The Misuse of Regional Economic Models

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Introduction

That economic analysis is sometimes used selectively and prejudicially to support positions motivated by self-interest or ideology is hardly news to most scholars. The purpose of this paper is to describe an important example of the misuse of economic models to support ideology and self-interest of state and local government officials. Billions of dollars of taxpayers' money are at stake.

The subject of the paper is the use by state and local governments and their consultants of regional economic models in order to justify proposed government projects in physical capital facilities. The models are used in ways that systematically exaggerate the public benefits of proposed government projects, thus biasing government decision-making in the direction of excessive government spending and expansion into areas that should be left to the private sector.

Most state and local governments require that economic impact studies be undertaken before important proposed investment projects can be approved. The purpose of economic impact studies is similar to that of environmental impact studies: to measure the positive and negative economic impacts of a proposed project on people and businesses in the surrounding areas. That is certainly a desirable goal; most scholars would agree that no important government project should be undertaken without a prior economic impact study. It is also important that such studies be carried out objectively and with models that are appropriate for the purpose.

This paper analyzes the use of a model called REMI in economic impact studies. REMI is an acronym for Regional Economic Models

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Incorporated, a firm in Amherst, Massachusetts of which George Treyz is president. Two facts justify concentration on REMI in this paper. First, it is widely used, perhaps more widely used than any similar model. Second, it is available in explicit detail in publicly accessible papers. Several consulting firms have regional models of one kind or another, but most consultants keep their models proprietary and there is no easy way to evaluate them. The same is true of most macro models owned by profit-making consulting firms. To REMI's credit, the REMI model is completely public.

Two excellent surveys of economic impact studies and related regional models are Nijkamp (1986) and the *Journal of Regional Science,* vol. 25 (1985). Roger Bolton's (1985) contribution is especially valuable. Based on these surveys, reading of dozens of published model documents, and reading of many impact analyses undertaken with proprietary models, REMI appears to be among the very best regional impact models extant. Much research and hard work have gone into REMI's formulation and estimation; much of its content is based on publications in scholarly journals. Thus, my at times severe criticism is of the ways REMI is misused, not of REMI itself. Any model can be misused. How responsibility for misuse of REMI should be divided between REMI staff and the government officials who use it, I have no way to ascertain.

The Model

A Brief Description

The description of REMI in this section is based on careful reading of all REMI reports available in early 1992. Relevant published and unpublished papers are listed in the references. Like any such model, REMI evolves and becomes more detailed and complex as time passes. REMI has been estimated for states, counties, and groups of counties such as metropolitan areas. Inevitably, more detail is available for some places than for others.

The most detailed version of REMI contains 49 private production sectors. Production functions are Cobb-Douglas, relating sectoral output in the region to sectoral labor, capital, and fuel inputs, assuming constant returns to scale. Regional share coefficients indicate shares of inputs purchased locally, and are determined in the same way that regional export shares are determined. Shares of sectoral production exported from the region are similarly set by share coefficients, which depend on endogenous regional prices relative to national prices for each sector. Regional consumption of each locally produced consumer good and service is proportional to local dispos-

able income, allowing for regional variation in consumer demands. Local prices are set by local production costs, but do not affect the composition of local demand. Disposable income is correctly defined as earnings plus property income plus government transfers minus taxes paid. Sectoral investment equations bring sectoral capital stocks to their desired levels, determined by marginal productivity conditions. Local wage rates are determined by demands for workers in various occupations, by overall demand and supply for local labor, and by national wages and local consumer prices. Labor demand adjusts gradually to the level indicated by equilibrium labor market conditions. The local labor force depends on the local population, adjusted for labor force participation rates by cohorts. Cohorts are adjusted by births, deaths and aging. Economic migration between the region and elsewhere is modeled as a function of income and amenities in the region relative to national averages.

The model's representation of government sectors is crucial for this paper. Personal taxes per dollar of personal income (less transfers) equal national average taxes per dollar of personal income (similarly adjusted) multiplied by a local tax factor. Personal taxes per dollar of adjusted personal income do not vary with government policy simulations carried out with the model. Government spending is represented by six equations, one each for: federal civilian; federal military; state and local education; state and local health and welfare; state and local safety; and state and local miscellaneous. The first two categories are exogenous. State and local spending in each of its four categories is proportional to the region's share of national population, adjusted for national average state and local spending and a local factor. Analyses of government expenditure on proposed projects and policy simulations are carried out by adding terms to relevant equations to represent the government actions. For example, spending on a proposed state or local government project would be represented by terms added to the demand equations for inputs needed to produce the project.

