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The Influence of Evaluation on Technology Policy-Making and Program Justification: A State Level Perspective

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Introduction

I have worked as economic policy advisor to Governor Jim Hunt since early 1993. My responsibilities include recommending economic policies and legislation to the Governor; advising on tax policy, particularly as it affects economic development; and serving as Executive Director of the Economic Development Board, the key economic development policy board in North Carolina. I am also engaged in technology policy as it affects economic development.

I've been asked to talk about how the current state of evaluation in modernization influences policy – how we use it and how useful it is. I'm going to draw pretty heavily from my own experiences in North Carolina, but I don't think that's atypical of the policy and political setting in most other states.

Much of the discussion at this conference is directed to evaluation of modernization policy from the federal perspective. Since NIST is funding this conference, that certainly makes sense. More seriously, NIST is clearly dedicating significant resources and leadership in developing improved methods for evaluating the impacts of modernization services to forms. If federal issues alone drive development of evaluation processes, however, we will be ignoring the information needs of another critical partner -- state government. At least as much attention must be paid to how states evaluate modernization policy as to federal needs – and I suggest that, given the importance of state involvement to the long term future of NIST's strategy, much more attention should be paid to the state level than is now the case.

The original regional modernization centers were clearly federal creatures, based on a federal agency view of how a modernization strategy would work, and how it would be justified. NIST's current strategy, however, depends heavily on building upon existing state infrastructure, funded with state appropriations. That means state goals as well as federal goals must drive the development of the system if it is

to prosper. And while industrial competitiveness and technological leadership may drive federal agendas, most states, I believe, view technology deployment and modernization as an arm of state development policy. That requires that performance be measured in terms of state development objectives, which require performance measures beyond firm competitiveness or cost-benefit calculations for a particular program. Modernization dollars have to compete for other claimants for economic development funds.

Given that, I want to suggest three points in my comments to start this discussion.

1. That state governments will view modernization programs as a component of existing technology extension efforts, and that will shape what kinds of evaluation will be effective in talking with governors and state legislators.

2. That state governments will view modernization dollars as one element of overall economic development expenditures, and thus the issue is not simply whether modernization programs are effective, but how much they add to gross state product, job creation, and wages compared to competing expenditures for state dollars.

3. That we are not starting with a blank slate in the Manufacturing Extension Program – that most states have some experience with technology development and deployment programs, and that will color what standards and expectations they apply to MEP and modernization in general.

Background on State Roles in Deployment/Modernization

Before I begin I should tell you a bit about North Carolina, since for those of you who aren't familiar with our economy we may seem an odd choice to talk about state views on evaluating modernization programs. North Carolina is often viewed through the lens of textiles, tobacco, and basketball. Not that these aren't important, of course. In fact, measured by employment, textiles and apparel, furniture, and lumber and wood represent about 48 percent of manufacturing employment – although less of manufacturing production. And tobacco manufacturing represents about 20 percent of manufacturing output in the state economy. The economy is rapidly changing, however, as North Carolina's economy continues to go through a major transition in both manufacturing and non-manufacturing industries. Pharmaceuticals, plastics, and automotive components are the fastest growing manufacturing sectors and about 20 percent of manufacturing employment is now classified in high-technology sectors. Strong growth in financial services and business services is making those sectors a larger share of the state's economy.

North Carolina remains among the most industrialized states in the nation. While we rank tenth in population, we rank eighth in value of manufacturing shipments and first in the percentage of the workforce in manufacturing. And contrary to the national picture, manufacturing employment continues to grow in the state although its percentage of the labor force is declining.

Like many of your states, North Carolina became strongly interested in technology transfer in the late 1970s. (Although my state's Industrial Extension Program began in the late 1950s, and technology related centers have a long history at NC State University.) Early on, this was fueled by interest in entrepreneurship, new product development, and new technologies. In a handful of states, however, this extended by the 1980s to a revived interest in traditional manufacturing. While programs were often small and marginal, in terms of outreach, they gradually spread from the North Central to the Mid-West and eventually to the Southeastern States. (Although I would point out Georgia has the largest industrial extension program in the country.)

