.

c) There needs to be sufficient returns in terms of greater prestige or increased political support that accrues to the "political entrepreneur" for the entrepreneur to introduce institutional innovations.

The cost reducing factors can be interpreted as inducing both technical and institutional innovations by causing changes in factor prices. These axioms provide a criteria to evaluate the outcome of efforts to introduce institutional changes into the provision of local government services.

We can apply this framework to the behavior of local governments in response to declines in economic base and fiscal stress. In Figure 1, the isoquant $i_0$ represents the quantity of public goods that can be produced by a combination of tax based spending and by alternative nontax arrangements such as the privatization of certain services, contracting, or consolidation. Line BB represents and exchange ratio between tax revenues and nontax means of providing the public goods. An optimal equilibrium point $b$ occurs under a fiscal relationship prior to changes in the fiscal or economic environment.
The loss of federal revenue sharing and tax base declines raise the relative cost of using local taxes. This revenue loss results in a change in the tax-nontax exchange ratio CC. The local response to this change in tax revenues is expected to be either a reduction in the quantity of public services offered by local government, or a movement toward nontax means of providing these public services. Within the induced institutional innovations framework, a shift in the exchange ratio is expected to induce political entrepreneurs to develop new approaches or institutional arrangements to provide local public services as represented by isoquant i.
Theoretical Framework

In the public finance literature, one of the primary roles of local government is the provision of public goods and service. The mix is dependent on local values and resources. The public sector organizes to provide public goods by combining private and public resources. The public resources are represented by purchased services financed by taxes. Therefore, it is possible to examine induced innovations in a constrained maximization framework in which elected representatives respond to community preferences for public and private expenditures. It is assumed that local representatives seek to maximize the community welfare function:

\[ U = U(E, NT, X) \]

subject to the local government budget constraint

\[ E + C = T + (Y - T) \]

where \( E \) is dollar expenditures on local public goods,
\( NT \) is nontax dollar spending on local public goods,
\( C \) is dollar expenditures on all other goods,
\( T \) is own-source local revenue, and
\( Y \) is income of local residents.

The community is also limited by a balanced budget constraint where \( E = T \).

When tax revenues or income levels are reduced, counties can increase their utility by using nontax means of service provision.

A linear relationship is assumed for the \( i \)th county between the utility of adopting institutional innovation \( t \) and the characteristics of the \( i \)th county:

\[ U_{it} = X_{it} \beta_t + e_{it}; \ i = 1, ..., n; \ t = 1, 2. \]
Counties are assumed to choose new methods of service delivery if they can achieve a higher level of utility by doing so. The ith county will adopt an innovation if $U_{i2} > U_{i1}$. Once they choose to use an innovation, they are able to initiate any number of agreement which is a tobit type specification. If we define a variable, $Y_{it}$, to be an observed indicator of a county's use of institutional innovations, we can write the empirical approximation of (3) as:

$$\begin{align*}
Y_{it} &= \begin{cases} 
X_i \beta + e_{it} & \text{if } X_i \beta + e_{it} > 0 \\
0 & \text{if } X_i \beta + e_{it} \leq 0
\end{cases}
\end{align*}$$

where $X_i$ is a vector of independent variables, $\beta$ is a vector of parameters, and the disturbances, $e_{it}$, are truncated normal variables.

The maximum likelihood approach suggested by Amemiya is used to estimate the parameters $\beta$ and $\sigma^2$. Since we are concerned with counties utilizing innovations, the problem is to estimate an equation in which the dependent variable is truncated from below. The density function for number of innovations adopted, given that the number of innovations is positive, is obtained by dividing the normal density function by the probability that the number of innovations implemented is positive. Therefore, the likelihood function based on the model in (4) is given as:

$$L = (y | y > 0; \beta, \sigma) = \prod_{i=1}^{M} \frac{f(e_i/\sigma) / \sigma}{1 - \Phi(\Theta_i)}$$

where $f$ and $F$ are the standard normal density and distribution function and $\Theta_i = -g(x_i, \beta) / \sigma$. Parameter estimates can be obtained by maximizing this likelihood function with respect to $\beta$ and $\sigma$. Amemiya has shown that the maximum likelihood estimator is consistent and asymptotically
normal and efficient for the case where $g(x_1, \beta_1)$ is linear in the parameters (Amemiya).

Hypotheses and Empirical Methods

Iowa is used as a case study of local government institutional innovation. Iowa is an appropriate choice for study because the economic base of the state is rather homogenous and dependent upon an agricultural base. The financial stress in the agriculture and rural private sector economic base, in turn, may create fiscal stress conditions which induce local government units to develop institutional innovations.

As a result, the empirical specification of the theoretical model is used to analyze previous Iowa county government decisions regarding adoption of institutional innovations (nontax methods of providing public services). The Iowa Code provides that local units of government may develop agreements with other government units and/or private agencies. These 28E agreements allow internal restructuring, functional consolidation and/or privatization, as well as, contracting for services, joint venturing, functional mergers, and development of multi-county agencies.

