Regional database for USAGE

by

Peter Dixon and Maureen Rimmer*

Centre of Policy Studies

Monash University

December 2003

1. Output and employment by industry and State

The main data ingredient in our regional calculations is a matrix showing the shares of each industry located in each region. We assume that these shares refer to industry outputs. We also use them as shares in industry employment.

The starting point for developing the shares matrix is IMPLAN data for 1998 showing numbers of jobs (wage and salary plus self-employed) for 528 industries and 51 States (we treat the District of Colombia as a State). The IMPLAN data was supplied to us for construction of USAGE by the USITC (email, July 18, 2002).

Our first task was to convert the IMPLAN jobs data into a jobs matrix for the 513 USAGE industries by 51 States. In making the conversion we formed a 513 by 528 matrix (MAPMAT) of ones and zeros. MAPMAT(i,j) is 1 if and only if USAGE industry i is part of IMPLAN industry j or IMPLAN industry j is part of USAGE industry i. We generated MAPMAT from two vectors, MAPA and MAPB. MAPA maps from IMPLAN industries to USAGE industries and MAPB maps from USAGE industries to IMPLAN industries. For each IMPLAN industry MAPA gives the first USAGE industry to which the IMPLAN industry belongs. For each USAGE industry MAPB gives the first IMPLAN industry to which the USAGE industry belongs. In making MAPA and MAPB we noted that each USAGE industry is either a subset of a single IMPLAN industry or a number of IMPLAN industries are subset of it. There are no cases of a USAGE industry i being partly in IMPLAN industry j and partly in IMPLAN industry k where j and k are not entirely in i. In these circumstances MAPMAT can be generated according to:

MAPMAT(i,j) = 0 + if(MAPA(MAPB(i)) = MAPA(j),1) .

With MAPMAT in place, we used it to estimate the share of USAGE industry i in the wagebill of IMPLAN industry j as:

$$SH(i,j) = LABIND(i) * MAPMAT(i,j) / [\sum_k LABIND(k) * MAPMAT(k,j) + TINY] \ .$$

Then we estimated the number of jobs in State s and USAGE industry i as

$$JOBS(s,i) = \sum_j SH(i,j) * JOBS\_IMPLAN(s,j)$$

where JOBS_IMPLAN(s,j) is the number of jobs in State s and IMPLAN industry j.

At this stage, JOBS has columns of zeros for OwnoccDwell, GenGovInd, Holiday, FgnHol, ExpTour, ExpEdu and OthNonRes. With the exception of GenGovInd, none of these USAGE industries has any employment (LABIND(i) = 0). For GenGovInd, the problem is that what we have deemed to be the corresponding IMPLAN industry has no employment. Eventually we will be using JOBS as the basis for distributing some national variables (e.g. industry outputs) to the regions. Therefore we need to fill up the zero columns.

We start by giving 1 job to OwnoccDwell and distributing it to the regions according to regional shares in total jobs. This will have the effect of introducing the assumption that the distribution across States of rental incomes (explicit and imputed) on the housing stock is the same as that of jobs.

Next we consider GenGovInd. In USAGE a small part ($100m) of the wagebill of I493-I506 was given to I491, GenGovInd. Here we assign to GenGovInd a number of jobs equal to GenGovInd's wagebill share of the wagebill in the government sector. Jobs in the other government industries are scaled down. Then we distribute the jobs in GenGovInd to the regions in proportion to regional shares in government sector employment.

For ExpTour we assumed a distribution of "jobs" across States reflecting expenditures by foreign tourists. Estimates of these expenditures are given in Table 10 in a study prepared in December 1999 by the Travel Industry Association of America for the Department of Commerce (International Trade Administration, Tourism Industries). The study is entitled "Impact of international visitor spending on state economies 1997".

---

* Throughout the preparation of this paper, particularly the transition described in section 4 from the BEA database to the MONASH-style database, we have relied on helpful advice and supplementary data supplied by Karen Horowitz of the BEA.

For ExpEdu we assumed a distribution of jobs across States reflecting the distribution of jobs in CollegeUni and SLCEpubHied. Under this procedure, Massachusetts, Pennsylvania, New York and Washington DC are identified as specialists in the provision of education services to foreigners. Each of these States has a significantly larger share of tertiary education employment than it has of employment in general.

OthNonRes covers purchases in the US by foreigners working in the US for foreign governments and international organisations, and purchases in the US by Mexicans, West Indians and Puerto Ricans working in the US (see Benchmark Input-Output Accounts of the United States, 1992 p. M-88). We assumed a distribution of "jobs" across States reflecting the distribution of disposable income. Clearly we could have done better. For example, Washington DC is likely to have an over-representation of foreign workers. However, OthNonRes is a minor item (about $6billion) and we decided not to devote significant research time to distributing it across States.