North Carolina's experience is perhaps typical. The initial development of a technology development strategy was driven by a

comprehensive science and technology strategy designed in the late 1970s; roll-out was more piecemeal, however, arising from gubernatorial proposals, legislative actions, the demands of important industry sectors, or federal funding opportunities. By 1995 North Carolina was spending about $37 million annually on technology development and deployment programs, more than any other state according to a Battelle Institute study. Because of what the study did and did not count I don't think we can rely too heavily on these numbers, but the central point is that states including North Carolina were spending substantial sums on technology development and deployment.

In North Carolina, and I suspect other states, this number didn't include expenditures in regional universities and technical colleges affiliated with technology deployment, largely because good numbers aren't available. If these numbers were included, state expenditures in technology development would be higher.

Nor do they include tax-side expenditures. North Carolina, like many other states, has a lower sales tax rate on purchases of equipment and machinery used in manufacturing. And North Carolina recently adopted an investment tax credit to encourage modernization of existing manufacturing plants as well as to encourage location of new facilities in the state. If tax side expenditures were added to direct appropriations, state financial support for modernization would be rated higher.

Through our Economic Development Board, and the NC Alliance for Competitive Technologies, headed by Walt Plosila, we attempted an accounting of all technology and modernization related expenditures. This eventually included 60 some individual programs affiliated with universities, non-profit organizations, technical colleges, state government, and joint partnerships with industry. The investment was substantial, particularly when viewed over time. The two largest investments were in industry specific sectors for new technology development and deployment – the biotechnology center and the microelectronics center. Since the early 1980s these two institutions alone received about $300 million in state funds – about $26 million per year recently until a change in policy, which I'll discuss in a moment.

These sums are large, but put into the context of the overall economic development budget they shrink somewhat in size. Depending on what's counted, the state funded portion of the economic development is about $160 million annually – that's appropriated dollars, not tax side expenditures, federal dollars, or private match or fees. That's held fairly constant at about 1.5 percent of the overall state appropriated budget. Technology and modernization expenditures account for about 22 percent of those appropriations.

North Carolina's initial MEP award was $3 million over two years, and we're looking forward to a second round. That funding is a necessary component of Governor Hunt's technology extension strategy, outlined in both his 1992 and 1996 campaign agendas, so it's an integral part of our overall technology deployment funding.

From the legislative perspective, however, it's less than 10 percent of what the state now spends annually on technology development and deployment, less than one percent of the state economic development budget. And from a legislative perspective, and largely from a policy perspective, there is no interest in technology or modernization in itself. It's only value is as an economic development tool. And that will a large degree frame how these programs are evaluated from a state perspective.

For one thing, the MEP will to some extent carry the experience – positive and negative – of the last decade of investment. The positive is that MEP can build on an infrastructure and deployment system that states have already put in place. While this can generate some friction, it does remove the need to completely fund a program from scratch.

On the negative side, by and large many of the technology development and deployment programs have done a poor job of clarifying mission and objectives, in designing performance measurement systems tied to those objectives, and in demonstrating how technology would

contribute to overall economic development. From a state, and particularly legislative perspective, this activity has been going on for a decade or more at funding levels from scores of millions to hundreds of millions of dollars. There's not much patience for providing more time to demonstrate results.

At the same time, state government has become more and more performance driven – predating to a large extent the federal interest in performance measurement. Texas, Oregon, and a handful of other states were early leaders, and others have quickly followed.

In 1991, KPMG conducted an 18 month, $3.5 million dollar performance audit of North Carolina state government – which a number of other states have repeated. The audit paid particular attention to economic development and technology issues. The final report called economic development an "octopus with many tentacles" – with myriad organizations operating independently without a single state strategy. The audit called for a single policy board to guide state economic development strategy and development of a single strategy with clear objectives assigned to various entities.

The Economic Development Board was created and charged with this responsibility in 1993. The Board was directed to develop an overall economic development budget, a strategy with clear objectives, and to recommend allocations of appropriations to various agencies and organizations based on their performance.

At about the same time, the state launched a major investment in performance budgeting. Rather than preparing state budgets line item by line item, similar programs with related missions or objectives would be grouped by function – such as economic development. To the extent possible, these related programs would be given common or related performance measures to enable comparisons across programs. The idea is that legislators will be better able to determine which programs are most successful, and to shift funds from less successful to more successful programs. In return, agencies would receive greater flexibility in using dollars to accomplish objectives rather than managing line items.

