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MARYLAND INTERINDUSTRY FORECASTING PROJECT

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Disaggregation of the Petroleum Refining Row

by

David Gilmartin

This note presents the disaggregation of the 1958 petroleum refining row into separate output distributions for each of six product groups: gasoline, kerosene, fuel oil, liquified petroleum gases, lubricants, and a miscellany (asphalt, solvents, unfinished oils, etc.). These more detailed allocations are derived primarily from the Office of Business Economics worksheets for petroleum refining. The OBE worksheets provided 85% of each product group's distribution, except for Fuel Oil.

Table I presents our estimates of these six rows. In parenthesis beneath each entry is the allocation derived from the original OBE worksheets. The seventh column shows the total allocation to each purchasing industry as it appears in the published OBE table. Several groups of sectors are treated as aggregates: agriculture, forestry, fisheries, and agricultural services constitute one; construction, food, and the nonferrous metals are the other three aggregates.

The row of total shipments at the bottom of Table I needs comment. Each total consists of three parts: 1) "primary products wherever made" as shown in the 1958 Census; 2) transfers-in from non-manufacturing establishments; and 3) excise taxes. The first and largest part comes directly from 1958 Census of Manufactures, Volume II, Part 2, pages 29A-13 and following. The Table 6A reports:

<u>Product</u>	<u>Product Codes</u>	<u>Value of shipments (\$MM)</u>
Gasoline	2911 1--	7825.0
Kerosine	2911 2--	411.7
Fuel Oil	2911 3--, 2911 4--	3308.1
LPG, excluding chemical feedstocks	2911 511, 2911 598	180.1
Lubricants	2911 6--, 2911 7--	872.7
Asphalt, solvents, and unfinished oils	2911 8--, 2911 9 2911 0--, 2951, 2952, 2992 000, 2999	<u>1897.4</u>
		14,495.0

To the above shipments were then added OBE's estimate for petroleum products shipped by non-manufacturing plants. These transfers-in were \$8.5 million of fuel oil shipped by gas utilities and \$280.9 million of LPG shipped from natural gas liquids plants. Finally, the producer values of the OBE table and the MIFP include all manufacturers' excise taxes. Two products carry the tax: gasoline, \$1,583.9 million; and lubricants, \$70.2 million. Summing the three parts gives total shipments:

<u>Product</u>	<u>Census Value</u>	<u>Transfers-in</u>	<u>Excise</u>	<u>Total Shipments</u>
Gasoline	7825.0		1583.9	9408.9
Kerosine	411.7			411.7
Fuel oil	3308.1	8.5		3316.6
LPG	180.1	280.9		461.0
Lubricants	872.7		70.2	942.9
Asphalt, sol- vents, un- finished oils	<u>1897.4</u>	<u> </u>	<u> </u>	<u>1897.4</u>
	14,495.0	289.4	1654.1	16,438.5

A final comment about Table I concerns Purchaser 96, Net Exports. In the OBE table, no imports are subtracted from exports, so the row sum represents total "new supply", whether of foreign or domestic origin. In the MIFP tables, however, we subtract imports by a negative entry in the net export column. The row sum then equals domestic production. All other cells in the two tables are the same. The import entries are significant for the Fuel Oil and for the Asphalt, Solvents, and Unfinished Oils sectors.

For guidance in allocation of "Miscellany's" \$290.8 million unallocated residual, we include Table II, which displays the product detail in this category. The entries in the Total column of Table II are identical to those in parentheses in the Miscellany column of Table I.

In Table I, the totals for industries 1 through 100 include withdrawals from finished products inventories as well as 1958 production. However the total shipments shown at the end of Table I do not include inventory depletions. Thus in allocating the residuals, there are two alternatives: to create a consumption table by balancing to total purchases or to create a shipments table by balancing to total shipments shown at the end of Table I. For 1958, the difference is roughly 1%. Since the current MIFP projections use Census Bureau data on shipments and include no accounting of inventories, the second alternative is followed.