The Iowa Code requires that all 28E agreements be registered with the Secretary of State. Therefore, a county was defined to exhibit institutional innovation if it registered a 28E agreement with the Secretary of State's office. Furthermore, the number of 28E agreements registered between 1984 and 1986 was used as an indicator of the institutional innovations for each county. We believe that these years were appropriate due to the lag between local government fiscal stress and the financial conditions in agriculture and the rural economy during the early 1980s.
We may infer from related research (Orazem, Otto, and Edelman) that community preferences on institutional innovations are likely to be related to financial status indicators, technical community size indicators, and indicators of access to human capital resources. First, it may be hypothesized that communities with greater financial stress would be more inclined to seek institutional innovations. Second, larger communities are more likely to develop institutional innovations because of economies of size and specialization of city functions. Third, institutional innovations are likely to be greater in communities with greater access to human capital resources. As a result, the institutional innovations framework would be supported by this study if the analysis of observed institutional innovations are empirically related to measures of financial stress, community size and human capital variables.

Five variables were used as indicators of county government financial status (Table 1). The percentage of agricultural land in the county tax base (AGLPCT) is used as an indicator of potential fiscal stress and was hypothesized to be positively related to institutional innovations. Per capita income (INCOME) is inversely correlated with fiscal stress and therefore was expected to be negatively related to institutional innovations. Change in farmland values (LVALCH) is used as an indicator of change in the county tax base and was hypothesized to be negatively related to institutional innovations. Fiscal effort (TAXBUR) was expected to be positively related to institutional innovations. Finally, the county taxable valuation (TAXVAL) is inversely related to fiscal stress and would therefore be hypothesized to be negatively related to institutional innovations.
Two variables used as indicators of community size, population (POPUL) and county revenues from all sources (LREV) were hypothesized to be positively related to institutional innovations. As community size increases, we expected lower relative costs for institutional innovations, as well as, greater economies of size and specialization—which suggests greater returns to innovation.

Only one variable was used as a proxy for access to human capital. Here, presence of a college or university (COMCOL) in the county was hypothesized to be positively related to institutional innovation.

The data for estimating the independent variables of the model were collected from various Departments of state government. The Iowa Office of the Secretary of State provided primary data on 28E agreements. Using the above specification of institutional innovations, 85 percent of the 99 counties in Iowa exhibited 28E agreements. Since more than one 28E agreement can be initiated by each county, a Tobit model is deemed appropriate for analyzing the presence of multiple institutional innovations per county.

Empirical Results

Maximum likelihood estimates of the Tobit model are presented in Table 2. The ordinary least squares results, Tobit estimates and elasticities are presented for comparison. The Tobit results were estimated using SHAZAM.

The results are generally consistent with expectations. Although three variables are nonsignificant, the signs on all of the remaining significant variables are consistent with the hypothesized signs.
Three of the five indicators of county financial status LVALCH, Income, and TAXBUR were not significant in explaining institutional innovation. However, the coefficient for TAXVAL was significant and provided the highest T-ratio and elasticity compared to all other variables. The sign for TAXVAL indicates that as county property tax valuation declines, ceteris paribus, institutional innovation increases. At the sample mean values for the variables, the elasticity for TAXVAL indicates that a 1 percent decline in taxable valuation would be associated with 3.07 percent increase in institutional innovation agreements.

The sign for AGLPCT indicates that as the percentage of agricultural land in county tax base increases, ceteris paribus, institutional innovation increases. This is consistent with the hypothesized relationship.

Although the coefficient on income per capita and land value change were not significant, they do have the hypothesized signs. The sign for tax effort was inconsistent with our hypotheses, the coefficient was not significant.

Both county size indicators (POPUL and LREV) were significant. POPUL exhibits the second highest T-ratio and elasticity compared to the other variables. Evaluated at the sample means, the elasticity implies that a 1 percent increase in population is associated with a 2.45 percent increase in institutional innovation agreements.

The sign on LREV is positive in contrast to the negative sign for the previously discussed TAXVAL variable. Local revenue (LREV) includes intergovernmental revenues in addition to revenues from own sources. That is why TAXVAL is included as a measure of financial status, while LREV is
included as a measure of county size. As a result, it is logical to expect opposite signs for these two variables.

Finally, as expected, the proxy indicator for the level of human capital, COMCOL, was positively related to institutional innovation. Since awareness of institutional innovations is deemed an important part of the institutional innovation adoption process, it is logical to presume that the presence of a college or university would be an appropriate proxy which indicates a more open innovation and learning environment as well as access to knowledge of innovations and outreach programs on this subject.

Conclusions and Implications

In general the theoretical model developed to analyze institutional innovation behavior of local government units is supported by the empirical indicators of fiscal status, size, and human capital. All signs, except one, were consistent with the hypotheses and their coefficients were insignificant. Five of the eight variables were significant.

County population and total property tax valuation appear to dominate the other variables. These results imply that institutional innovations would seem to be associated with more highly populated counties with relatively lower property tax valuations. In contrast, more sparsely populated counties with relatively larger property tax valuations would be less inclined to adopt institutional innovations.

