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CHAPTER 4

Incomes in the Five Professions

THE FACTORS that make the professions as a whole a 'noncompeting group' affect individual professions as well. The capital investment needed varies from profession to profession and young men who have enough funds to enter one profession may not have enough funds to enter another. Similarly other social and economic factors that hinder passage between professional and nonprofessional pursuits also restrict movement among professions.

These hindrances to free choice of occupation are of course matters of degree. And it seems clear that they are far less potent among professions than between professions and other pursuits. The undoubted heterogeneity within the professional group pales into insignificance relative to the difference between the professions as a whole and pursuits not requiring a college education. It is doubtful, therefore, that differences among the professions in capital investment needed constitute a barrier to entry at all approaching in importance that set by the minimum capital investment needed to enter any profession. The proportion of young men able to enter the professions whose choice among them is restricted by lack of funds is almost certainly much smaller than the proportion of all young men entirely barred from the professional fold.

Differences in capital investment may seldom bar a person from going into one profession rather than another but they frequently affect his choice. Parents and candidates will be influenced by the returns a profession is expected to yield and the costs that must be incurred. A profession must have compensating advantages if it is to be selected in preference to another requiring a smaller capital outlay. Of course, pecuniary returns and pecuniary costs are not the only items considered in deciding on a profession; "the whole of the ad-

vantages and disadvantages" of the different professions will be compared. A profession is a 'way of life' as well as an income-yielding occupation. Personal aptitudes and preferences, the desire to render service, and the like doubtless play an important role, often completely outweighing pecuniary considerations. Adjustment of differences in income to differences in capital investment does not require that every prospective entrant choose his profession on the basis of economic considerations or even be influenced in his choice by them. Adjustments take place on the 'margin' and there are many different 'margins'. It is sufficient that *some* prospective entrants be influenced by economic considerations and that the larger the differences in pecuniary returns the larger is the number who are influenced. The adjustments will take place more rapidly, the larger the number who are influenced by any given difference in pecuniary returns.

Even this restricted emphasis on pecuniary considerations may strike many readers as unrealistic; recalling the factors that determined the occupations chosen by themselves and their friends, they may view pecuniary considerations as least important. One reason that pecuniary considerations seem so unimportant is that the balance brought about by free choices of individuals within the broad noncompeting professional group is ordinarily maintained so well that it need hardly be taken into consideration. Precisely in the measure that pecuniary considerations are effective and operative, they recede from the level of consciousness. The operator of a smoothly working machine is seldom conscious of the nice balance of its many parts; only when the machine stops working smoothly does he become conscious of its complexity. So it is with price and income adjustments. Let incomes in two fields, open to the same group of persons, become markedly out of line, and the importance of pecuniary considerations will assert itself.

Several factors hinder or retard adjustments among different professional groups. "Not much less than a generation elapses between the choice by parents of a skilled trade [profession] for one of their children, and his reaping the full results of

their choice. And meanwhile the character of the trade [profession] may have been almost revolutionized by changes, of which some probably threw long shadows before them, but others were such as could not have been foreseen even by the shrewdest persons and those best acquainted with the circumstances of the trade [profession]." [1] The difficulty of forecasting the demand for a service would be of minor importance if the number of professional persons could be adjusted quickly to changes in demand. This is not the case. The abilities acquired by training are highly specialized and can seldom be profitably turned to other pursuits. Even large decreases in relative return will not lead to an appreciable shift of those already in the field into other pursuits, nor can many individuals pursuing other callings readily enter the field in response to large increases in relative return. Adjustment must take place in the main through a slowing down or speeding up in the number newly entering the profession. And even this adjustment, which would in any event be relatively slow, is retarded by the long period that elapses between the choice of a profession and the completion of preparation for it. A change in demand today that is broadly recognized will be reflected not in the number of new entrants this year, but in the number who this year start their professional training.[2] Moreover, most people have but hazy notions of the state of the market for professional services. Secular changes in demand may not be immediately recognized and short time cyclical rises or declines may be interpreted as secular changes. These difficulties still further impede the tendency to adjustment.