Eight of eleven functional budgets were completed last year. This year remaining functions will be brought under the performance budgeting system, including educational institutions. While programs like Industrial Extension will remain within the university for budgetary management, they will likely be grouped under the economic development function in the performance budgeting process. This will mean greater scrutiny of all technology development and deployment programs in terms of their accomplishments for economic development.

As most of you know, North Carolina also created the Alliance for Competitive Technologies and recruited Walt Plosila as its Executive Director. NC ACTs has been instructed to do specifically for technology programs what the Economic Development Board has done for overall economic development – create a single strategy, design performance objectives, and improve the operation of the overall system. NC ACTs has contracted with the Research Triangle Institute to help develop performance metrics for the overall system.

The central point is states are investing substantially in performance measurement systems that will apply across the board, and that will try to look at how particular programs fit into overall economic development strategies. And that will strongly influence how states look at and evaluate technology deployment programs.

Another major trend I want to point out before attempting to pull all this together is tax cuts. About 27 states had significant tax reductions in 1995, and there were additional tax cuts in 1996. North Carolina enacted $363 million in tax cuts in 1996 and $337 million in 1997. The revenue cost will be about $850 million five years out, from a budget that will be around $12 billion.

In addition, as in most states, there are growing demands for expenditures in education, infrastructure, crime reduction, and the environment.

This means that dollars for new programs will be scarce. Each new program expenditure will have to clearly justify itself.

Legislators may well look to ending or reducing some existing expenditures to pay for higher priority programs.

There is also somewhat greater propensity to fund programs through tax expenditures rather than appropriations. North Carolina enacted several tax credits to stimulate jobs and investment, including an investment tax credit and a research and development tax credit. These will total about $40 million annually in estimated revenue costs when fully in effect. It's not likely that an investment or research and development program that required state appropriated spending could have been funded at this level.

Implications for Policy and Evaluation

I've suggested three trends in state policy that will have a significant effect on how modernization programs are understood and evaluated at the state level.

1. A history of state investment in various forms of technology development and deployment, which has left in place a state infrastructure with its own history, positive and negative.

2. An insistence on evaluating modernization programs in the context of overall economic development and a growing emphasis on performance measurement in general.

3. An environment in which state appropriations for economic development in general, and technology deployment in particular, will compete with tax reductions, tax expenditures as economic development programs, and demands for funding for education, environmental protection, and crime prevention.

That means a program can no longer be justified for new or continued funding by demonstrating leverage of additional dollars, positive outcomes, or even a positive cost benefit ratio. It means that successful programs are those that can demonstrate close links to economic development, that fare well in comparison to alternative expenditures, and that use this performance to develop a political constituency.

Let me use one example of how these trends shaped a policy change in North Carolina, although I'm sure there are similar examples in other states. (There were certainly other program specific factors involved, but the environment for the policy change was shaped greatly by these trends.

MCNC, formerly the Microelectronics Center of North Carolina, was created in the early 1980s during Governor Hunt's second term. MCNC was recommended by the Board of Science and Technology to help North Carolina compete in the rapidly growing microelectronics industry. It was created as a private, non-profit organization in order to give it greater flexibility and to enable productive partnerships with the private sector. It had strong support from the universities in the state and from most of the large electronics and information industries companies. It received significant and consistent state funding over more than a decade, totaling over $200 million by 1995. This support continued through several different legislatures and through two terms by a Republican Governor who succeeded Governor Hunt. In addition, it received some industry and federal grant support.

As the industry changed, so did MCNC. It migrated its mission to become more integrally involved with information and communications technologies as well as microelectronics.

By many measures it was highly successful. It spun out the first Internet service company in the state, and it built a statewide system linking universities through high end telecommunications – and sold the name for that system to a private company for substantial sums. It partnered with several private companies for product development. It attracted substantial federal funds; by 1995 the organization was leveraging at least one dollar in federal and private funds for every state dollar appropriated -- $19 million in state funds supported a total budget of $40 million.

In 1995, however, the legislature told MCNC to develop a plan within six months that would enable it to become self-sufficient within four years. And the legislature reduced the budget for MCNC in 1995 and 1996 to begin that process. What caused this dramatic redirection in state policy regarding MCNC?