In addition, it would appear that innovation may be associated with presence of a university or college, larger proportions of agricultural land valuation in the property tax base, and presence of higher total local revenues to implement change.
Finally, it may appear that sparsely populated rural counties, without a college or university, with less productive agricultural land, and with less intergovernmental aid perhaps symbolize the government units which are perhaps the least likely to pursue institutional innovations. Yet these are perhaps the most likely candidates for mandatory consolidation which is currently being debated.

Within the axioms of the induced innovations model it appears that the political costs of lost autonomy and shared resources exceed the benefits or cost savings of a cooperative agreement for local "political entrepreneurs" in the more rural counties. This result implies that other local governmental reorganization issues in sparsely populated areas may be difficult to resolve without stronger incentives or more direct government involvement and information.

The results also imply that studies of local restructuring options and programs designed to provide outside technical assistance may be required to induce institutional innovation for public services in many of these rural areas. Perhaps there is a role for institutions like the Extension Service in providing technical assistance and facilitating this study process because the targeted audience represents Extension's traditional clientele.

Finally, a distinction is made between mandatory studies to explore the institutional innovation options and mandatory restructuring. The first concept of induced innovation accepts some measure of local government self-determination. However, the second approach presumes that a higher level of government would impose structural change. In accordance with the induced innovational model first discussed, the latter approach to institutional innovation is likely to occur only at a high political cost.
Table 1. Mean, Standard Deviation, and Definition of Variables Used.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>28EAG</td>
<td>4.58</td>
<td>10.5</td>
<td>Number of 28E agreements in county during 1984-86</td>
</tr>
<tr>
<td>AGLPCT</td>
<td>.412</td>
<td>.151</td>
<td>Percentage of county tax base in agricultural land</td>
</tr>
<tr>
<td>INCOME</td>
<td>11.74</td>
<td>1.173</td>
<td>Per capita income in each county ($1,000)</td>
</tr>
<tr>
<td>LVALCH</td>
<td>-.633</td>
<td>-.016</td>
<td>Change in farmland values, 1980-86 ($1,000)</td>
</tr>
<tr>
<td>TAXBUR</td>
<td>.028</td>
<td>.008</td>
<td>Per capita tax revenue as a percent of per capita personal income</td>
</tr>
<tr>
<td>TAXVAL</td>
<td>720.5</td>
<td>801.7</td>
<td>County taxable valuation ($ million)</td>
</tr>
<tr>
<td>POPUL</td>
<td>28.796</td>
<td>41.0</td>
<td>Population in each county (1,000)</td>
</tr>
<tr>
<td>LREV</td>
<td>7.412</td>
<td>7.454</td>
<td>County tax revenues from all sources ($ million)</td>
</tr>
<tr>
<td>COMCOL</td>
<td>.777</td>
<td>.417</td>
<td>Presence of 4-year or community college in county, 0=not present, 1=present</td>
</tr>
</tbody>
</table>

Table 2. Estimates of Linear and Tobit Probability Models and Elasticities of 28E Agreement Adoption by Iowa Counties, 1984-86.

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Linear(^a/) Estimate</th>
<th>T-Ratio</th>
<th>Tobit(^b/) Estimate</th>
<th>T-Ratio</th>
<th>Elasticities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-46.79</td>
<td>-1.72</td>
<td>-5.32</td>
<td>-1.10</td>
<td>--</td>
</tr>
<tr>
<td>AGLPCT</td>
<td>15.23</td>
<td>1.72</td>
<td>1.038</td>
<td>2.42</td>
<td>1.47</td>
</tr>
<tr>
<td>INCOME</td>
<td>.714</td>
<td>.87</td>
<td>.059</td>
<td>4.16</td>
<td>.64</td>
</tr>
<tr>
<td>LVALCH</td>
<td>-.418</td>
<td>-1.07</td>
<td>-.037</td>
<td>-5.49</td>
<td>-2.21</td>
</tr>
<tr>
<td>TAXBUR</td>
<td>-69.32</td>
<td>-.48</td>
<td>-31.32</td>
<td>-1.23</td>
<td>- .81</td>
</tr>
<tr>
<td>TAXVAL</td>
<td>-.022</td>
<td>-3.22</td>
<td>-.004</td>
<td>-3.57</td>
<td>-3.07</td>
</tr>
<tr>
<td>POPUL</td>
<td>.519</td>
<td>3.26</td>
<td>.092</td>
<td>3.24</td>
<td>2.45</td>
</tr>
<tr>
<td>LREV</td>
<td>1.08</td>
<td>1.64</td>
<td>.245</td>
<td>2.09</td>
<td>1.68</td>
</tr>
<tr>
<td>COMCOL</td>
<td>7.25</td>
<td>3.56</td>
<td>1.29</td>
<td>3.50</td>
<td>.92</td>
</tr>
</tbody>
</table>

\(^a/n=99, R^2=.71\)

\(^b/n=99, \text{log likelihood: 286.46}\)
REFERENCES


Kansas Agricultural Experiment Station. "Can the Number of People Served Make a Difference in Cost of Local Government?" *Public Affairs Pamphlet Series*, December 1974.