We can now describe some of the details of the allocations of the unallocated residuals in the OBE worksheets. The residual purchases of State & Local Government of \$257.3 million was thought to be primarily Fuel Oil for heating, since none had been allocated. Another possibility was that the residual included Miscellany, but no example could be adduced. Consequently, \$5 million was assumed to be Kerosene for lanterns and other small-quantity uses and the remaining \$252.3 million was allocated as Fuel Oil. The remaining \$29.7 million of Kerosene was allocated to Agriculture (\$14.6 million) and Lumber, (\$15 million)

sectors which, like State & Local Government, include many establishments each using small quantities. The residual LPG of \$1 million was added to Petroleum Refining purchases already recorded, there to have a negligible effect. The consumption of fuel oil by electric utilities was estimated at \$225 million using 1958 Census of Manufactures unit prices and the distillate and residual oil demands by use from the American Petroleum Institute's Annual Statistical Bulletin. With consumption of still gas by gas utilities, this explains all but \$11.2 million of the total for sectors 78-80; this residual was distributed evenly among the three as gasoline consumption. The residual purchases of government Enterprises were divided between Gasoline and Fuel Oil, the larger value being for heating rather than autos. The residual purchases of Agriculture were allocated by increasing proportionally the consumption of Gasoline, Fuel Oil, and Lubricants after setting the consumption of the Miscellany at \$10 million. The residual purchases of Construction were also prorated to the Gasoline, Fuel Oil and Lubricants cells in proportion to the OBE estimates. The residual purchases of Telephone and Telegraph were assumed to be Gasoline, Fuel Oil, and Miscellany; those of Automobile Repair, Lubricants. The one, notably large number to be handled in this arbitrary fashion was the residual purchases of Transportation: \$40 million were assigned to Miscellany and the remaining \$557.2 million were divided equally between Gasoline and Fuel Oil. This treatment is chosen because of the large residuals for these products, though a different distribution is obviously possible. These allocations account for over one-third of the Transportation industry's total purchases.

Once these individual allocations were made, four products remained partially undistributed: Gasoline (3%), Fuel Oil (8%), Lubricants (10%), and Miscellany (9%). Also, sixty-nine sectors had small residual purchases: all manufacturing industries, Telephone & Telegraph, Trade, Finance & Insurance, Real Estate, Hotels, Business Services, and Medical & Educational Institutions. The undistributed value of Lubricants was prorated to these sixty-nine industries on the basis of their residual purchases. After these allocations were deducted, the new residual of each purchasing industry was distributed as Gasoline, Fuel Oil, and Miscellany in proportion to the unallocated value of these products. These two steps account for \$700 million--about 4.3% of all petroleum products. Finally, those groups of sectors which were aggregated in the OBE Worksheet received individual allocation in proportion to their total purchases.

The final values are consistent with every piece of information available to us. The greatest detail of the original worksheets is faithfully reflected in them and they sum to all the published and unpublished totals. Consistency, however, is an insufficient measure. Overall, 13% of the allocations are uneducated estimates, guided only by everyday knowledge and the demands of consistency. No particular knowledge of the products or the purchasers informed the decisions. In this fact lies the deficiency of the table.

TABLE I

1958 PURCHASES OF PETROLEUM REFINING PRODUCTS, BY SECTOR (\$1. million)

Purchasing Industry	Gasoline	Kerosene	Fuel Oil	LPG	Lubricants	Miscellany	Total Purchases
1 Livestock	39.8	1.1	2.4	0.9	3.4	0.5	48.1
2 Crops	749.2	19.4	42.3	17.4	60.7	9.3	898.4
3 Forestry and Fishery Products	15.6	0.4	0.9	0.4	1.3	0.2	18.9
4 Agricultural Services	2.6						2.6
Agriculture (1-4)	807.2 (686.6)	20.9 (6.3)	45.6 (37.6)	18.7 (18.7)	65.4 (54.1)	10.0	
5 Iron Ore Mining	1.7 (1.7)		6.1 (6.1)		2.0	0.5	10.4
6 Non-Ferrous Ore Mining	3.0 (3.0)		3.3 (3.3)		1.9		8.2
7 Coal Mining	10.0 (9.0)		10.6 (9.5)		9.7		30.3
8 Petroleum Mining	35.2 (33.2)		7.0 (6.6)		9.7		51.9
9 Minerals Mining	28.5 (28.5)		11.3 (11.3)		5.6		45.4
10 Chemical Mining	1.2 (1.2)		3.0 (3.0)		1.2		5.4
11 New Construction	240.5		35.9	0.1	17.9	692.0	986.5
12 Maintenance Construction	91.4		13.7	0.1	6.8	262.9	374.8
Construction (11-12)	331.9 (307.2)		49.6 (45.9)	0.2 (0.2)	24.7 (9.4)	954.9 (883.8)	