We assumed that the distribution of "jobs" for FgnHol is that same as that for disposable income. This assumption has very little impact on our regional calculations. It affects the regional demands for US supplied international air travel (commodity Air2).

State distribution of holiday industry

By contrast, the assumptions that we make about the distribution of "jobs" for Holiday are important. The output of the Holiday industry (which produces US holidays for US residents) is worth $143.5 billion.

We assume that the distribution across States of activity in the Holiday industry is the same as that of the hotel input to the holiday industry. In deciding the State distribution of hotel input to Holiday, we started with the equation:

$$X0(\text{"hotels"}, r) = D1(\text{"hotels"}, r) + D2(\text{"hotels"}, r) + D3(\text{"hotels"}, r) + D4(\text{"hotels"}, r) + D5(\text{"hotels"}, r) + D(\text{"hotels"}, \text{"holiday"}, r) \qquad (1.1)$$

where

X0("hotels",r) is output of hotels in State r (estimated from the MAKE matrix and the JOBS matrix);

D1("hotels",r) is business demand for hotel services from State r (excludes hotel input to Holiday and ExpHol);

D2("hotels",r) is investment demand for hotel services from State r (=0);

D3("hotels",r) is household demand for hotel services from State r (estimated by assuming that national consumption of Hotel services is distributed across States according to State disposable income);

D4("hotels",r) is foreign tourist demand for hotel services from State r (known from the State distribution of export tourism);

D5("hotels",r) is government demand for hotel services from State r (=0, government demands are intermediate inputs into government industries); and

D("hotels", "holiday", r) is demand for hotel services from State r by the Holiday industry.

From (1.1) we can estimate business plus holiday use of hotels from region r as a residual, that is we know the value of BusHol("hotels", r) where

$$\text{BusHol("hotels", r)} = \text{D1("hotels", r)} + \text{D("hotels", "holiday", r)} \quad .$$

We calculated the holiday part of BusHol("hotels", r) as:

= BusHol("hotels", r) * Est_D("hotels", "holiday", r)/[Est_D1("hotels", r) + Est_D("hotels", "holiday", r)]

$$\text{D("hotels", "holiday", r)} = \text{BusHol("hotels", r)} * \text{Est\_D("hotels", "holiday", r)} / [\text{Est\_D1("hotels", r)} + \text{Est\_D("hotels", "holiday", r)}] \quad . \qquad (1.2)$$

In (1.2), Est_D("hotels", "holiday", r) is an estimate of D("hotels", "holiday", r) and is computed according to

$$\text{Est\_D("hotels", "holiday", r)} = \text{BAS1("hotel", "dom", "holiday")} * \text{SH\_R(r, "ExpTour")} \qquad (1.3)$$

and Est_D1("hotels", r) is an estimate of D1("hotels", r) and is computed according to

$$\text{Est\_D1("hotels", r)} = \sum_{s} \Psi(r,s) * \sum_{\substack{j \neq \text{Holiday} \\ j \neq \text{ExpTour}}} \text{BAS1("hotel", "dom",j)} * \text{SH\_R(s,j)} \qquad (1.4)$$

In (1.3) and (1.4), SH_R(s,j) is the share of State s in the output of industry j (estimated from the JOBS matrix). In (1.4) $\psi(r,s)$ is the share of business demand for hotels in region s that is met by hotels in region r. We set these shares as

$$\Psi(r,s) = \begin{cases} 0.5 & \text{if } r = s \\ \text{SH\_R(r,"hotels")} * \beta(s) & \text{if } r \neq s \end{cases}$$

where $\beta(s)$ is set t ensure that $\sum_r \Psi(r,s) = 1$.

Under (1.3), domestic tourism demand for hotels is given the same State profile as foreign tourism demand for hotels. Under (1.4), we assume that 50 per cent of business demand for hotels by State s is satisfied by hotels in State s. The remainder of State s's business demand for hotels is satisfied by other States in proportion to those States output of hotels.

The sum of our final estimates of D1("hotels",r) and D("hotels", "holiday", r) add correctly to BusHol("hotels", r) for all r. However, there is a small discrepancy between the

national number for D1("hotels") and $\sum_r$D1("hotels", r). Similarly, there is a small discrepancy between the national number for D("hotels", "holiday") and $\sum_r$D("hotels", "holiday", r). Only our estimates of D("hotels", "holiday", r) are used in our regional modelling, and they are used only in share form. Thus, it seemed reasonable to ignore these small discrepancies.

The results of the procedures outlined above are shown in Table 1. The two States with the largest Hotel outputs are California (10.95 per cent of US output) and Nevada (10.08 per cent). For California, output of Hotel services is not a specialty. The large output from California merely reflects the size of the Californian economy. Notice from the fourth column of Table 1 that California has 12.44 per cent of US disposable income. By contrast, Nevada specialises in the output of Hotel services (more than 10 per cent of hotel services compared with only 0.71 per cent of disposable income.

