

On Input-Output Analyses With Incomplete Data

Sylvester Damus
DIA Inc.
Ottawa, ON K1T 1H9

The rising powers of personal computers and software increase the ease with which one can make input-output projections and analyses. Unfortunately, individual Canadian researchers who use Canadian data can only achieve results of questionable accuracy.

Of all the countries in the world, Canada is perhaps the only one where the central statistical office -- in this case Statistics Canada -- publishes unbalanced input-output data. The data are unbalanced in the sense that supply does not equal demand for several commodities and industries.

The main reason for lack of balance in published input-output data is the suppression of confidential cell values in the data matrices. Small aggregation, 16-industry tables, do not suffer from this defect. Confidentiality is a concern in the larger, more disaggregated tables, which also are the more useful ones.

There are also significant rounding errors in special tabulations prepared by Statistics Canada on request of customers. Values in special aggregations are rounded to millions of dollars so that, in effect, all cells containing less than \$500,000 are suppressed by rounding down to zero. Other cells under \$10,000,000 also suffer relatively large rounding errors of more than 5 per cent.

Lack of balance in the data leads to inaccuracies in projections and other computational results. For many years, the solution was to purchase from Statistics Canada not the data, but the results of computations made by Statistics Canada with its access to complete data. This solution costs time and money that researchers must balance with the inaccuracy of their own, cheaper results.

Helpful comments by two anonymous referees and financial support by Queen's - University of Ottawa Economic Projects are gratefully acknowledged.

This note presents a new method for achievement of accurate and nearly accurate results with public use data. The solution is an application of the "dummy industry" technique already in use.¹ The new solution is peculiar to a Canadian data problem and therefore not yet found in the international input-output literature. The statement of the solution follows a brief restatement of the problem.

Let q be a vector of m commodity outputs,
 g be a vector of n industry outputs,
 V be a $n \times m$ matrix of industrial commodity outputs,
 U be a $m \times n$ matrix of commodity inputs to industries,
 e be a $m \times 1$ vector of final demands for commodities,
 y be a $n \times 1$ vector of value added by industry,

then, using primes to denote transposition, carets for diagonalization and i for a unit vector,

$$g = Vi \quad (1)$$

$$g = U' \hat{g} + y \quad (2)$$

$$q = V' i \quad (3)$$

$$q = Ui + e \quad (4)$$

Defining technical production and market share coefficients by

$$B = U \hat{g}^{-1}$$

$$D = V \hat{q}^{-1}$$

one obtains after some manipulation

$$[I - BD] q = e \quad (5)$$

$$\text{and } [I - DB] g = De \quad (6)$$

Equations (5) and (6) can be solved for q and g by matrix inversion assuming (1)-(4) hold. Excessive rounding and suppression of confidential values mean that public use data do not meet conditions (1)-(4). Consequently, users of such data obtain incorrect values of B and D and erroneous solutions for q and g . The problem is not confined to the output determination models in (5) and (6). It, of course, affects also the dual price models.

The problem is not that equations (5) and (6) are invalid but that the assumptions from which they were derived are violated. The solution is then to re-balance the tables so that the assumptions can be maintained. A further problem is that V and U cannot be re-balanced individually because different data are suppressed from each. What is required is a simultaneous re-balancing that restores the equalities between supplies and demands for commodities and industry outputs.

The solution is to work simultaneously in commodity and industry space augmented by a dummy activity that balances the public use tables. Analogous to three dummy activities and dummy commodities already in existing input-output data and models, the new dummy activity uses goods of unknown origin to produce a fictitious commodity used by all other activities in place of unknown, alternative inputs. The inputs to the new dummy activity and the uses of its output are residuals that balance the public use data. The residuals can be computed using any available control totals or without benefit of such control totals. The latter alternative is discussed first.

Let the public use data be arranged in a square, partitioned, national accounting matrix:

$$M^* = \begin{bmatrix} 0 & V & 0 \\ U & 0 & e \\ y' & 0 & 0 \end{bmatrix}$$

where $q^* = M^* i$; $g^* = M^{*'} i$ and asterisks denote unbalanced data.