Purchasing Industry	Gasoline	Kerosene	Fuel Oil	LPG	Lubricants	Miscellany	Total Purchases
13 Ordnance	1.7		1.6 (2.8)	0.4 (0.4)	0.7		10.2
14 Meat Packing	6.6		2.5	0.1	0.3	0.4	
15 Dairy Products	11.9		4.4	0.2	0.5	0.7	
16 Canned and Frozen Foods	6.6		2.5	0.1	0.3	0.4	
17 Grain Mill Products	2.7		1.0			0.2	
18 Bakery Products	35.2		13.0	0.5	1.2	2.0	
19 Sugar	1.3		0.5				
20 Candy	1.3		0.5				
21 Beverages	4.6		1.7	0.1	0.3	0.3	
22 Miscellaneous Food Products	118.3		43.5	1.9	4.6	6.6	
Food (14-22)	188.5 (171.3)		69.6 (53.8)	2.9 (2.9)	7.2	10.6	283.8
23 Tobacco	1.6 (1.5)		0.8 (0.8)	0.1 (0.1)			2.6
24 Fabrics and Yarn	5.5 (4.1)		16.6 (15.3)	0.6 (0.6)	0.6	0.8	26.0
25 Rugs, Tire Cord, Misc. Textiles	1.3 (1.0)		2.2 (1.9)	0.4 (0.4)	0.1	0.2	4.2
26 Apparel	2.3 (2.0)		2.2 (2.0)	0.2 (0.2)	0.1	0.1	5.7
27 Household Textiles and Upholstery	1.7 (1.5)		0.2		0.1	0.1	2.1

Purchasing Industry	Gasoline	Kerosene	Fuel Oil	LPG	Lubricants	Miscellany	Total Purchases
28 Lumber & Products, Except Containers	27.4 (22.9)	15.0	14.3 (10.1)	2.0 (2.0)	1.9	3.5 (0.7)	75.4
29 Wooden Containers	2.2 (2.0)		0.2		0.1	0.2	2.8
30 Household Furniture	4.1 (3.6)		2.3 (1.8)	0.1 (0.1)	0.2	0.3	7.0
31 Office Furniture	2.0 (1.5)		0.5		0.2	0.3	3.0
32 Paper & Products except Containers	5.2 (4.6)		50.7 (50.1)	2.2 (2.2)	0.3	55.7 (55.3)	119.6
33 Paper Containers	2.3 (2.0)		4.5 (4.2)	0.2 (0.2)	0.1	17.7 (17.5)	24.8
34 Printing and Publishing	9.0 (8.2)		0.7		0.3	0.5	10.5
35 Basic Chemicals	23.8 (9.7)		50.6 (37.7)	3.5 (3.5)	6.0	10.3 (1.7)	99.1
36 Plastics and Synthetics	2.1 (1.0)		6.3 (5.3)	0.8 (0.8)	0.5	0.7	20.1
37 Drugs, Cleaning & Toilet Items	7.3 (2.5)		10.9 (6.5)	0.3 (0.3)	2.1	2.9	24.2
38 Paint and Allied Products	1.8 (1.5)		1.7 (1.4)	0.1 (0.1)	0.1	5.7 (5.6)	9.4
39 Petroleum Refining	243.0 (211.7)	8.6 (8.6)	119.9 (119.9)	139.2 (138.2)	72.5 (72.5)	659.0 (627.5)	1242.2
40 Rubber and Plastic Products	1.7 (1.5)		9.4 (9.2)	0.3 (0.3)	0.1	2.4 (2.3)	15.5