Evaluation of the Model

The key point about REMI's representation of government sectors is that the model contains no budget constraint for any set of governments. There is no requirement that state and/or local government tax receipts plus user fees plus transfers from other governments plus increase in indebtedness equal expenditures. In fact, there is no exhaustive list of government receipts and expenditures. For example, there is no government debt or debt service in the model.

REMI is calibrated one region at a time, based on estimates using data from all states. REMI has been estimated for all 48 contiguous states to ensure that state estimates add up to 48-state totals that are consistent with a national 48-state model. Particular state or local projects are small relative to 48-state totals, and there is of course no way to analyze an exhaustive set of state and local proposals in all 48 states. The implication is that the national government's budget constraint is of relatively minor importance in the model. For example, a national decision to build a military base in a particular county would have only negligible effects on national taxes paid by residents of the county. However, a county government decision to build a domed stadium to be financed by county government funds logically implies some combination of reduction in other spending by the county government, increased taxes in the county or increased indebtedness by the county government. State government projects are somewhere between the above extremes. A convention center to be built in a particular municipality and to be financed partly by the municipal government's funds and partly by state government funds requires some tax increases, or other changes among those listed above, in the municipality. Using state government funds requires state tax increases, or other changes among those listed above. But state tax increases (if that is the method of financing) paid by local residents are a large or small part of the total costs paid by the state depending on how large the municipality is relative to the state and on the pattern of state tax increases. The remainder of the required state tax increase is paid by state residents outside the municipality, but they are not represented in the model analysis.

The implication of the above is that REMI makes it appear that all increments to government spending, federal, state and local, for projects REMI analyzes are free. To finance new government projects, the model introduces no extra taxes, no cuts in other government services or transfers, and no increase in government indebtedness. Many projects whose impacts are analyzed by REMI are infrastructure investments. Frequently, capital costs are to be paid by governments and the facility is expected to generate revenues from user fees that will cover operating costs. Since most infrastructure projects are capital intensive, REMI evaluates the projects as though the capital were free. There is no opportunity cost of government project spending in REMI.

The contention here is not that there are no federal, state or local taxes in REMI. It has been shown above that there are. Indeed, it is possible that state and/or local taxes might be so high that REMI would predict that they would drive workers and/or businesses from

the jurisdiction. State and local government spending is basically driven by population in REMI. Thus, if a proposed government project would increase population and employment, REMI calculates increases in government tax receipts and spending that would result from the changes in population and employment. But REMI is used to analyze government projects, not overall state and/or local government spending or receipts. Nothing in the REMI model requires that government project spending be matched by tax receipts that would cover parts of project costs not covered by money from other sources.

A state or local government project may nevertheless have some adverse effects on the local economy, according to REMI. If there is little local unemployment and inmigration is not very responsive to increases in local wages, then a proposed government project may reduce private output and employment. Some output and employment are transferred to the government sector. But it is impossible for REMI to indicate a reduction in total real private income from a proposed government project. This is an implication of the structure of the model, not of particular parameter sets. Since a project requires no increased taxes or other measures that might deter private spending, total employment and private income are predicted by REMI to rise as a result of any government project spending. If there is any labor response because of inmigration or reduced unemployment, REMI inevitably shows an increase in total employment and private income from any proposed government project analyzed. The model result occurs regardless of the project's merits.

The conclusion is that REMI inevitably exaggerates the benefits of government projects. The opportunity cost of state and local government funds for projects is represented to be zero. In fact, REMI is certain to show that the transfer of any project or economic activity from the private to the government sector is socially beneficial. REMI contains nothing that could permit the model to indicate that the private sector has a comparative advantage in producing any good or service. Hence, a transfer of an activity from the private to the government sector avoids the private sector's capital costs, while at the same time failing to register governments' expenditures in capital and labor as costs. Thus increases in consumer welfare result (since the private sector had to charge prices that covered costs whereas the government can give the good or service to consumers). Total earnings are unaffected, since the same employment and wage rates are required in the government as in the private sector.

None of the above relies on choices of particular parameter values for REMI. The conclusions are inherent in REMI's structure.