Balancing the national accounts requires

$$q_i^* = g_i^* \quad \forall i \in (1 \leq i \leq n+m) \quad (7)$$

Public use data do not satisfy (7). One can thus create two dummy vectors r and s whose elements are given by

$$r_i = \max(g_i^* - q_i^*, 0) \quad \forall i$$

$$s_j = \max(q_j^* - g_j^*, 0) \quad \forall j$$

The national accounts balanced by r and s are now

$$M^{**} = \begin{bmatrix} 0 & V & r^1 & 0 \\ U & 0 & r^2 & e \\ s^1 & s^2 & 0 & 0 \\ y' & 0 & 0 & 0 \end{bmatrix}$$

where a superscript 1 denotes residuals that balance industries; a superscript 2 denotes residuals that balance commodities. V and U cannot be balanced separ-

1. On the "dummy industries" see Dominion Bureau of Statistics, *The input-output structure of the Canadian economy*, 1961, vol. I, August 1969, page 121; and Statistics Canada, *The input-output structure of the Canadian economy*, 1971-80, catalogue No. 15-201E, page 23.

ately because $r^i \neq s^i$ and $r^2i \neq s^2i$; only M^* can be balanced without disclosure of confidential data.

The new matrix is such that

$$q_i^{**} = g_i^{**} \quad \forall i \in (1 \leq i \leq n+m)$$

$$g^{**} = M^{**}i = q^{**}; \quad e^{**} = \begin{bmatrix} 0 \\ e \\ 0 \end{bmatrix}$$

and so the new technical coefficients are

$$A = M^{**}(\hat{g}^{**})^{-1}$$

and, after deleting final demand and value added from M^{**} and A to close the model,

$$g^{**} = [I - A]^{-1} e^{**} = q^{**} \quad (8)$$

is the simultaneous solution in both industry and commodity spaces.²

The model in (8) produces much improved results. Some errors in projected industry and commodity outputs vanish. Other errors are drastically reduced. Remaining errors are confined to industries and commodities that suffer most from data suppression, such as tires and tubes, and processed, unmanufactured tobacco. National, medium level tables for the year 1988 were used to provide examples of alternative output projections. Industry and commodity outputs required to meet actual final demands were computed. The results are shown in Table 1.³ Column (1) of Table 1 shows the control totals g and q in millions of dollars at 1988 prices. Column (2) shows the outputs projected from the actual final demand e with equations (5) and (6). The projection error is shown in column (3) as a per cent of column (1). Column

2. The models in (5), (6) and (8) correspond to the open model without leakages presented in Statistics Canada, *The input-output structure of the Canadian economy, 1961-81*, Catalogue 15-510, December 1987. The simultaneous approach in (8) simplifies the algebra of the models with leakages. Matrix M can be augmented by three rows and three columns for inventory change, government and the rest of the world. Expenditures on additions to inventories, government consumption and exports go in the columns. Negative columns in Statistics Canada's final demand tables are transposed and changed in sign. They represent receipts by withdrawals from inventory, government sales of goods and services, and imports that go in the rows. Thus, besides yielding results in both industry and commodity space, the model in (8) does not require the vectors α , β and μ in Statistics Canada's models with leakages.

3. Computations were made on a PC with the *Economists' TOOLKIT* software by DIA Inc. and using 1988, medium level public use tables supplied by Statistics Canada in *LOTUS 1-2-3* spreadsheets.

(4) shows the outputs projected with equation (8). The reduced percentage errors are shown in column (5). For example, the error in projected output of the nickel products commodity was reduced from 100 per cent in column (3) to only 2.7 per cent in column (5). This reduction was achieved by creation of a dummy residual activity whose inputs and outputs were estimated without benefit of control totals. The accuracy of results obtained by this method varies according to the severity of data suppression. Data suppression increases in severity as increased disaggregation unveils more and more confidential cell values. Data suppression varies also from year to year in the national tables. Data suppression also varies among provincial tables; it presents a larger problem in tables for the smaller provinces.⁴

Exact results are obtained when control totals are used to fill dummy vectors; that is, when

$$r = \begin{bmatrix} g \\ q \end{bmatrix} - q^*; \quad s = \begin{bmatrix} g \\ q \end{bmatrix} - g^*$$

The vectors g and q are published to the nearest \$100,000 at the 50-industry, 92-commodity, medium level of aggregation. No results are shown for this case as the errors are all zero.⁵

Users can usually obtain at least g at other aggregation levels. Thus, a combination of the two approaches to r and s is possible. Virtually exact industry output projections using residuals based on published industry output figures are shown in columns (6) and (7) of Table 1. These last results were obtained by letting

$$r^1 = g - Vi$$

$$s^1 = g - U^i i - y$$

$$r_i^2 = \max(v_i - u_i, 0) \quad \forall i$$

$$s_j^2 = \max(u_j - v_j, 0) \quad \forall j$$

where

$$v = V^i i$$

$$u = U^i i + e$$

Commodity output projections remained inexact because residual commodity flows were not based on control totals. Again, the inaccuracy of the commodity output projections depends on the case. However, the exact industry