Purchasing Industry	Gasoline	Kerosene	Fuel Oil	LPG	Lubricants	Miscellany	Total Purchases
41 Leather Tanning	0.5 (0.5)		2.4 (2.4)	0.2 (0.2)			3.6
42 Shoes and Other Leather Products	0.7 (0.5)		0.2		0.1		1.0
43 Glass and Glass Products	1.2 (1.0)		5.0 (4.8)	0.3 (0.3)	0.1	0.2	6.8
44 Stone & Clay Products	16.8 (15.3)		32.4 (31.1)	2.2 (2.2)	0.7	4.7 (3.7)	63.5
45 Iron and Steel	14.1 (4.1)		117.2 (108.0)	0.4 (0.4)	4.3	6.2	147.2
46 Copper	1.8		4.6	0.9	0.4	3.5	
47 Aluminum	2.0		5.1	1.0	0.4	3.8	
48 Other Non-Ferrous Metals	3.2		8.0	1.5	0.7	5.9	
Non-Ferrous Metals (46-48)	7.0 (3.6)		17.7 (14.6)	3.4 (3.4)	1.5	13.2 (10.2)	41.8
49 Metal Containers	1.8 (0.5)		2.3 (1.2)	0.1 (0.1)	0.5	0.8	5.6
50 Heating, Plumbing, Structural Metal	16.6 (7.6)		15.2 (7.0)	0.5 (0.5)	7.9 (4.0)	5.6	42.5
51 Stampings, Screw Machine Products	7.3 (2.0)		9.4 (4.6)	0.2 (0.2)	2.3	3.2	23.5
52 Hardware, Plating, Valves, Wire Products	9.9 (2.0)		10.4 (3.1)	0.1 (0.1)	3.4	4.9	29.0

Purchasing Industry	Gasoline	Kerosene	Fuel Oil	LPG	Lubricants	Miscellany	Total Purchases
53 Engines and Turbines	2.0 (0.5)		4.5 (3.2)	0.2 (0.2)	0.7	1.0	8.7
54 Farm Machinery and Equipment	2.8		3.8 (1.2)	0.2 (0.2)	1.2	1.7	9.8
55 Construction & Mining Machinery	4.1 (0.5)		5.0 (1.7)	0.2 (0.2)	1.6	2.3	13.5
56 Material Handling Equipment	1.2		1.1		0.5	0.7	3.6
57 Metalworking Machinery & Equipment	6.6 (1.5)		4.6		4.0 (4.0)	3.1	18.3
58 Special Industrial Machinery	5.9 (1.0)		4.5		0.9 (0.9)	2.9	14.2
59 General Industrial Machinery	4.3 (0.5)		4.5 (1.1)	0.1 (0.1)	2.4 (2.4)	2.3	13.9
60 Machine Shops & Miscellaneous Machinery	5.4 (1.0)		5.5 (1.5)	0.1 (0.1)	1.9	2.8	16.0
61 Office and Computing Machines	1.1		1.0		0.5	0.6	3.4
62 Service Industry Machines	1.9		2.5 (0.8)	0.1 (0.1)	0.8	1.3	6.6
63 Electric Motors & Apparatus	0.8 (0.5)		2.3 (2.0)	0.4 (0.4)	7.6 (7.5)	4.9 (4.8)	16.0
64 Household Appliances	1.5		1.5 (0.2)	0.1 (0.1)	0.6	0.9	4.6
65 Electric Lighting and Wiring Equipment	1.4		1.2		0.6	0.9	4.1

Purchasing Industry	Gasoline	Kerosene	Fuel Oil	LPG	Lubricants	Miscellany	Total Purchases
66 Communication Equipment	2.0 (0.5)		3.6 (2.3)	0.1 (0.1)	0.6	0.9	7.5
67 Electronic Components	0.8		2.3 (1.6)	0.1 (0.1)	0.3	0.6	4.2
68 Batteries, X-Ray & Engine Electrical Equipment	0.7		0.7		0.3	0.4	2.1
69 Motor Vehicles	14.7		20.5 (7.0)	1.9 (1.9)	6.3	10.7 (1.7)	47.6
70 Aircraft and Parts	5.3		10.6 (5.8)	0.6 (0.6)	7.5 (10.2)	3.3	30.3
71 Ships, Trains, Trailers & Cycles	4.7 (1.5)		7.2 (4.3)	0.2 (0.2)	1.4	2.9 (0.9)	16.4
72 Instruments and Clocks	1.5		1.3		0.7	1.0	4.6
73 Optical & Photographic Equipment	1.1		1.6 (0.6)	0.2 (0.2)	0.5	0.7	4.1
74 Miscellaneous Manufactured Products	4.6 (2.0)		2.4		1.1	8.0 (6.4)	16.8
75 Transportation	983.9 (705.3)		393.6 (139.3)	28.8 (28.8)	41.4 (41.4)	64.5	1518.4
76 Communication	11.8 (10.7)		2.9 (1.9)	0.1 (0.1)		0.7	16.2
77 Radio, TV Broadcasting			0.4 (0.4)				2.0