To some extent, there were political issues involved which played a role: a recent change in the legislative leadership, a renewed interest in budget cutting, and the loss of some powerful patrons in the state legislature.

In large part, however, it was the lack of direct, demonstrable links to economic development that made MCNC unable to weather this storm. As I noted earlier, by some metrics MCNC could easily demonstrate success. But they were not the performance measures that justified, to the legislature, continued state appropriations. MCNC's links to the universities and success in building a public infrastructure were not compelling to appropriations committees; the lack of ability to clearly demonstrate success in stimulating jobs and new investment were.

Two other factors were also involved, with some uncertainty about whether they will play continuing roles in policy direction for technology deployment. One is a concern about accountability of state funds expended through private not-for-profit organizations, which in many states are a principal vehicle for technology development and deployment services. The other was a growing sense that industry related services should be self-sufficient at some point – and after 15 years the legislature cut the cord.

The critical point is that evaluation measures can't simply be developed in conversations among technocrats and specialists in the field, or among program practitioners, academics, and federal agencies. They have to be developed with the ultimate customer in mind, state legislatures.

Evaluation measures must be tightly knit to the policy questions that in the end will drive funding decisions for the programs. Those policy questions include program efficiency and effectiveness, increases in productivity, and improvements in firm competitiveness. But they must also include questions of relative contribution of modernization programs compared to other economic development programs in accomplishing one or more of the key economic development objectives in the state.

In North Carolina we have three dominant policy objectives for economic development, which probably don't differ greatly from other states: high wage jobs, high quality enterprises, and widely shared prosperity. Job creation is less of an economic development issue in our state because of high levels of job creation; that gives us some lee-way to focus on issues of kinds of jobs and competitiveness of enterprises. Still, it can be an up-hill battle to focus the discussion of economic development on anything other than jobs, and most state performance measures still are predominantly concerned with job creation.

In the current climate of relatively strong levels of job growth in most states, there is the opportunity to focus on broader measures of economic health and vitality. Productivity, growth in value added, and wage growth are strong candidates for the most important measures of long term economic health. Distributional aspects of economic growth, both among people and places, will continue to be important measures of successful economic policy at the state level.

Building a Dialogue Around Evaluation

At an earlier NIST conference on evaluation, I heard many of the participants, who by and large represented MEPs, talking about the economic development organizations in their states as the "eco-devo" people – and it wasn't a complimentary term. It's like "Manufacturing Modernization is from Venus, Economic Development is from Mars." Or like Deborah Tannen's best seller on male/female communication, "You Just Don't Understand."

There's a perceived need to educate the economic development people about technology and how development really works. But like

most communication, that has to be two way. And for most state policy makers, in the end, despite all the other performance measures, if it doesn't lead to improved economic performance it doesn't count. There is little interest in firm competitiveness or technology development or deployment as an end in itself; it's the eventual contribution of these activities to improving economic development, and particularly the quality of job creation, that drives legislative interest.

In many ways North Carolina seems to have a very conducive environment for manufacturing modernization programs. We have a very supportive Governor who has made transfer of technology to the shop floor for small and medium-sized enterprises one of the key issues in his 1996 agenda for economic development. We have an established university industrial extension service, a number of technology transfer centers in regional universities and community colleges, and a history of state funding for technology development and deployment. We have 12,000 manufacturing firms, most small and medium sized, and a traditional base of industry that must modernize to survive. And that industry has political clout.

Yet we have had and will have to fight hard for every dollar that goes into manufacturing modernization. In part that's a reflection of tight budgets and reluctance to expanding state programs. In part it's a climate of focusing more on general improvements to business competitiveness through tax policy, infrastructure, and regulatory reduction rather than direct services. And in part it's a resistance to singling out a handful of firms for subsidized assistance while the majority must fend for themselves.

But it's also because when modernization programs are compared to other uses of public funds based on traditional economic development measures, they tend not to fare well.

In part, I think, it's because so many evaluation measures for modernization programs tend to be more internally directed – both at the program itself, and at the dynamics and outcomes inside the firm. While these are important for program metrics, they contribute little to policy concerns. Fundamentally, it's the external measures that are important for policy considerations – how will these firm level interactions contribute to an improved economy, as measured by increases in employment, increases in output and value added, increased productivity and higher wage levels, improved regional performance, or other contributions to economic development objectives?