4. That accuracy varies in relation to disaggregation and economic size was also noted by one of the referees.

5. Exact results were obtained also in the author's application of a larger, 73-industry, 116-commodity price model in "The Effect of Indirect Tax, Wage, and Regulated Price Changes on the Competitiveness of Canadian Exports," a paper prepared for Queens'-University of Ottawa Economic Projects, May 1993.

projections are sufficient for attainment of exact projections of employment and other variables proportional to industry output.

In conclusion, data suppression and rounding are no longer impediments to input-output modelling with public use data, least of all when sufficient control totals are available.

TABLE 1 Errors in Projections With Incomplete, 1988 Input-Output Data

	CORRECT VALUE	CONVENTIONAL PROJECTION	ERROR in %	NEW PROJECTION	ERROR in %	LAST PROJECTION	ERROR in %
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
INDUSTRY OUTPUT							
Agriculture	24586.7	24497.4	-0.36	24586.7		24586.7	
Fishing, hunting and trapping	1700.7	1596.7	-6.12	1700.7		1700.7	
Logging and forestry	8702.4	8643.8	-0.67	8702.4		8702.4	
Mining	14562.0	13948.8	-4.21	14552.8	-0.06	14562.0	
Crude petroleum and natural gas extraction	17385.0	17320.9	-0.37	17385.1	0.00	17385.1	0.00
Quarries	1384.8	1365.0	-1.43	1384.9	0.01	1384.9	0.01
Services to mining	4283.4	4261.3	-0.52	4283.4		4283.4	
Food	38554.1	38475.9	-0.20	38536.5	-0.05	38554.1	
Beverages	6323.3	6353.7	0.48	6323.2	0.00	6323.2	0.00
Tobacco	1749.5	1468.0	-16.09	1476.5	-15.60	1749.5	
Rubber	2929.1	2528.7	-13.67	2801.9	-4.34	2929.1	
Plastic	6043.4	5877.3	-2.75	6015.9	-0.46	6043.4	
Leather	1316.3	1099.9	-16.44	1252.8	-4.82	1316.3	
Textiles	6711.0	6740.8	0.44	6553.6	-2.35	6711.0	
Clothing	6837.9	6798.5	-0.58	6814.2	-0.35	6837.9	
Wood	15503.8	15433.4	-0.45	15501.2	-0.02	15503.8	
Furniture	4672.9	4574.2	-2.11	4653.3	-0.42	4672.9	
Paper	26019.6	25431.4	-2.26	25865.4	-0.59	26019.6	
Printing and publishing	12842.2	12619.9	-1.73	12826.3	-0.12	12842.2	
Primary metal products	28336.0	23738.6	-16.22	28304.0	-0.11	28336.0	
Metal fabricating	18339.2	17316.4	-5.58	18289.1	-0.27	18339.2	
Machinery	10401.8	10515.6	1.09	10383.5	-0.18	10401.8	
Transport equipment	53885.4	54292.9	0.76	53245.5	-1.19	53885.4	
Electrical products	19236.4	19385.4	0.77	19190.4	-0.24	19236.4	
Non-metallic products	8110.1	8096.8	-0.16	8086.1	-0.30	8110.1	
Refined petroleum and coal products	14180.7	14098.0	-0.58	14178.0	-0.02	14180.7	
Chemicals	23572.5	23320.2	-1.07	23515.7	-0.24	23572.5	
Other manufacturing	6496.3	6152.8	-5.29	6394.5	-1.57	6496.3	
Construction	90268.9	90220.1	-0.05	90268.9		90268.9	
Transport	38217.7	38064.5	-0.40	38217.8	0.00	38217.7	
Pipeline transport	2926.0	2906.6	-0.66	2926.0		2926.0	
Storage	1156.2	1151.4	-0.42	1156.3	0.01	1156.3	0.01
Communications	19830.3	19811.1	-0.10	19830.3		19830.3	
Other utilities	21601.7	21347.0	-1.18	21601.7		21601.7	
Wholesale trade	42178.9	42024.5	-0.37	42178.8	0.00	42178.9	
Retail trade	50876.3	50847.8	-0.06	50876.4	0.00	50876.4	0.00
Finance and real estate	72105.3	71981.0	-0.17	72105.3		72105.3	
Insurance	10167.1	10149.6	-0.17	10167.2	0.00	10167.2	0.00
Royalties	3473.5	3467.5	-0.17	3473.5		3473.5	
Owner-occupied dwellings	44770.4	44770.4		44770.5	0.00	44770.5	0.00
Business services	31367.2	31354.8	-0.04	31367.3	0.00	31367.3	0.00
Education	1626.7	1626.7		1627.1	0.02	1627.1	0.02
Health services	14503.8	14503.1	0.00	14504.0	0.00	14504.0	0.00
Accommodation and food	23697.9	23689.0	-0.04	23697.9		23697.9	
Amusement and recreation	8136.6	8134.9	-0.02	8136.7	0.00	8136.7	0.00

