Capital Stock Accounts

Now, let us switch gears and talk about how to calculate capital stocks for highways. I have developed two strategies: a simple one and a complicated one.

Sometimes it is really going to be worthwhile to do the more complicated strategy, but let us start with the simple strategy. It is just a formula, as follows:

$$KS_y = \text{capital outlay}_y + [(1 - 0.0202) * KS_{y-1}]$$

There is one magic number that you need to know to be able to work with the simple strategy: 0.0202. It is the crucial piece in the construction of a capital stock when you use the perpetual inventory method, which is what almost everyone uses. The preceding formula shows that the capital stock in a given year depends upon the capital outlay in that year plus how much capital stock you already have. However, the capital stock you already have must be adjusted because of retirement and a decline in efficiency, and that is the 0.0202 factor: the rate of deterioration. In plain language, this is the decline in the potential productive capacity of any asset over time. And for this number, the 0.0202 factor is pretty good, as it derives from multiple empirical analyses.

Beyond the 0.0202 deterioration factor, what else do you need? Two pieces: You need a deflator. BEA uses a deflator that is essentially the same as the construction cost index from the Federal Highway Administration, which is very easy to get. Second, you need a benchmark, which is to say a starting point. That is the one thing for which there is not a totally obvious answer. You might choose, for example, the starting point of 1950, and then estimate the efficiency of the existing highway components. Even if you do not have a perfect benchmark, use a benchmark.

That is it for the simple strategy. Why would you want to use the more complicated strategy? Mainly because your particular region may not resemble the country as a whole. The paper I have prepared (available for download at www.itsamac.com/~nsjfoster/TRB/99Irvine/index.nclk) gives you a blueprint about how you can use the more complicated approach. A series of five Excel spreadsheets will soon be available for download from that same site, so that if you want to try your hand at the more complicated strategy, you do not have to type in all the numbers. This approach includes divisions by local, state, and interstate outlays and splits by right-of-way, new construction, reconstruction, pavement grading, structures, and so forth. The fat paper considers a $1,000 capital outlay in 1960 and provides a step-by-step example, showing exactly what you would do under the more complicated approach.

Finally, in response to a comment from the audience, I concur that capital stock measures, in and of themselves, reveal only part of the story. What is really useful is information on the services provided by those existing assets. We have very minimal information on the service provided by our capital stocks, and that is an inquiry that very much needs to take place.

Anyone who is a glutton for punishment should read the full 125-plus-page report ("Productive Capital Stock Measures," prepared by Barbara Fraumeni on behalf of the Federal Highway Administration and available for download at http://www.fhwa.dot.gov/reports/phcsm/index.htm). But I recommend looking at the strategy paper, which is only 11 pages. (Please see the "Resource Papers" section of these proceedings for the full text of the 11-page paper.)

Rate of Return and Productivity Studies, Commodity and Passenger Flow Data, and American Community Survey

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I am going to talk about data on physical transportation activity, including commodity flows, passenger movement, and vehicle use. These data feed national economic accounts, can be used to translate those accounts to the state and local level, and provide key variables for use in project evaluation and revenue forecasts.

Transportation is an enabler of economic relationships, and transportation activity is a reflection of those relationships. The enabling role of transportation is obvious but not well measured. Someone asked earlier this morning whether a complete cessation of transportation services would cause the economy to decline 5 percent or disappear. The satellite account shows that transportation services contribute 5 percent to the economic activity of the nation; however, without transportation the steel produced in the Midwest would be worthless to the consumers of steel in the East, South, and West. Our economy would not disappear, but it certainly would be much smaller. Transportation allows local economies to link with one another, and the resulting flows of goods, people, and vehicles indicate how important those linkages are.

Our traditional view of transportation activity often focuses on the volumes of activity on each link in the network rather than on the areas being connected. The resulting images are very strong indications of hubs of activity, but they are not always an accurate reflection of underlying economic relationships. Moreover, when we consider volume rather than the value of the items being transported, we get a distorted view. When one considers tonnage moved by rail, it appears that the economic heart of America is Wyoming, but most of the tonnage is low-value coal rather than high-value manufactured goods.

A different picture emerges when we look at value. When we consider the value of imports and exports at the nation's many international gateways, America has multiple economic hearts. This view also demonstrates that intermodalism is more than a wish; indeed, the top three gateways in 1996 were a port (Long Beach), an airport (John F. Kennedy in New York), and surface crossings (the rail and highways bridges at Detroit).

Commodity Flow Survey

An intermodal world is not easily measured by a carrier-based, mode-specific survey. As a consequence, the Bureau of Transportation Statistics and the Census Bureau turned to shippers to measure commodity flows by all modes. The Commodity Flow Survey (CFS) asks basic questions of about 100,000 shipping establishments: What did you ship? Where did it go? How did it get there? How much did it weigh? How much was it worth?

CFS does not ask for distance, but it turns the reported origins and destinations into distance through network models and network databases developed primarily by Oak Ridge National Laboratory. The network databases are published as a BTS data product every year as the National Transportation Atlas Database.

CFS was conducted first in 1993, and the second edition covering 1997 was to be released at the TRB annual meetings in January 2000. CFS reports will include state-to-state and metropolitan-area-to-metropolitan-area flows of commodities by type of commodity, modes used, value, weight, and other shipment characteristics. This is the most complete view of shipments by all modes, and the only nationwide source of data on where trucks carry commodities.