Frankly, at times we continue technology policy on faith, because we have limited hard evidence that firm level interactions supported by the public sector have made significant substantial contribution to economic performance. We have some wonderful anecdotes, we have high levels of activity measures, and we have some evidence of improved firm performance that can be extrapolated to broader returns in tax revenues, or other measures.

In terms of public policy, there are several standards that need to be brought to bear in evaluation measures if they are to have real impact on modernization policy and funding.

Goal Clarification: How do we define success? What outcomes do we desire that makes this expenditure of public dollars worthwhile? Then how do we measure to test for those outcomes and whether they are significant enough to justify the level of effort required? Unless we have agreement on what constitutes desirable outcomes we can measure lots of good but useless things.

Much of the debate about evaluation seems to me to be about program performance absent a clear sense of the policy objectives the program was created to achieve. Or the system is driven by NIST's objectives – important, to be sure, but inadequate if the intent is to generate ongoing state support.

And my view is the system will collapse without state support – not just of the NIST modernization programs specifically but of the broader infrastructure they depend upon.

Evaluation programs must also recognize the issues of scale -- whether limited resources can make a big enough difference to justify their

continued appropriation. Let's assume a program is working. It has a positive cost benefit ratio. The firm has demonstrated cost savings. It is using more modern technology and product quality has gone up. The program could still be a failure unless this outcome is written large, thousands of times. And with the current and proposed scale of resources in the MEP program, it's difficult for me to see how that is going to happen.

Jack Kasarda of the Kenan Institute of Private Enterprise at UNC-Chapel Hill looked at job growth in NC over a four year period several years ago. While he found higher levels of job growth in small and medium sized firms, he found most of that growth in a relatively small number of high growth firms. Most firms started small and stayed small – or died. He also found a high degree of volatility; to generate 400,000 net new jobs required a gross job creation rate of 700,000 jobs.

This suggests to me that metrics built upon firm-by-firm intervention miss the larger point of the contribution of the activity to overall economic development. Instead of looking to effects on individual firms, should we look at key industries? Should we deal with regional clusters to build the competitiveness of a group of firms important to a regional economy? Should we better understand characteristics of high growth firms and target those enterprises?

In a presentation I heard a year ago, Phil Shapira introduced some data that suggested that not all interventions were created equal, that some activities produced greater returns than others. Should we refine the kinds of interventions to those that produce the greatest return and concentrate scarce resources?

In the view that an MEP should be a "one stop center" for manufacturing firms, there's been a tendency for some MEPs to expand their services into areas such as providing capital through loan pools or provide "soft" services such as human resource management or business technical services. This is wrong. These services should be built from existing state infrastructures in these areas. That means, of course, that evaluation systems have to cross program boundaries.

Summary

I've suggested several shortcomings of current discussions of appropriate evaluation systems for manufacturing modernization.

- They fail to involve the customer (the legislature) in building a consensus about the ultimate goal of these programs.
- They are not adequately linked to generally accepted economic development objectives.
- They are driven by federal issues of overall economic competitiveness and fail to adequately include state level issues.
- They are complex and difficult to communicate to the public.
- They fail to address issues of scale and how that might be addressed by focusing on particular strategies, such as sectors, clusters, or geography, or by concentrating on particular kinds of services.

That said, we owe a great debt to NIST's commitment and tenacity in developing best practices in evaluation of technology deployment. We clearly do need better information on program efficiency and effectiveness. Program managers do need better metrics to guide them in administration of program resources. And we need better information on how new technology leads to improved competitiveness at the firm level.

We also, however, need to devote our best thinking to policy questions at the state and federal level, to answering the question of how the state as a whole is better off as a result of these expenditures. And to do that we first have to communicate clearly and succinctly how technology is integral to achieving state policy goals.