	CORRECT VALUE	CONVENTIONAL PROJECTION	ERROR in %	NEW PROJECTION	ERROR in %	LAST PROJECTION	ERROR in %
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Personal and household services	6725.9	6714.1	-0.18	6726.0	0.00	6726.0	0.00
Other services	9887.9	9872.0	-0.16	9887.8	0.00	9887.8	0.00
Supplies	24398.9	24170.7	-0.94	24398.9		24398.9	
Travel, advertising and promotion	20245.4	20205.0	-0.20	20245.5	0.00	20245.5	0.00
Transport margins	17081.4	16958.8	-0.72	17081.4		17081.4	
TOTAL INDUSTRY OUTPUT	939910.4	929922.8	-1.06	938048.9	-0.20	939911.9	0.00
COMMODITY OUTPUT							
GRAINS	5158.6	5152.0	-0.13	5158.7	0.00	5158.7	0.00
LIVE ANIMALS	6909.3	6898.7	-0.15	6909.3		6909.3	
OTHER AGRICULTURAL PRODUCTS	11484.3	11413.0	-0.62	11484.4	0.00	11484.4	0.00
FORESTRY PRODUCTS	8338.9	8282.2	-0.68	8338.8	0.00	8338.8	0.00
FISH LANDINGS	1613.5	1610.2	-0.20	1613.5		1613.5	
HUNTING AND TRAPPING PRODUCTS	65.1	-35.8	-154.99	64.9	-0.31	64.9	-0.31
IRON ORES AND CONCENTRATES	1211.7	1130.9	-6.67	1211.7		1211.7	
OTHER METALLIC ORES AND CONCENTRATES	11099.3	9307.7	-16.14	10229.4	-7.84	10229.4	-7.84
COAL	1545.3	1447.9	-6.30	1544.9	-0.03	1544.9	-0.03
CRUDE MINERAL OILS	9890.7	9865.1	-0.26	9890.7		9890.7	
NATURAL GAS	5894.1	5854.3	-0.68	5894.1		5894.1	
NON-METALLIC MINERALS	2663.8	2632.0	-1.19	2651.0	-0.48	2651.0	-0.48
SERVICES INCIDENTAL TO MINING	4361.5	4339.6	-0.50	4361.5		4361.5	
MEAT PRODUCTS	11596.5	11485.5	-0.96	11535.3	-0.53	11535.3	-0.53
DAIRY PRODUCTS	6845.9	6840.9	-0.07	6845.9		6845.9	
FISH PRODUCTS	2789.4	2788.5	-0.03	2789.4		2789.4	
FRUITS AND VEGETABLES PREPARATIONS	3865.7	3863.4	-0.06	3865.3	-0.01	3865.3	-0.01
FEEDS	3467.0	3457.2	-0.28	3466.9	0.00	3466.9	0.00
FLOUR, WHEAT, MEAL & OTHER CEREALS	839.5	836.3	-0.38	839.5		839.5	
BREAKFAST CEREAL & BAKERY PRODUCTS	3387.5	3385.7	-0.05	3387.6	0.00	3387.6	0.00
SUGAR	502.9	503.8	0.18	502.7	-0.04	502.7	-0.04
MISCELLANEOUS FOOD PRODUCTS	5246.8	5241.7	-0.10	5242.4	-0.08	5242.4	-0.08
SOFT DRINKS	2048.0	2054.9	0.34	2048.0		2048.0	
ALCOHOLIC BEVERAGES	3789.2	3789.9	0.02	3789.2		3789.2	
TOBACCO PROCESSED UNMANUFACTURED	247.3		-100.00	17.5	-92.92	17.5	-92.92
CIGARETTES AND TOBACCO MFG.	1448.3	1448.3		1448.3		1448.3	
TIRES AND TUBES	n/a		n/a	132.0	n/a	132.0	n/a
OTHER RUBBER PRODUCTS	2244.0	2096.7	-6.56	2215.4	-1.27	2215.4	-1.27
PLASTIC FABRICATED PRODUCTS	4663.7	4545.7	-2.53	4574.8	-1.91	4574.8	-1.91
LEATHER AND LEATHER PRODUCTS	1136.4	964.6	-15.12	1117.6	-1.65	1117.6	-1.65
YARNS AND MAN MADE FIBRES	1463.6	1501.0	2.56	1444.3	-1.32	1444.3	-1.32
FABRICS	2070.3	2082.0	0.57	2041.1	-1.41	2041.1	-1.41
OTHER TEXTILE PRODUCTS	2858.0	2827.9	-1.05	2819.9	-1.33	2819.9	-1.33
HOSIERY AND KNITTED WEAR	1203.8	1203.1	-0.06	1203.1	-0.06	1203.1	-0.06
CLOTHING AND ACCESSORIES	5558.2	5443.2	-2.07	5455.5	-1.85	5455.5	-1.85
LUMBER AND TIMBER	7648.4	7586.9	-0.80	7594.2	-0.71	7594.2	-0.71
VENEER AND PLYWOOD	1072.6	1063.0	-0.90	1065.9	-0.62	1065.9	-0.62
OTHER WOOD FABRICATED MATERIAL	6820.1	6779.0	-0.60	6819.3	-0.01	6819.3	-0.01
FURNITURE AND FIXTURES	4881.9	4869.6	-0.25	4873.6	-0.17	4873.6	-0.17
PULP	7431.7	7354.1	-1.04	7431.7		7431.7	
NEWSPRINT & OTHER PAPER STOCK	12233.1	12058.5	-1.43	12222.9	-0.08	12222.9	-0.08
PAPER PRODUCTS	7255.1	7222.7	-0.45	7255.3	0.00	7255.3	0.00
PRINTING AND PUBLISHING	8896.2	8752.9	-1.61	8894.7	-0.02	8894.7	-0.02
ADVERTISING, PRINT MEDIA	3230.7	3223.4	-0.23	3230.7		3230.7	

