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Appendix C. Cross Section: Sources and Methods

EXP:

1966 gross annual business receipts of physicians in self-employment practice [61, pp. 55-73; 142-56]. This material was originally published in [33, pp. 96-98]. We have restricted our sample to the thirty-three states for which data are available on both sole proprietorships and partnerships. Excluded from the sample are Alaska, Delaware, District of Columbia, Hawaii, Idaho, Maine, Massachusetts, Montana, Nevada, New Hampshire, New Mexico, North Dakota, Rhode Island, South Dakota, Utah, Vermont, West Virginia, and Wyoming.

Q:

Number of general practitioner (G. P.) outpatient visits or their equivalent.

AP:

Average price of a G. P. outpatient visit equivalent. Q and AP are implicitly defined by the identity

$$EXP \equiv Q \cdot AP. \tag{1}$$

We estimate Q for each state directly, employing our knowledge of outpatient visits, inpatient visits, and the extent of physician specialization, and then obtain AP from (1).

Total outpatient visit equivalents are equivalent to the sum of such visits by G. P.'s and such visits by specialists.

$$V = V_g G + V_s S = V_g (G + bS), \tag{2}$$

and total expenditures can similarly be decomposed into expenditures for G. P.'s and expenditures for specialists,

$$EXP = P_g V_g G + P_s V_s S = P_g V_g (G + abS), \tag{3}$$

where P_g, P_s = average price per G. P., specialist outpatient visit equivalent; V_g, V_s = number of outpatient visit equivalents per G.P., specialist; G, S = number of G.P.'s, specialists; $P_s/P_g = a$, $V_s/V_g = b$. P_g is equivalent to AP, and thus:

$$Q = V_g (G + abS). \tag{4}$$

The number of outpatient visit equivalents, V, is defined by

$$V = O + wH, \tag{5}$$

where O = home and office visits; H = hospital inpatient visits; and w = outpatient visit equivalents per inpatient visit.

After appropriate substitutions, we have

$$Q = \frac{(O + wH)(G + abS)}{G + bS} \tag{6}$$

and

$$AP = EXP/Q. \tag{7}$$

According to (6), the quantity of physicians' services in a state equals the number of outpatient visit equivalents multiplied by a factor indicating the number of G. P. equivalent visits in the average physician visit. Sources for the right-hand side terms in (6) are described below.

O:

The National Center for Health Statistics provides data on number of home and office visits per capita for the four census regions in 1966-67 [57] and for the nine divisions in 1957-59 [52]. Home and office visits together accounted for 75 per cent of the total physician visits reported in the 1966-67 National Health Survey. We exclude visits in hospital outpatient clinics and emergency rooms (10 per cent) because these are performed by hospital physicians, not private practitioners. Also excluded are telephone visits (10 per cent), which are generally free of charge and represent much less utilization than in-person visits. The additional 5 per cent of visits occurred in company and industry health units, other places, or sites unknown.

We assume an intraregion distribution of per capita visits in 1966-67 comparable to the distribution that prevailed in the earlier period:

$$1957\text{-}59: \; O_1^* = O_{1a}^* W_{1a} + O_{1b}^* W_{1b} + \ldots . \tag{8}$$

$$1966\text{-}67: \; O_2^* = \frac{(O_{1a}^*)}{O_1^*} O_2^* W_{2a} + \frac{(O_{1b}^*)}{O_1^*} O_2^* W_{2b} + \ldots , \tag{9}$$

where

$O^*_{i(j)}$ = per capita home and office visits for this region at time i (in division j).

W_{ij} = per cent of region's population residing in division j at time i.

In this way we can estimate 1966-67 per capita home and office visits for each of the divisions in a region by the term (O^*_{1j}). $(O^*_2)/O^*_1$. We then impute the same figure to each state in the division.

H:

We assume one hospital visit by a private practice physician for each day of stay in a nonfederal, short-term hospital. 1966 days of stay, the product of admissions and average length of stay, are known for each state [25, Aug. 1, 1967]. Our assumption is supported by survey data which indicate that the median number of hospital visits by self-employed physicians was 22 per week in 1966, and that the median number of weeks worked per year was 48 (in 1968) [30]. If physicians in these thirty-three states conformed to the national medians, they would have made 177 million hospital visits; in fact, the number of patient days in these states was quite close to this—185 million.

w:

The 1968 national ratio of average charge for a hospital inpatient visit relative to a home or office visit, or 1.71. Data apply to the Medicare population [58].