The Influence of Evaluation of Technology Policy-making and Program Justification: Discussion

Bozeman. Here are some questions that have plagued me in my efforts to evaluate science and technology programs. Who is the constituency for evaluation and what difference does that make? Have there been times you've been fooled by who the constituency is? Does it ever worry you that you are developing metrics without a good understanding of cause? Does it worry you that what's the most important thing to economic developers is not MEPs but the condition of public schools? How do we go about evaluating R&D tax credit programs? How do we treat equivalency in evaluation; MEP has to stand up there against other state programs such as infrastructure programs. How do you parse out the effect of the MEP program relative to the effect of infrastructure? How do we evaluate the impact of perceptions? My thesis is that there is never an economic development program that is as important as perceptions. If that's true, how do we evaluate the impact of perceptions?

Ellington. As an MEP center manager, I have three investors: the federal government, the states, and the manufacturers. We've discussed the first two. I would venture that success is defined by our third investor, industry. I have an easier job of marketing to industry and by saying, "This is our track record, our success." Why can't I use this argument with state and federal governments? I don't think it's three different metrics. The people that vote politicians into office are the people who work in manufacturing. There is not perfect set of metrics. I pick the one with the shortest fuse to the customer.

Regarding targeting, I get the sense that we talk about targeting based on available data, such as the data collected in the census. But, I go back to manufacturing managers perspective that says we should target based on management styles. Certain managers have a higher propensity to success regardless of whether they are in the apparel or biotech industries.

Sears. We use the term "continuous improvement" a lot at MEP. I didn't hear Rick talk about evaluation in this sense—that is, evaluation which is intended to get the program to do a better job, to be more efficient and effective. At NIST we are doing a lot of evaluation work which is aimed at program justification of the type that Rick described, but a second important purpose of evaluation is program improvement.

Carlisle. Continuous improvement is part of evaluation practice. I addressed most of my comments at program justification because of the problem with the lack of policy. I would take issue with the focus solely on industry. The state is investing for broader reasons so having the customer happy is not enough.

Oldsman. The performance budgeting movement is sweeping the country, comparing program against program. Can you explain the ability to develop a set of metrics and the political process comparing dissimilar programs?

Carlisle. I don't know how performance-based budgeting will play out. More and more states are going to use it. Frankly, the current measures need to be improved. Many are developed by the state agencies themselves which creates the same problem of measures without policy. Right now performance budgeting is in the formative stages.

Feller. New programs are looked at differently than existing programs. That's why MEP is evaluated so rigorously; evaluation gives that fragile new program some legitimacy. The federal approach takes the best of the state programs without the worst of the state strategies such as giving tax rebates and starving infrastructure. It induces the states to follow a higher road strategy. There is a difference between the federal perspective and the state perspective which is redistributive and smokestack chasing.

Gray. The literature has looked at why evaluation is not used. One theme is that you don't have the real stakeholders involved on the front end. You have academics answering

questions that the real decision-makers didn't want asked in the first place. Another problem is that the originally stated goals were used in a political process to justify the program which people didn't believe were valid in the first place. They were just to get the programs through the political process. Can we expect in the political process that goals will be reasonable for evaluation?

Carlisle. Solving individual company problems will not be an adequate justification. You have to have a set of workable objectives. Like most states we rely to heavily on job creation measures. We've got to generate a higher number of companies that use more technologies. We focus on value-added, productivity, and wage rates, which is somewhere between the firm by firm approach and gross impacts on the economy.

Russell. You said that manufacturing extension will require significant investment from the states. How will you yourself make that decision?

Carlisle. In the program in North Carolina, we're trying to co-locate in the existing infrastructure (e.g., community colleges). We're trying to locate where clusters of manufacturers exist, e.g., plastics in Charlotte. We'll have to track improvements in particular regions or areas which in turn adds up to a state impact. This is a clear state strategy. With this strategy, then I think we can convince the legislature. They would invest in that.

Burress. At the national level, we constantly hear if you help one firm you are hurting another. At the state level, why don't you hear that? Ninety percent of Kansas manufacturers sell out of state. So if you help a Kansas firm you don't hurt another Kansas firm. That means that what justifies the program at the state level does not work at the national level.

Luria. Only 16 cities have lost manufacturing jobs, so you can't justify the program based on "stemming the bleeding." Plus in North Carolina you have got a lot of bad manufacturing, low-wage jobs. The sad history is that there have been pitched battles over what the measures should be. One measure would be the year before and after service, we would get what we need for value-added. But we don't seem nearer to getting measures that we agree on.

Bury. We are working on making progress with the value-added measure in our work with the Census Bureau. Give us a little time.