The demand for Californian hotel services is biased towards holiday demand by both domestic and international tourists. California accounts for 19.44 per cent of domestic holiday use of hotels and 18.93 per cent of foreign tourist use of hotels. At the same time, California accounts for only 7.65 per cent of business demand. The demand for Nevada hotel services is biased towards business. Nevada accounts for 12.66 per cent of business use of hotels but only 10.40 per cent of domestic holiday use and 3.22 per cent of foreign tourist use.

Table 1. Regional distribution of hotel supply and demand

	Output	Holiday demand	Business demand	Household demand	Tourism exports	exports
National totals ($m)	*49207*	*6850*	*31125*	*3736*	*7451*	*45*
			Percentages			
1 Alabama	0.87	0.22	1.07	1.34	0.18	0.87
2 Alaska	0.44	0.52	0.48	0.24	0.27	0.44
3 Arizona	2.53	3.92	2.47	1.54	2.33	2.53
4 Arkansas	0.65	0.10	0.85	0.75	0.06	0.65
5 California	10.95	19.44	7.65	12.44	18.93	10.95
6 Colorado	2.28	2.21	2.61	1.58	1.19	2.28
7 Connecticut	0.66	0.34	0.67	1.60	0.36	0.66
8 Delaware	0.14	0.09	0.14	0.29	0.11	0.14
9 Florida	8.25	18.28	3.53	5.54	23.56	8.25
10 Georgia	2.48	1.81	2.84	2.70	1.25	2.48
11 Hawaii	2.02	2.44	0.21	0.44	10.54	2.02
12 Idaho	0.48	0.27	0.61	0.37	0.14	0.48
13 Illinois	3.02	2.34	3.15	4.85	2.02	3.02
14 Indiana	1.31	0.44	1.59	2.02	0.36	1.31
15 Iowa	0.81	0.19	1.04	0.98	0.13	0.81
16 Kansas	0.64	0.18	0.79	0.92	0.14	0.64
17 Kentucky	0.90	0.25	1.12	1.20	0.19	0.90
18 Louisiana	1.35	0.96	1.57	1.36	0.63	1.35
19 Maine	0.63	0.69	0.70	0.40	0.38	0.63
20 Maryland	1.35	0.65	1.57	2.10	0.45	1.35
21 Massachusetts	1.90	2.53	1.59	2.67	2.45	1.90
22 Michigan	2.11	0.90	2.44	3.55	0.77	2.11
23 Minnesota	1.66	0.95	1.99	1.86	0.62	1.66
24 Mississippi	1.50	0.14	2.12	0.78	0.06	1.50
25 Missouri	1.88	0.52	2.44	1.90	0.31	1.88
26 Montana	0.56	0.36	0.72	0.26	0.16	0.56
27 Nebraska	0.52	0.14	0.67	0.59	0.09	0.52
28 Nevada	10.08	10.40	12.66	0.71	3.22	10.08
29 New Hampshire	0.55	0.32	0.68	0.48	0.17	0.55
30 New Jersey	4.09	2.11	5.14	3.69	1.04	4.09
31 New Mexico	0.82	0.36	1.08	0.51	0.17	0.82
32 New York	4.34	6.16	1.91	7.75	12.10	4.34
33 North Carolina	2.11	1.10	2.50	2.61	0.82	2.11
34 North Dakota	0.31	0.17	0.39	0.21	0.09	0.31
35 Ohio	2.10	0.90	2.36	3.95	0.87	2.10
36 Oklahoma	0.62	0.13	0.76	1.03	0.12	0.62
37 Oregon	1.28	1.03	1.49	1.14	0.62	1.28
38 Pennsylvania	2.99	1.98	3.31	4.47	1.53	2.99
39 Rhode Island	0.22	0.16	0.24	0.38	0.13	0.22
40 South Carolina	1.51	1.25	1.75	1.19	0.77	1.51
41 South Dakota	0.42	0.14	0.57	0.25	0.06	0.42
42 Tennessee	2.02	0.89	2.55	1.88	0.51	2.02
43 Texas	5.29	4.97	5.42	7.09	4.01	5.29
44 Utah	0.96	0.86	1.11	0.64	0.48	0.96
45 Vermont	0.62	0.58	0.76	0.20	0.23	0.62
46 Virginia	2.59	1.17	3.25	2.58	0.68	2.59
47 Washington	1.67	1.75	1.64	2.21	1.46	1.67
48 West Virginia	0.53	0.08	0.71	0.51	0.05	0.53
49 Wisconsin	1.78	0.81	2.21	1.84	0.51	1.78
50 Wyoming	0.52	0.36	0.67	0.16	0.14	0.52
51 District of Columbia	0.70	1.42	0.22	0.27	2.57	0.70
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*