	CORRECT VALUE (1)	CONVENTIONAL PROJECTION (2)	ERROR in % (3)	NEW PROJECTION (4)	ERROR in % (5)	LAST PROJECTION (6)	ERROR in % (7)
IRON AND STEEL PRODUCTS	11926.8	11568.0	-3.01	11919.2	-0.06	11919.2	-0.06
ALUMINUM PRODUCTS	6201.7	5874.3	-5.28	6163.6	-0.61	6163.6	-0.61
COPPER & COPPER ALLOY PRODUCTS	2421.2	2356.0	-2.69	2416.1	-0.21	2416.1	-0.21
NICKEL PRODUCTS	2557.9		-100.00	2489.0	-2.69	2489.0	-2.69
OTHER NON FERROUS METAL PRODUCTS	3319.1	3108.1	-6.36	3313.1	-0.18	3313.1	-0.18
BOILERS, TANKS AND PLATES	1078.0	1054.3	-2.20	1065.1	-1.20	1065.1	-1.20
FABRICATED STRUCTURAL METAL PRODUCTS	4038.0	4000.8	-0.92	4020.8	-0.43	4020.8	-0.43
OTHER METAL FABRICATED PRODUCTS	11663.3	10021.4	-14.08	11596.0	-0.58	11596.0	-0.58
AGRICULTURAL MACHINERY	995.0	992.7	-0.23	994.4	-0.06	994.4	-0.06
OTHER INDUSTRIAL MACHINERY	12653.1	12646.0	-0.06	12643.6	-0.08	12643.6	-0.08
MOTOR VEHICLES	29587.3	29582.3	-0.02	29578.4	-0.03	29578.4	-0.03
MOTOR VEHICLE PARTS	15689.9	16564.2	5.57	15654.0	-0.23	15654.0	-0.23
OTHER TRANSPORT EQUIPMENT	7682.8	7748.1	0.85	7677.2	-0.07	7677.2	-0.07
APPLIANCES AND RECEIVERS, HOUSEHOLD	2531.0	2545.1	0.56	2527.9	-0.12	2527.9	-0.12
OTHER ELECTRICAL PRODUCTS	13070.4	13124.2	0.41	13063.8	-0.05	13063.8	-0.05
CEMENT AND CONCRETE PRODUCTS	3987.1	3980.4	-0.17	3980.3	-0.17	3980.3	-0.17
OTHER NON-METALLIC MINERAL PRODUCTS	3715.4	3689.2	-0.71	3714.0	-0.04	3714.0	-0.04
GASOLINE AND FUEL OIL	10555.1	10510.0	-0.43	10554.8	0.00	10554.8	0.00
OTHER PETROLEUM AND COAL PRODUCTS	5052.2	4996.7	-1.10	5052.0	0.00	5052.0	0.00
INDUSTRIAL CHEMICALS	11792.2	11625.5	-1.41	11783.2	-0.08	11783.2	-0.08
FERTILIZERS	2274.2	2267.0	-0.32	2272.7	-0.07	2272.7	-0.07
PHARMACEUTICALS	2978.4	2972.3	-0.20	2977.9	-0.02	2977.9	-0.02
OTHER CHEMICAL PRODUCTS	7566.2	7524.1	-0.56	7563.3	-0.04	7563.3	-0.04
SCIENTIFIC EQUIPMENT	2821.5	2561.5	-9.21	2770.2	-1.82	2770.2	-1.82