Purchasing Industry	Gasoline	Kerosene	Fuel Oil	LPG	Lubricants	Miscellany	Total Purchases
78 Electric Utility	3.7		225.0				} 241.4
79 Gas Utility	3.7					5.2	
80 Water Utility	3.8					(5.2)	
81 Wholesale and Retail Trade	557.7 (508.5)		77.8 (32.7)	1.4 (1.4)	20.3		687.5
82 Finance and Insurance	57.5 (52.5)		29.8 (25.2)	1.1 (1.1)	2.1	3.0	93.5
83 Real Estate and Rental	29.7 (27.0)		204.5 (202.0)	8.7 (8.7)	1.1	1.6	245.6
84 Hotels, Personal & Repair Services	73.8 (67.3)		16.3 (10.3)	0.4 (0.4)	2.8	18.1 (14.1)	143.7
85 Business Services	82.1 (75.0)		12.2 (5.7)	0.2 (0.2)	3.1	4.4	108.7
86 Automobile Repair Services	8.0 (8.0)		2.7 (2.7)	0.1 (0.1)	0.3		27.2
87 Amusements and Recreation			3.5 (3.5)	0.2 (0.2)			3.7
88 Medical and Educational Institutions	28.6 (20.3)		16.5 (8.8)	0.4 (0.4)	3.5	5.0	70.1
89 Federal Government Enterprises	1.0		5.2				6.2
90 State and Local Government Enterprises	9.0		30.4 (12.7)			1.0 (1.0)	40.4

Purchasing Industry	Gasoline	Kerosene	Fuel Oil	LPG	Lubricants	Miscellany	Total Purchases
95 Consumption	4843.7 (4843.7)	358.0 (358.0)	1460.0 (1460.0)	170.2 (170.2)	407.7 (407.7)	19.8 (19.2)	7259.4
96 Net Exports	99.5 (99.5)	4.2 (4.2)	-318.0 (-318.0)	65.3 (65.3)	159.3 (159.3)	-57.0 (-57.0)	-46.7
99 Non-Defense Federal	606.1 (605.6)		95.4 (95.4)		22.3 (22.3)	2.0 (2.0)	725.8
100 State and Local Government	120.8 (120.8)	5.0	252.3		3.5 (3.5)		381.6
Transfers into inventories							-186.1
Total output	9408.9 (8715.3)	411.7 (377.1)	3316.6 (2338.8)	461.0 (460.0)	952.7 (799.2)	1897.4 (1606.6)	16,438.5

TABLE II

PRODUCT DETAIL FOR MISCELLANEOUS CATEGORY

<u>Purchasing Industry</u>	<u>Unfinished Oils</u>	<u>Asphalt</u>	<u>Petrolatum, Coke, Still Gas</u>	<u>Road Oil</u>	<u>Naphtha Solvents</u>	<u>Waxes</u>	<u>Other Refinery Products</u>	<u>Paving & Roofing Materials</u>	<u>Packaged Fuel and Misc.</u>	<u>Total</u>
11-12 Construction		182.6		29.2				672.0		883.8
28 Lumber, exc. containers								0.7		0.7
32 Paper, exc. containers						55.3				55.3
33 Paperboard containers						17.5				17.5
35 Basic chemicals						1.7				1.7
38 Paint					5.6					5.6
39 Petroleum	503.8	101.5	14.3			7.9				627.5
40 Rubber & plastics prod.						2.3				2.3
44 Stone & clay products		3.5	0.2							3.7
46-48 Nonferrous metals			2.2						8.0	10.2
63 Electric Apparatus Motors									4.8	4.8
69 Motor vehicles								1.7		1.7
71 Ships, trains, trailers, cycles								0.9		0.9
74 Misc. manufactured prod.						6.4				6.4
79 Gas utilities			5.2							5.2
84 Hotels, personal & repair services					14.1					14.1
90 State & local government enterprises			1.0							1.0
94 Personal consumption									19.2	19.2
97 Net exports	-62.9	-3.0	18.7			15.5	-3.6	-22.0	0.3	-57.0
99 Federal government purchases									2.0	2.0
A Total of above	440.9	284.6	41.6	29.2	19.7	106.6	-3.6	653.3	34.3	1606.6
B Total shipments	440.9	284.6	78.2	29.2	135.7	113.4	74.4	674.0	67.0	1897.4
Unallocated residual (B-A)	--	--	36.6	--	116.0	6.8	78.0	20.7	32.7	290.8

All figures in \$million.