The influence of these factors affecting the choice of a profession by individuals is limited by the fact, noted in Chapter 1, that a person who desires to enter a profession and has the funds to prepare himself may not be free to do so. In the first

1 Marshall, *Principles of Economics*, p. 571.

2 To some degree, of course, a decrease in demand will doubtless lead to an increase in the number discontinuing training at an intermediate stage or shifting from one type of training to another before their invested capital is either very great or very specialized. These effects are probably of secondary importance.

place, practice of some professions is restricted to those licensed by the state. Licensing is of little importance from the present point of view when it is automatic, constituting essentially a device for the registration of practitioners. Licensing is important when the demonstration of some degree of competence is required, and more especially when the level of competence demanded—or what is the same thing, the number of applicants refused licenses—is influenced by an explicit or implicit desire to limit the number of practitioners. Such limitation obviously nullifies to some extent whatever 'automatic' adjustment from the side of individual choice might otherwise occur. In the second place, limitation of entry takes place in some professions at an earlier stage, namely, before admission to professional training. The effect is the same as limitation at the time of application for licensure.[8]

The degree to which the factors enumerated prevent the number of practitioners from responding to changes in demand varies greatly from profession to profession and from period to period. The tendency toward adjustment is clearly greatest in those professions in which entry is easiest, training least expensive and time-consuming, and demand most stable. Similarly, adjustment is likely to be most rapid when general economic conditions are least subject to violent and erratic fluctuations.

The extent to which incomes in various professions are adjusted to the conditions of demand and supply cannot be judged solely in terms of actual incomes received. Equal incomes in two professions are no test of a close adjustment of supply to demand. Incomes in one profession may have to be

[8] These limitations not only affect the extent to which 'automatic' adjustments take place; they also affect the criteria on the basis of which individuals decide whether to try to enter a profession. To the degree that the training is of little value in other occupations, the capital investment of those who prepare for a profession but are never given an opportunity to practise must be included along with the costs of those who are able to practise in computing the 'average' cost of becoming a professional practitioner. The two types of limitation differ in this connection, since limitations before admission to professional school involve much smaller costs without any return than limitations at the stage of licensure.

considerably higher than in another to compensate for other disadvantages; or to induce enough persons to enter that profession to satisfy a strong demand for its services. At the same time, an examination of actual incomes received is a prerequisite to a more detailed and quantitative analysis of the factors making for differences in income. We turn therefore to a description of the income structure in five professions—medicine, dentistry, law, certified public accountancy, and consulting engineering—as revealed by our primary data. We shall then return to the theme of the preceding few pages, attempting to fill in the details and sketch the quantitative importance of the factors responsible for the observed income differences among the professions.