G, S:

Applies to physicians in private practice in 1966 [2, 1967].

a:

National ratio of specialists' average gross receipts per visit (AGR) to those of general practitioners. We assume that this ratio is the same for total visits (to which the data apply) as for outpatient visit equivalents. The AGR for G. P.'s was $5.48, computed from survey data for solo practitioners on 1966 median annual gross income from self-employment practice and number of annual visits (median weeks per year times median visits per week). Computation was made for each kind of practitioner, with G. P.'s and selected kinds of specialists together accounting for 80 per cent of self-employed solo physicians. A weighted average for the specialists was $10.55. Thus, a = 1.93, assumed constant for all states [30].

b:

1966 median number of weekly visits per specialist (a weighted average of all kinds of specialists) relative to median number of weekly visits per G. P., or 0.625, assumed constant for all states [30]. Again, we assume this ratio to be the same for total visits (to which the data apply) as for outpatient visit equivalents.

MD:

Number of nonfederal physicians active in "solo, partnership, group, and other practice." MD = G + S. The series excludes nonfederal physicians primarily engaged in teaching, research, industry, public health, or hospital-based practice.

BEN:

1966 private insurance benefits for physicians' services. Because data are not published on the type of health insurance benefits paid in each state, we estimate BEN from data on total health insurance benefit payments for a state (this includes hospital expense and disability income payments as well as physician expense) and on the number of state residents protected by the various kinds of policies (published only for hospital, surgical, and regular medical policies).

We assume first that hospital expense and physician expense benefits together constituted 89 per cent of the benefit total, since this is the ratio that prevailed nationally in that year. Then we separate out the physician expense benefits by assuming that the national ratio of hospital benefits per hospital insured to physician benefits per surgically insured (1.76) prevailed in each state. The data are from [23, 1967 and 1968]. Thus,

(1) $HIB = HOS + BEN + DI$;

(2) $0.89\ HIB \approx HOS + BEN$;

(3) $BEN + HOS = bB + hH \approx b\,(B + 1.76H)$;

(4) $$BEN = bB \approx \frac{.89\ HIB\ (B)}{B + 1.76H},$$

where HIB = total health insurance benefits, 1966; HOS, BEN, DI = hospital expense, physician expense, and disability income benefit payments, 1966; h, b = hospital, physician benefits per person with hospital, physician expense protection; H, B = number of persons with hospital, physician expense protection. B, the number of persons with *any* physician insurance (surgical, regular

medical, or major medical), is not precisely known, owing to an undetermined number of policyholders with two or more forms of coverage. The number of surgically insured persons serves as a very good proxy for B (see Appendix B). H and B are only available for the population under age sixty-five, but this should not bias the results, since only their ratio is of consequence.

PRM/BEN:

Ratio of all health insurance premiums to all health insurance benefits [23, 1968].

INC*:

1966 per capita disposable personal income [49, p. 29].

MED SCLS:

1966 [1, Nov. 21, 1966].

BEDS:

Beds in nonfederal, short-term general and other special hospitals, as of Mar. 1, 1967 [2]; from statistics collected by American Hospital Association.

UNION:

1966 labor union members [47, 1969, p. 236].

POPULATION:

July 1, 1966 civilian resident population [44].

The following variables also appeared in the preliminary large-scale version of our model:

DTH RT:

Average of 1965, 1966, and 1967 death rate per 1,000 residents [47, 1968, p. 56 and 1969, p. 56].

ΔINC*:

1966 INC* minus 1960 INC* [49, p. 29].

INF MRT:

1966. Deaths of infants under one year old, exclusive of fetal deaths, per 1,000 live births. A weighted average of published series for white and nonwhite births [47, 1968].

EDUC:

Median years of school completed by persons twenty-five years old and over [43, pp. 1-20, Table 12].

%URB:

1960. Per cent of total population classified as urban [43, p. xvi].

AGED:

Persons sixty-five years and over, July 1, 1966 [44], as per cent of population.

BRTH RT:

1966 live births, white plus nonwhite, per 1,000 persons [47, 1968, p. 55].

%BLK:

1960 [47, 1969, p. 27].

S&L GOV:

Fiscal 1967 state and local government expenditures for hospitals and "other health" [42, Table 18 of each state volume].

TEMP:

[47, 1969, p. 174] lists one average annual figure for all but fourteen states in our sample (California, Florida, Illinois, Michigan, Missouri, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, Virginia, Washington). For these states, characterized by greater geographic variation in temperature and more widely dispersed populations, temperatures are given for two or three major cities. We have used a weighted average of the city figures (with the cities' populations as weights) as the basis for our TEMP variable in these cases.