How REMI Is Used

I do not have an exhaustive list of applications of REMI. REMI has kindly furnished a list of REMI projects and REMI clients, but I have come across several economic impact studies done for proposed state and/or local government projects that indicate that REMI was employed, but are not on the lists furnished by REMI. Nevertheless, between the lists furnished by REMI and applications that have come to my attention in other ways (mostly reports sent to me in connection with other work), it is my estimate that I have seen nearly 100 applications of the model. (Some analyses may appear in more than one source.) That is probably a quite representative list of REMI applications.

I have no way to calculate accurately how much money is involved in government projects that REMI has been used to analyze. However, projects that I know about plus descriptions of analyses furnished by REMI make clear that, in the last five to ten years, REMI has been used to analyze projects whose costs are many billions of dollars. Likewise, it is impossible to know how much influence REMI has had in the process of project approval. REMI calculations are advisory to the political process. However, government agency statements in support of proposed projects frequently quote REMI calculations as to how many jobs and how much taxes the project will generate. A few examples of REMI uses are: analysis of the economic impact of proposed expansion of the McCormick Convention Center in Chicago; analysis of proposed expansion of MASSPORT/Logan Airport in Boston; economic impact of expansion of Fort Drum in New York; several economic impact analyses of proposed highway expansion projects. Many uses are reported of REMI for general modeling of state or sub-state areas by state and sub-state government agencies to analyze an unidentified variety of state and sub-state programs. Finally, it should be stated that REMI will do analysis for clients, rent REMI programs to clients, or sell the model to clients. REMI has no control over modifications to the model made by clients in some of the above arrangements.

Many REMI applications appear to be entirely appropriate and may provide better analyses than any alternative model available. However, the description of REMI in the previous section implies that use of REMI to analyze economic impacts of proposed government investments leads to exaggerated estimates of projects' net public benefits. A typical economic impact analysis concludes that (x) jobs, (y) dollars of private income, and (z) dollars of state and local government tax revenues will be generated by the proposed

project. These conclusions are generated by simulations with REMI that were described in the previous section. In project analysis, one simulation is done in the absence of the project and another in the presence of the project. REMI enables users to calculate multipliers, which are employment- or income-generated per dollar of government spending on the project. Typical income multipliers I have seen in economic impact analyses are between two and five. That means that each dollar of spending on the proposed project is projected to generate 2 to 5 dollars of additional income in the area included in the study. Income generated includes both income paid to workers and contractors on the project and also income generated by subsequent income recipients of subsequent rounds of spending. The multiplier process is precisely analogous to Keynesian multiplier analysis that appeared in macro texts some years ago. But REMI takes account of limitations on labor supply and of leakages outside the jurisdictions studied, which some Keynesian macro multiplier analyses did not do.

The exaggeration of public benefits of government projects in such REMI simulations stems precisely from the incomplete modeling of government sectors. If state and local government budget constraints were included in the model, REMI would recognize that increased government spending would entail increased taxes or other government fiscal alterations as indicated above. Then, increased spending by recipients of the increased government spending would have to be weighted against reduced spending by those whose taxes were increased or by reduced spending by recipients of government purchases that were cut in order to finance the project.

Obviously, all costs of a government project not financed by charges for use of the facility should be regarded as being financed by taxes with negative multiplier effects. It is often proposed to finance a government facility by taxes ostensibly levied on facility users—for example, a tax on hotel and restaurant bills in the vicinity of a proposed convention center. To the extent that such taxes are paid by convention center users, they are simply indirect charges for use of the facility and should be, but typically are not, added to user charges with the same assumed deterrent effect on use as direct user charges. In fact, such taxes are paid by all those who consume the taxed services, whether they use the proposed facility or not. To that extent, they are just one kind of tax levied on the population and have the same negative multiplier effect as any other tax to pay for the facility. More important, I have indicated in Mills (1991) that taxes ostensibly levied on facility users seldom cover more than a small fraction of facility costs. The remainder must be paid by usual

taxes levied on local residents and businesses. It really does not matter whether other taxes are to be increased or other government expenditures are to be reduced to pay for the tax-financed part of a facility's cost. If other spending is to be reduced, it could have been reduced in the absence of the facility, so the facility requires taxes in excess of what they would need to be in the absence of the facility.

Finally, the analysis does not depend on whether the facility is bond financed or not. The present value of taxes needed to finance bond debt service, discounted at the government's borrowing rate, equals the sale price of the bond. If taxpayers' discount rates exceed the government borrowing rate then of course the present value of the debt service costs is less than the sale price of the bond, but the difference is not likely to be large.