1 STATISTICAL EVIDENCE ON DIFFERENCES IN INCOME

a Level of income

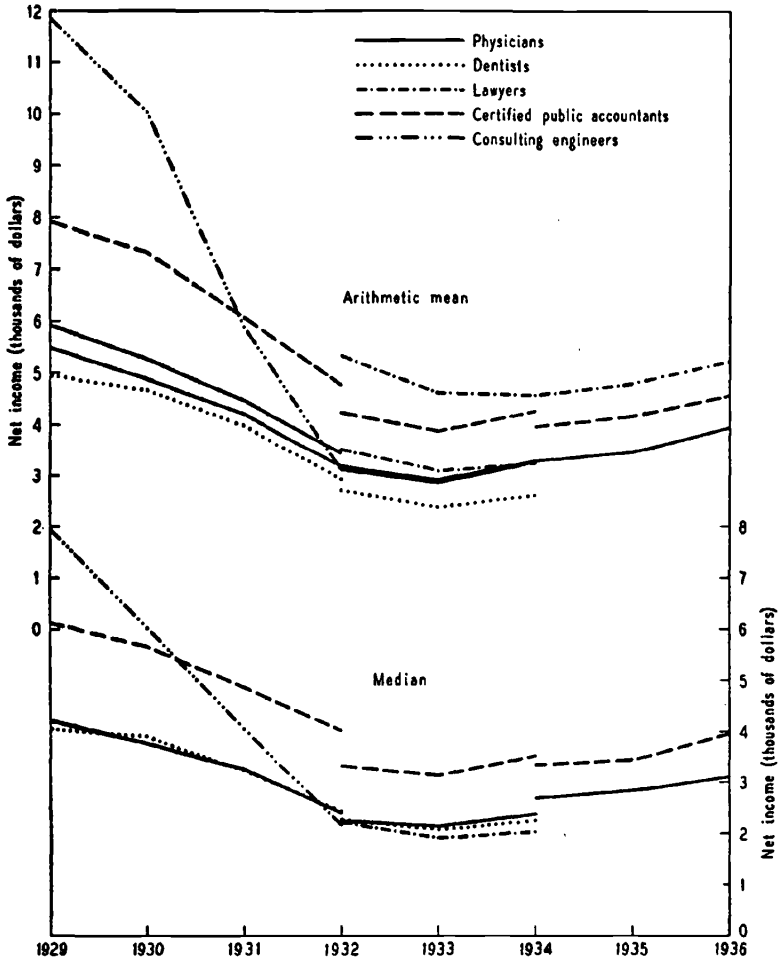
Table 10 and Chart 7 give the arithmetic mean and median net incomes computed from our samples.[4] The different samples for the same profession are not designated on the chart but can be easily distinguished by the period each line covers. For three professions the evidence is quite clear: certified public accountants have a distinctly larger arithmetic mean income than physicians, and physicians than dentists.[5] Similarly, certi-

[4] For reasons indicated in more detail in footnote 8 below, frequency distributions were computed for the 1937 medical and accountancy samples only for 1934–36; none were computed for the 1937 legal sample. Hence, medians are available for fewer years than arithmetic means.

[5] The results for 1929–32 from the 1933 samples are sufficient to establish the statistical significance of the observed differences between the arithmetic means. The average difference for the four years between physicians and dentists is $656, between certified public accountants and dentists, $2,380, and between certified public accountants and physicians, $1,725. To determine exactly the standard errors of these differences is difficult, since they depend on the correlation between the incomes of the respondents in different years. However, the standard error of the average difference cannot be larger than the largest of the standard errors of the differences for each year separately. For each pair of professions, the standard error of the difference is largest for 1929. We may, therefore, take these as maximum estimates of the standard error of the average difference. They are approximately $180, $270, and $290 for the differences between physicians and dentists, certified public accountants and

CHART 7

Arithmetic Mean and Median Income



fied public accountants have a larger median income than either physicians or dentists, and, while the latter two groups have almost identical medians, physicians would almost cer-

dentists, and certified public accountants and physicians respectively. Each average difference is considerably more than three times the maximum estimate of its standard error.

TABLE 10

Arithmetic Mean and Median Incomes, and Number of Persons Covered

PROFESSION & SAMPLE	1929	1930	1931	1932	1933	1934	1935	1936
Physicians				*Arithmetic Mean (dollars)*				
1933	5,916	5,270	4,564	3,434				
1935				3,107	2,867	3,296		
1937	5,493	4,878	4,199	3,165	2,905	3,276	3,470	3,944
Dentists								
1933	4,969	4,664	3,986	2,943				
1935				2,704	2,381	2,609		
Lawyers								
1935				3,508	3,096	3,248		
1937	8,118			5,303	4,604	4,567	4,795	5,202
Certified public accountants								
1933	7,926	7,314	6,072	4,777				
1935				4,218	3,886	4,274		
1937	5,858					3,984	4,177	4,556
Consulting engineers								
1933	11,840	10,037	5,887	3,116				
Physicians				*Median (dollars)*				
1933	4,223	3,798	3,275	2,400				
1935				2,247	2,137	2,378		
1937						2,690	2,824	3,100
Dentists								
1933	4,080	3,911	3,238	2,414				
1935				2,260	2,080	2,266		
Lawyers								
1935				2,218	1,906	2,028		
Certified public accountants								
1933	6,116	5,647	4,780	4,017				
1935				3,336	3,129	3,515		
1937						3,358	3,460	3,963
Consulting engineers								
1933	7,943	6,016	4,041	2,178				
Physicians				*Number of Persons Covered**				
1933	2,139	2,220	2,281	2,288				
1935				1,392	1,452	1,497		
1937	912	867	906	972	1,043	1,238	1,294	1,408
Dentists								
1933	1,335	1,383	1,418	1,452				
1935				1,026	1,061	1,107		
Lawyers								
1935				1,269	1,332	1,377		
1937	724			805	945	929	1,016	1,168
Certified public accountants								
1933	963	1,002	1,020	1,063				
1935				1,415	1,489	1,518		
1937	689					901	971	1,043
Consulting engineers								
1933	471	481	476	474				