OTHER MANUFACTURED PRODUCTS	4778.3	4648.1	-2.72	4665.0	-2.37	4665.0	-2.37
RESIDENTIAL CONSTRUCTION	34634.8	34634.8		34634.8		34634.8	
NON-RESIDENTIAL CONSTRUCTION	42415.0	42415.0		42415.0		42415.0	
REPAIR CONSTRUCTION	12729.3	12683.1	-0.36	12729.3		12729.3	
PIPELINE TRANSPORTATION	3042.6	3022.1	-0.67	3042.6		3042.6	
TRANSPORTATION AND STORAGE	38318.5	38156.0	-0.42	38318.5		38318.5	
RADIO AND TELEVISION BROADCASTING	3366.4	3361.7	-0.14	3366.4		3366.4	
TELEPHONE AND TELEGRAPH	12428.0	12407.0	-0.17	12428.1	0.00	12428.1	0.00
POSTAL SERVICES	3211.9	3205.5	-0.20	3211.9		3211.9	
ELECTRIC POWER	18062.6	17914.5	-0.82	18062.7	0.00	18062.7	0.00
OTHER UTILITIES	2946.8	2845.9	-3.42	2942.8	-0.14	2942.8	-0.14
WHOLESALE MARGINS	43663.2	43475.6	-0.43	43663.2		43663.2	
RETAIL MARGINS	42585.0	42571.4	-0.03	42585.2	0.00	42585.2	0.00
IMPUTED RENT OWNER OCPD, DWELLINGS	44770.4	44770.4		44770.4		44770.4	
OTHER FINANCE, INSURANCE, REAL ESTATE	84244.2	84089.8	-0.18	84244.3	0.00	84244.3	0.00
BUSINESS SERVICES	33353.0	33332.2	-0.06	33353.3	0.00	33353.3	0.00
EDUCATION SERVICES	1626.7	1626.7		1626.7		1626.7	
HEALTH SERVICES	14316.3	14316.2	0.00	14316.3		14316.3	
AMUSEMENT & RECREATION SERVICES	7445.7	7444.4	-0.02	7445.8	0.00	7445.8	0.00
ACCOMMODATION AND FOOD SERVICES	24489.7	24480.7	-0.04	24490.0	0.00	24490.0	0.00
OTHER PERSONAL & MISC. SERVICES	32620.7	32557.6	-0.19	32620.8	0.00	32620.8	0.00
TRANSPORTATION MARGINS	17081.4	16960.7	-0.71	17081.6	0.00	17081.6	0.00
OPERATING, OFFICE, LAB. & FOOD	24398.9	24177.8	-0.91	24399.3	0.00	24399.3	0.00
TRAVEL, ADVERTISING & PROMOTION	20245.4	20199.9	-0.22	20245.8	0.00	20245.8	0.00
TOTAL COMMODITY OUTPUT	939910.4	929777.2	-1.08	937973.3	-0.21	937973.3	-0.21
RESIDUAL	n/a	n/a	n/a	8009.2	n/a	9872.2	n/a

Note: A blank denotes an exact zero. n/a: either not available or not applicable.