An additional benefit is typically claimed in economic impact analyses of proposed government projects: the so-called outside money multiplier. A proposed convention center or domed stadium, for example, is assumed to draw patrons from outside the jurisdiction in which effects are being analyzed. It is undoubtedly true that many patrons of a large convention center or sports stadium come from outside the county or metropolitan area in which the center is located. Such patrons spend money in the jurisdiction but outside the facility on hotels, meals, etc. REMI is then used to trace the effects of such outside spending through the local economy, and multipliers are calculated that are precisely analogous to those calculated for spending on the project itself.

An unusually well documented example of distortions from regional impact analyses has been provided by the plans for a billion dollar expansion of McCormick place, Chicago's convention and exposition center. The consultant's economic impact study, KPMG Peat Marwick (1990), concluded that the outside money multiplier would result in a permanent net creation of 6,000 jobs. (Outside money multiplier jobs are permanent in that the outside money comes in each year. Construction multiplier jobs result from a one-time injection of construction money and disappear after the construction multiplier has worked itself out.) Virginia Carlson (1991) redid the calculations using all the consultant's assumptions except that she took account of jobs that would be displaced by the McCormick expansion and of the impact of local taxes that are to be levied to help finance the project. Her estimate is that the expansion of McCormick Place will result in a net loss of 348 jobs. She estimates that 3,335 jobs will be created by direct and indirect effects of outside money spent on the expanded convention center. The offsets are 2,799 jobs lost because of business displacement and 884 jobs lost

because of negative multiplier effects of tax increases. No estimates are made by Carlson of revenues that will be raised by the increased taxes, but they are unlikely to raise more than enough to offset the center's operating losses. Capital costs must be financed in other ways. Interestingly, the Peat Marwick analysis was undertaken with a U.S. government model and Carlson's analysis was undertaken with REMI. Carlson predicts net job loss despite the absence of a government-balanced-budget equation in REMI.

The outside money multiplier has really nothing to do with the fact that the project is government-sponsored. Any local business activity that sells goods or services outside the local area—a pension management company or auto assembly plant, for example—brings precisely the same kinds of outside money benefits to the local area. In most kinds of private investments, state and local governments recognize this benefit and provide temporary and declining tax forgiveness, low interest loans, or other subsidies that are intended to stimulate investments in the private businesses. Convention centers and domed stadiums are no different and there is nothing in the modeling that indicates that government policies toward them should be different or that governments should own them. Visiting patrons to conventions or sporting events consume services that are exported from the local area just as is true of any other locally produced commodity or service that is sold to businesses or residents outside the local area. The fact that government produces the export good or service has nothing to do with the magnitude of the local benefit. The absence from the models of a cost side to government financing of the projects makes it appear that there are public benefits that are peculiar to government projects.

Of course, any increased outside money spending in a jurisdiction resulting from a government or private investment in the jurisdiction is precisely offset by decreased spending in other jurisdictions, other things equal. It is a zero-sum game. However, our federal political system produces state and local governments that, at best, represent narrow local interests. The zero-sum character of outside money multipliers should be taken into account in federal spending programs, but state and local government programs cannot be expected to do so.

Conclusion

The conclusion of this paper is that REMI and other regional models are frequently misused by state and local governments and their consultants in ways that patently exaggerate the benefits of

proposed state and local government projects. By ignoring the need of state and local governments to raise money to finance capital costs of proposed projects, and by counting construction wages as benefits instead of costs, the models permit users to make it appear to the public that there are benefits to government projects that would not flow from similar private projects.

Such biased analysis cries out for explanation. Why do governments produce such patently exaggerated estimates of benefits of government projects? After all, the notion that state and local governments have budget constraints is not exactly an alien concept either to the public, to government officials or to scholars.

I simply throw out the following conjectures to stimulate thought. First, government officials like to promote big government. They benefit from large government roles in the economy. Adequate evidence is the observation that state and local governments resist cutting spending and, indeed, frequently raise taxes, in recessions when taxpayers' ability to pay has decreased. Second, to justify increased spending, government officials must identify some publicly desired goal to be accomplished by government spending. Creation of new jobs is among the best such goals that can be found. Third, they must make it plausible that government can accomplish the goal in a way that the private sector cannot. This is where REMI is so valuable. It is a complex computer model that lay people cannot understand or evaluate, and it has important scientific merits. Thus, the frequent government claim that the best scientific model available shows that x thousand jobs will be created by the project helps to carry the day. Finally, the inherent characteristics of the project help. A convention center can be claimed to improve the image of the city, and a domed stadium can be claimed to help keep the team in town.

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