* Actual number of *persons covered* by the returns used, before any weighting or adjustment. Table 4 gives total number of *returns received*.

tainly have the higher median income if that of dentists were corrected for the restriction of our samples to American Dental Association members.

The standing of the other two professions is less clear. The arithmetic mean income of consulting engineers for 1929–32 is almost $1,200 higher than the corresponding mean income of certified public accountants; the median income of consulting engineers is about as far below the median income of accountants in the last two years as it is above in the first two. Much of the difference between the arithmetic means may be due to the upward bias in the data for consulting engineers (see Ch. 2). Even if the data are accepted as correct, the fall in the mean income of consulting engineers from 1929 to 1932 was so sharp that it is difficult to infer what the results would be were data available for the entire period 1929–36. Would the fall have continued until 1933, as in other professions, and if so, would it have carried the income of consulting engineers below that of dentists? And would the income of engineers have risen, as in the other professions, from 1933 to 1936? If so, would the rise have been as sharp as the fall, relatively to the other professions? Affirmative answers would probably mean that over the period as a whole consulting engineers received a somewhat larger average income than certified public accountants, and hence a considerably larger average income than physicians and dentists. However, the lateness and mildness of the recovery in private construction and producers' goods industries in general may well have made the rise in the income of consulting engineers considerably less sharp than the fall, relatively to the other professions. In view of these doubts, little can be said about the standing of consulting engineers, except for the few years specifically covered by our data.

The difficulty of judging the standing of lawyers arises from a different source: the wide divergence between the results of the two samples. Both the means and the medians from the 1935 sample place lawyers on about the same income level as

physicians; the means from the 1937 sample, on the other hand, place lawyers above even certified public accountants.[6] For reasons given in Chapter 2, the later legal sample is suspect. In addition, over half of the difference between the means from the two samples is attributable to a single extreme return included in the 1937 sample. It seems reasonable to conclude that the average net income of lawyers is about the same as, or larger than, that of physicians.

On the basis of our data alone, the order of the five professions by size of net income (from large to small) is apparently: consulting engineering, certified public accountancy, law, medicine, and dentistry. The positions assigned consulting engineering and law are the most doubtful.

We may go somewhat further in assessing the differences in the income levels of physicians, certified public accountants, and dentists—the three professions for which data are available for the longest continuous periods and for which different samples give the most nearly identical results. The estimates in Table 11 were obtained by combining the different samples for each profession into a single series[7] and correcting the arithmetic mean incomes of dentists for the restriction of the samples to American Dental Association members.

Average net income during 1929–34 was about $5,300 for certified public accountants, $4,100 for physicians, and $3,100 for dentists. The averages for certified public accountants and physicians during 1929–36 are slightly lower, about $5,200 and $4,000 respectively. On the average, certified public ac-

[6] Since no frequency distributions were computed for the 1937 legal sample, medians are not available.

[7] In combining the samples we resorted to averaging the averages for 1932 from the different samples. We do not attribute any inherent logical merit to this procedure. For reasons given in Chapter 2 we suspect that the 1932 averages from the earlier samples have an upward bias and from the later samples a downward bias, and hence that the best estimate of the correct figure is between the two. Averaging seemed the simplest objective procedure for selecting such a figure. Moreover, the differences between the several samples are so small, except possibly between the first and the two later accountancy samples, that alternative procedures applied consistently to all professions would have yielded results differing but slightly from those in Table 11.