Using the Oak Ridge models, BTS has produced a picture of commodity movements by truck that demonstrates the importance of interstate commerce. This picture shows the ton miles of shipments by truck within, from, to, and through each state. The within-state shipments are a minority of the value or ton miles except for the corner states. The shipments to and from each state represent that state's trading relationships with other states. The through-shipments represent the traffic that affects the state's highways but not necessarily the state's economy.

CFS is the biggest data source of its kind, but it does not cover everything. One of the gaps is imports, for which we must turn to the transborder surface freight transportation data established by BTS through the Census Bureau. Foreign trade data are disaggregated by mode used at the border crossing, to show, for example, where commodities carried by truck go through or to each state. It is based on foreign trade data.

Foreign trade data, at best, is an attempt to measure economic activity, but at worst it tends to measure paperwork geography. Because of the way in which customs data are filed and developed, you can get some weird things in here. For example, the first time we published these data, we showed a small but not inconsequential amount of live animals entering the United States by pipeline. That problem was quickly fixed. However, we do still have a significant number of trucks from Canada entering the United States in Dallas, Texas. There is a little gap in there between Texas and the nearest spot in Canada. That is obviously where the paperwork was filed. BTS will explore ways to fix this problem in a study required by Section 5115 of the Transportation Equity Act for the 21st Century (TEA-21). This problem is worth fixing since international trade may account for about 10 percent of the ton miles of what moves on U.S. highways. The percentage could be much higher for some states.

International trade is important as a transportation issue and as an economic development issue for each state. If we can improve the quality of data on the domestic movement of foreign trade for national transportation policy purposes, then states and metropolitan areas will get a much better picture of their international trading partners as an incidental byproduct. This is not a modest challenge. Trade data agencies are responsible for national balance of payments and thus care about getting the country right rather than the states. Federal trade agencies generally do not care about the balance of payments between Missouri and France, but only the United States and France.

Even if we get the right state, we do not necessarily know where in the state imports originate or exports are destined. And we often know the value, but not the weight. BTS will deal with the latter problem by creating value-to-weight tables for each commodity captured in CFS.

My greatest concern with using transportation statistics as a proxy picture of the economy is our tendency to use ton miles as the measure of transportation. Although ton miles is commonly used, particularly as an indicator of consumption of transportation resources, the measure can skew our perceptions. The 1993 CFS reveals that shipments over 1,000 miles account for only 2 per-

cent of the tons shipped, 10 percent of the value of all truck-carried shipments, and a quarter of all ton miles. How could only 2 percent of the tons account for 25 percent of the ton miles? It takes one shipment moving 1,000 miles to equal 100 shipments each of the same size moving only 10 miles. Should shipments of fewer than 100 miles, representing nearly 80 percent of the tons and over 40 percent of the value, be given less weight than the 2 percent of tons and 10 percent of value that go more than 1,000 miles? The arithmetic is correct, but the perception of importance and the implications for economic activity may be overexaggerated by ton miles.

One challenge of this forum is to consider ways to turn these types of data into useful information for state and local decision makers.

American Travel Survey

Let me turn briefly to the passenger side. BTS conducted the American Travel Survey in 1995, asking 80,000 households where did they go on trips to places more than 75 miles away, how did they get there, why did they go, and a bunch of other things.

For trips of more than 100 miles, the survey revealed some obvious flows, such as the Northeast Corridor between Washington and New York, and also a few surprises, such as Los Angeles to Las Vegas.

From an economic standpoint, this information tells two stories: the tourism story and the services story. Tourism is the classic view, but the services view is perhaps more interesting, particularly because it is so poorly measured in general. Services are typically seen as the growing part of the economy, and business travel between regions reflects the service-based economic linkages of those regions.

Vehicle Inventory and Use Survey

Vehicle activity enables and reflects economic activity. The private trucking component of the Transportation Satellite Account described by Barbara Fraumeni was estimated from the Truck Inventory and Use Survey, which now has been renamed the Vehicle Inventory and Use Survey (VIUS) on the hope that it will be expanded to include automobiles and buses. VIUS is conducted by the Census every 5 years, and it is based on a sample of registered vehicles. Questions on miles traveled, type of business, and industry served provided data on physical characteristics that were linked with economic characteristics to determine the added value associated with private trucks.

The impact of changing costs and the role of transportation in the economy is even bigger from a household perspective. Dr. Fraumeni pointed out that transportation services contribute about 5 percent to GDP. This is a view from the supply side, which can be thought of as the business perspective. If transportation is measured from the perspective of final demand (what households consume, what governments spend, and what is in inventories), transportation accounts for about 11 percent of GDP. Much of the difference is in household spending, which is tracked by the Bureau of Labor Statistics through its Consumer Expenditure Survey. This survey shows that almost 20 percent of household expenditures are for transportation, much of which goes into personal-use vehicles.

Conclusion

Should we be content with these national statistics, or should we try to bring these statistics to the state and local levels? Abraham Lincoln, the father of transportation, implied a positive answer when he said in an 1848 speech while a member of Congress, "Statistics shall save us from doing what we do in the wrong places."

The question of place is made complicated by the tendency of major cities to be located at the edge of states. Economic areas often fail to respect state lines. Indeed, our country is organized economically, yet we administer much of our transportation system by political jurisdiction. We have to figure out how to accommodate this apparent mismatch in our data and in our actions.