%SPEC:

Specialists active in nonfederal, "solo, partnership, group, and other practice," as a per cent of MD [2, 1967].

HOSP MD:

Nonfederal, hospital-based physicians in 1966 [2, 1967].

%PART:

Number of physicians filing partnership business income tax returns for medical practice in 1966 as a per cent of total number of physicians so filing (sole proprietors plus partners) [61 or 33].

MD ORIG:

The sum of the number of first-year medical students originating from a state in each of six selected years (chosen so as to constitute a fairly representative sample of the 1966 physician stock). In the published data, state of origin is variously denoted as "birthplace" (1936, 1941), "residence" (1947, 1953, 1957), and "geographic source" (1961). The data for 1936 and 1941 apply to all medical students and hence describe the state of origin of entering students in the years 1933-36 and 1938-41, respectively; so as not to give undue weight to these years, only one-fourth of this figure enters the computation of MD ORIG [1, various issues].

Table C-1

Expenditures, Insurance, and Price, 1966

State	Total Expenditures (Thousands)	Physician Insurance Benefits per Capita (BEN*)	Per Cent of Persons with Surgical Insurance	Average Price (AP)	Net Price (NP)
Alabama	$110,519	$10.70	64.0	$4.96	$3.28
Arizona	83,252	12.40	47.4	7.22	5.52
Arkansas	57,612	8.25	45.9	4.84	3.49
California	1,265,801	17.20	67.7	8.31	6.23
Colorado	118,863	19.00	69.5	7.52	5.22
Connecticut	146,044	19.80	77.4	7.54	4.62
Florida	238,515	11.40	62.3	5.19	3.76
Georgia	148,515	11.10	74.5	4.87	3.29
Illinois	497,902	18.50	78.0	5.96	3.59
Indiana	200,540	17.30	75.8	5.86	3.37
Iowa	91,801	14.30	71.7	4.53	2.58
Kansas	98,479	13.10	59.9	5.78	4.05
Kentucky	118,176	10.10	57.0	5.94	4.35
Louisiana	158,431	8.86	49.5	6.06	4.85
Maryland	158,908	12.60	54.7	6.00	4.33
Michigan	340,574	24.10	79.6	5.23	2.11
Minnesota	125,355	16.00	71.3	4.22	2.31

(continued)

Table C-1 (concluded)

State	Total Expenditures (Thousands)	Physician Insurance Benefits per Capita (BEN*)	Per Cent of Persons with Surgical Insurance	Average Price (AP)	Net Price (NP)
Mississippi	$65,498	$8.17	47.1	$5.03	$3.58
Missouri	171,546	15.50	69.4	4.62	2.73
Nebraska	61,456	12.40	67.8	5.83	4.14
New Jersey	317,426	16.60	66.6	5.85	3.76
New York	895,435	22.30	86.2	5.55	3.04
North Carolina	161,411	9.72	68.6	4.54	3.21
Ohio	477,388	18.80	78.9	6.15	3.64
Oklahoma	85,159	11.30	69.4	5.11	3.46
Oregon	125,217	12.80	61.1	7.89	6.31
Pennsylvania	427,291	17.50	76.9	4.35	2.29
South Carolina	66,278	8.70	67.7	3.92	2.63
Tennessee	134,408	12.90	68.3	4.97	3.14
Texas	423,597	12.70	61.5	5.70	3.91
Virginia	160,820	12.00	56.4	5.15	3.50
Washington	138,211	16.20	71.5	6.00	3.90
Wisconsin	163,130	18.00	77.5	4.99	2.70

Table C-2

Physicians by Type of Practice, 1966

State	Physicians in Private Practice	Specialists in Private Practice
Alabama	2,190	1,321
Arizona	1,491	1,000
Arkansas	1,310	621
California	24,465	16,895

(continued)

Table C-2 (concluded)

State	Physicians in Private Practice	Specialists in Private Practice
Colorado	2,207	1,558
Connecticut	3,412	2,571
Florida	5,353	3,910
Georgia	3,084	2,048
Illinois	9,979	6,164
Indiana	3,896	2,122
Iowa	2,093	1,023
Kansas	1,729	952
Kentucky	2,237	1,279
Louisiana	2,804	1,904
Maryland	3,211	2,279
Michigan	6,603	4,469
Minnesota	3,342	2,044
Mississippi	1,385	702
Missouri	3,577	2,446
Nebraska	1,246	649
New Jersey	6,905	4,730
New York	24,292	17,347
North Carolina	3,450	2,225
Ohio	9,135	5,865
Oklahoma	1,873	1,101
Oregon	2,002	1,320
Pennsylvania	11,249	7,052
South Carolina	1,605	891
Tennessee	2,986	1,986
Texas	8,679	5,471
Virginia	3,486	2,277
Washington	3,162	2,021
Wisconsin	3,611	2,217