TABLE 11

Final Estimates of Arithmetic Mean Income

Physicians and Certified Public Accountants, 1929–1936; Dentists, 1929–1934

	1929	1930	1931	1932	1933	1934	1935	1936	Average 1929–34	Average 1929–36
Arithmetic mean income (dollars)										
Certified public accountants [1]	7,149	6,597	5,477	4,309	3,970	4,366	4,578	4,993	5,311	5,180
Physicians [2]	5,573	4,965	4,300	3,235	2,985	3,431	3,633	4,129	4,081	4,031
Dentists [3]	4,176	3,920	3,350	2,473	2,178	2,387			3,081	
Absolute difference (dollars) between arithmetic mean incomes of										
Certified public accountants & physicians	1,576	1,632	1,177	1,074	985	935	945	864	1,230	1,149
Certified public accountants & dentists	2,973	2,677	2,127	1,836	1,792	1,979			2,230	
Physicians & dentists	1,397	1,045	950	762	807	1,044			1,000	
% excess of										
Certified public accountants over physicians	28.3	32.9	27.4	33.2	33.0	27.3	26.0	20.9	30.1 [4]	28.5 [4]
Certified public accountants over dentists	71.2	68.3	63.5	74.2	82.3	82.9			72.4 [4]	
Physicians over dentists	33.5	26.7	28.4	30.8	37.1	43.7			32.5 [4]	

[1] See Table B 10 for method of computing these averages.

[2] See Table B 3 for method of computing these averages.

[3] The averages in Table B 5 were multiplied by .876 to adjust for restriction of samples to American Dental Association members. This adjustment factor assumes that average income of members exceeds the average income of nonmembers by 30 per cent and that 46.2 per cent of the dentists are members.

[4] Since these percentages are based on average incomes for the entire period, they represent weighted averages of the annual percentages, the weights being the average income for the profession on which the percentages are based.

countants received about 30 per cent more than physicians and physicians about 32 per cent more than dentists.

These differences among the professions are evidently not temporary aberrations. They have persisted over the entire period and the percentage differences have shown no consistent tendency to diminish. The percentage difference between certified public accountants and physicians increased somewhat during the downswing from 1929 to 1933 and then decreased from 1933 to 1936; i.e., the average income of physicians fell relatively more than that of certified public accountants during the downswing but rose more during the upswing. The average income of dentists seems to have declined relatively to incomes in the other two professions from 1929 to 1934; i.e., the percentage differences between dentists and the other two professions increased somewhat.

b Variability of annual income

In any one year, few persons in a profession receive the 'average' income; most receive incomes that vary more or less from the average, some receiving incomes far larger than the average, others receiving incomes far smaller. The extent to which individual incomes deviate from the average is not the same for all professions in all years.

Quartile and median incomes are given in Table 12 and measures of variability in Table 13.[8] The measures for den-

[8] Quartiles, medians, and measures of variability were computed from the 1933 and 1935 samples for all the years they cover—1929–32 and 1932–34; but from the 1937 medical and accountancy samples only for 1934–36. None have been computed from the 1937 legal sample. The earlier years were omitted in analyzing the 1937 medical and accountancy samples for reasons of economy. That little information is lost thereby is suggested by the consistent results about average income yielded by the various samples. The omission of the 1937 legal sample seemed desirable not only because of the labor entailed by its analysis, but also because, as previously noted, its reliability is peculiarly suspect. Since the 1937 legal sample was not random among states and, in addition, has a size of community bias, it would have been necessary to compute frequency distributions for each size of community class within each state separately, combining them by weighting by the estimated number of lawyers in the corresponding class. In view of the presumptive unreliability of the data, it scarcely seemed worth while to perform these arduous computations.

TABLE 12

Median and Quartile Incomes

	1933 SAMPLES				1935 SAMPLES			1937 SAMPLES		
	1929	*1930*	*1931*	*1932*	*1932*	*1933*	*1934*	*1934*	*1935*	*1936*
					(dollars)					
					Third Quartile					
Physicians	7,374	6,560	5,828	4,268	3,791	3,462	4,073	4,290	4,473	5,056
Dentists	6,003	5,794	4,885	3,512	3,352	2,996	3,304			
Lawyers					4,339	3,620	3,936			
Certified public accountants	9,308	8,560	7,326	5,993	5,029	4,724	5,232	4,967	5,073	5,687
Consulting engineers	14,805	11,721	8,631	4,785						
					Median					
Physicians	4,223	3,798	3,275	2,400	2,247	2,137	2,378	2,690	2,824	3,100
Dentists	4,080	3,911	3,238	2,414	2,260	2,080	2,266			
Lawyers					2,218	1,906	2,028			
Certified public accountants	6,116	5,647	4,780	4,017	3,336	3,129	3,515	3,358	3,460	3,963
Consulting engineers	7,943	6,016	4,041	2,178						
					First Quartile					
Physicians	2,253	1,982	1,600	1,163	1,158	1,068	1,216	1,554	1,588	1,824
Dentists	2,802	2,599	2,111	1,558	1,420	1,260	1,408			
Lawyers					1,140	982	967			
Certified public accountants	4,099	3,883	3,217	2,541	2,235	2,127	2,356	2,296	2,479	2,684
Consulting engineers	3,570	2,719	1,456	33						

tistry in Tables 12 and 13 have not been corrected for the restriction of the samples to American Dental Association members, which tends to make the quartiles and medians too high. Its effect on the measures of variability is less clear; although there is some reason to suppose that it makes them too low. The measures of variability for law, certified public accountancy, and consulting engineering—the three professions in which firms are common—are too low. The questionnaires for these professions requested the recipient, if a firm member, to reply for the firm as a whole. The reporting of income in this way does not affect our estimates of average income, but it does affect our estimates of the frequency distributions of income.[9] In computing frequency distributions we must perforce divide the total income of the firm by the number of members and attribute this average amount to each member. In fact, firm members do not invariably 'share and share alike'. The actual frequency distributions of income for firm members would therefore display greater absolute and relative variability than those we have computed by attributing to each member an equal share of the total firm income. The frequency distribution for the profession as a whole is affected considerably less than the distribution for firm members alone. Nonetheless, there is an error of uncertain magnitude in our frequency distributions of the incomes of lawyers, accountants, and consulting engineers that tends to make them more concentrated than the 'true' distributions.[10]

[9] The overrepresentation of firm members that resulted from requesting data for firms from a sample selected from a list of professional men (rather than of professional units) does of course affect both average incomes and frequency distributions, and both have been adjusted for this firm member bias (see Ch. 2).

[10] To estimate the size of this error requires knowledge of the relationship among the incomes of members of the same firm. If total income were always divided equally among the members there would be no error. If the correlation among the incomes of members of the same firm were zero the variance of the 'true' frequency distribution for members of firms of size n would tend to be n times the variance of the distribution we compute. In fact, of course, the correlation is greater than zero and the error is between the two limits noted. Rough estimates of measures of variability corrected for this error are presented in the footnote to Table 13.