Table C-3

Weighted, Logarithmic Correlation Matrix, 1966

(N=33 states)

	EXP*	Q*	AP	NP	BEN*	MD*	EXP/MD	Q/MD	DTH RT	INF MRT	INC*	MED SCLS[a]
Q*	.55											
AP	.91	.15										
NP	.71	-.07	.88									
BEN*	.50	.70	.24	-.21								
MD*	.83	.79	.59	.38	.64							
EXP/MD	.27	-.43	.54	.57	-.26	-.31						
Q/MD	-.84	-.52	-.74	-.57	-.49	-.93	.18					
DTH RT	-.27	.29	-.47	-.53	.25	.01	-.49	.15				
INF MRT	-.52	-.58	-.33	-.05	-.67	-.58	.11	.46	-.12			
INC*	.73	.73	.49	.14	.86	.79	-.12	-.67	.15	-.74		
MED SCLS[a]	.44	.72	.16	-.01	.55	.73	-.52	-.60	.25	-.24	.51	
UNION*	.50	.64	.27	-.12	.87	.59	-.17	-.45	.41	-.69	.82	.46
BEDS*	-.01	.54	-.29	-.39	.36	.23	-.43	-.00	.60	-.36	.25	.39
PRM/BEN	-.59	-.55	-.42	-.08	-.71	-.63	.07	.55	.06	.46	-.64	-.44
%SPEC[a]	.59	.59	.37	.23	.41	.63	-.14	-.54	-.15	-.14	.45	.43
ΔINC*	.36	.42	.21	-.12	.68	.40	-.08	-.31	.16	-.61	.78	.25
EDUC	.78	.54	.66	.41	.60	.70	.13	-.66	-.12	-.73	.77	.23
%AGED[a]	-.03	.34	-.21	-.23	.20	.18	-.37	-.05	.77	-.36	.22	.13
%BLK[a]	-.53	-.55	-.35	-.07	-.69	-.56	.07	.47	-.18	.89	-.72	-.22
%PART[a]	-.16	-.21	-.08	-.04	-.21	-.30	.26	.30	-.30	-.03	-.28	-.40
BRTH RT	-.20	-.51	.03	.09	-.34	-.42	.41	.29	-.60	.50	-.37	-.34
MD ORIG*	-.40	.10	-.53	-.58	.17	-.08	-.55	.18	.61	-.10	-.02	.22
S&L GOV*	.44	.55	.24	.07	.45	.61	-.30	-.52	.05	-.19	.46	.61
HOSP MD*	.43	.79	.11	-.16	.72	.69	-.46	-.49	.27	-.46	.68	.68
TEMP	-.07	-.40	.13	.43	-.68	-.21	.25	.05	-.45	.64	-.55	-.13
%URB[a]	.77	.70	.55	.27	.73	.82	-.11	-.74	.01	-.51	.85	.57

[a]Linear variable.

TABLE C-3 (Concluded)

UNION*	BEDS*	PRM/BEN	%SPEC[a]	ΔINC*	EDUC	%AGED[a]	%BLK[a]	%PART[a]	BRTH RT	MD ORIG*	S&L GOV*	HOSP MD*	TEMP
.37													
-.68	-.10												
.30	-.09	-.55											
.65	.19	-.28	.11										
.51	.13	-.51	.29	.52									
.27	.61	.13	-.10	.16	.26								
-.68	-.43	.44	-.12	-.53	-.75	-.46							
-.23	.12	.26	-.36	-.02	-.02	-.10	.03						
-.38	-.46	.12	-.09	-.13	-.35	-.71	.56	.33					
.20	.60	.04	-.33	.07	-.30	.30	-.05	-.03	-.29				
.35	.17	-.32	.53	.38	.29	.11	-.11	.02	-.06	.04			
.67	.43	-.63	.68	.48	.33	.16	-.40	-.34	-.32	.25	.56		
-.72	-.54	.30	.06	-.63	-.25	-.30	.62	-.14	.31	-.48	-.11	-.49	
.66	.12	-.73	.64	.42	.70	.12	-.54	-.41	-.27	-.17	.46	.62	-.17