TABLE 13

Measures of Variability of Income

	1933 SAMPLES				1935 SAMPLES			1937 SAMPLES		
	1929	*1930*	*1931*	*1932*	*1932*	*1933*	*1934*	*1934*	*1935*	*1936*
					Interquartile Difference (dollars)					
Physicians	5,121	4,578	4,227	3,104	2,633	2,394	2,857	2,736	2,885	3,232
Dentists	3,201	3,195	2,774	1,954	1,932	1,736	1,896			
Lawyers					3,199	2,638	2,969			
Certified public accountants	5,209	4,677	4,109	3,452	2,794	2,597	2,876	2,671	2,594	3,003
Consulting engineers	11,235	9,002	7,175	4,752						
					Standard Deviation (dollars)					
Physicians	6,855	6,448	5,473	4,270	3,947	3,675	4,250	2,965	3,057	3,631
Dentists	3,706	3,653	3,294	2,637	2,363	2,025	2,066			
Lawyers					4,369	4,368	4,164			
Certified public accountants	6,723	6,410	5,152	3,708	3,568	3,360	3,483	3,072	3,334	3,240
Consulting engineers	14,580	16,669	9,010	6,462						
					Relative Interquartile Difference					
Physicians	1.213	1.205	1.291	1.293	1.172	1.120	1.201	1.017	1.022	1.043
Dentists	.785	.817	.857	.809	.855	.835	.837			
Lawyers					1.442	1.384	1.464			
Certified public accountants	.852	.828	.860	.859	.838	.830	.818	.795	.750	.758
Consulting engineers	1.414	1.496	1.776	2.182						
					Ratio of Quartiles					
Physicians	3.273	3.311	3.642	3.669	3.274	3.242	3.350	2.761	2.817	2.772
Dentists	2.142	2.229	2.314	2.254	2.361	2.378	2.347			
Lawyers					3.806	3.686	4.070			
Certified public accountants	2.271	2.204	2.279	2.357	2.250	2.221	2.221	2.163	2.046	2.119
Consulting engineers	4.147	4.311	5.928	145.000						
					Coefficient of Variation					
Physicians	1.159	1.224	1.199	1.243	1.250	1.265	1.276	.886	.862	.902
Dentists	.746	.783	.826	.896	.864	.843	.787			

Lawyers				
Certified public accountants	.845	.865	.845	.768
Consulting engineers	1.251	1.647	1.548	2.124

All measures are computed from frequency distributions rather than from original data. For consistency, the arithmetic mean computed from the frequency distribution; rather than from the original data, was used in computing the coefficient of variation. Since corrections for grouping would not have affected the results appreciably they were not made.

All measures of variability for lawyers, certified public accountants, and consulting engineers are too low because the frequency distributions were computed by dividing the total income of a firm equally among its members. Two sets of rough estimates of the resultant error in the standard deviations (and consequently the coefficients of variation) for lawyers and accountants were prepared by assuming that (1) the correlation coefficient between the incomes of members of the same firm is .5; (2) the correlation is zero.

For simplicity, all firms were assumed to be two-member firms. This minimizes the upward adjustment. However, two-member firms are considerably more common than firms of any other size and include somewhat more than half of all firm members. Aside from the neglect of the larger firms, the assumption of zero correlation should give an upper limit to the possible error. That the intermediate assumption of a .5 correlation is not entirely unreasonable is suggested by the meagre evidence on the degree of correlation furnished by the 1937 legal sample. The questionnaire sent to lawyers in 1937 requested them to report their individual incomes from legal practice as well as the firm income. The intraclass correlation computed from data for both members of 25 two-member firms was .44; the corresponding value computed from data for all three members of 6 three-member firms was .32. (The fiducial limits, or confidence belts, corresponding to a .05 level of significance, are .07 to .71 for the first correlation and —.24 to .95 for the second.) The estimates of the standard deviations and coefficients of variation on the basis of these assumptions are:

	1933 SAMPLES				1935 SAMPLES			1937 SAMPLES		
ASSUMED CORRELATION	*1929*	*1930*	*1931*	*1932*	*1932*	*1933*	*1934*	*1934*	*1935*	*1936*
STANDARD DEVIATION (dollars)										
Accountants										
.5	7,369	7,085	5,647	4,045	3,788	3,581	3,710	3,253	3,580	3,438
0	8,514	8,273	6,526	4,647	4,192	3,985	4,126	3,589	4,026	3,822
Lawyers										
.5					4,597	4,609	4,380			
0					5,025	5,056	4,781			
COEFFICIENT OF VARIATION										
Accountants										
.5	.930	.969	.930	.847	.898	.922	.868	.816	.857	.755
0	1.074	1.131	1.075	.973	.994	1.025	.965	.901	.964	.859
Lawyers										
.5					1.310	1.489	1.349			
0					1.432	1.633	1.472			

CHART 8

Absolute Variability of Income Measured by Interquartile Difference

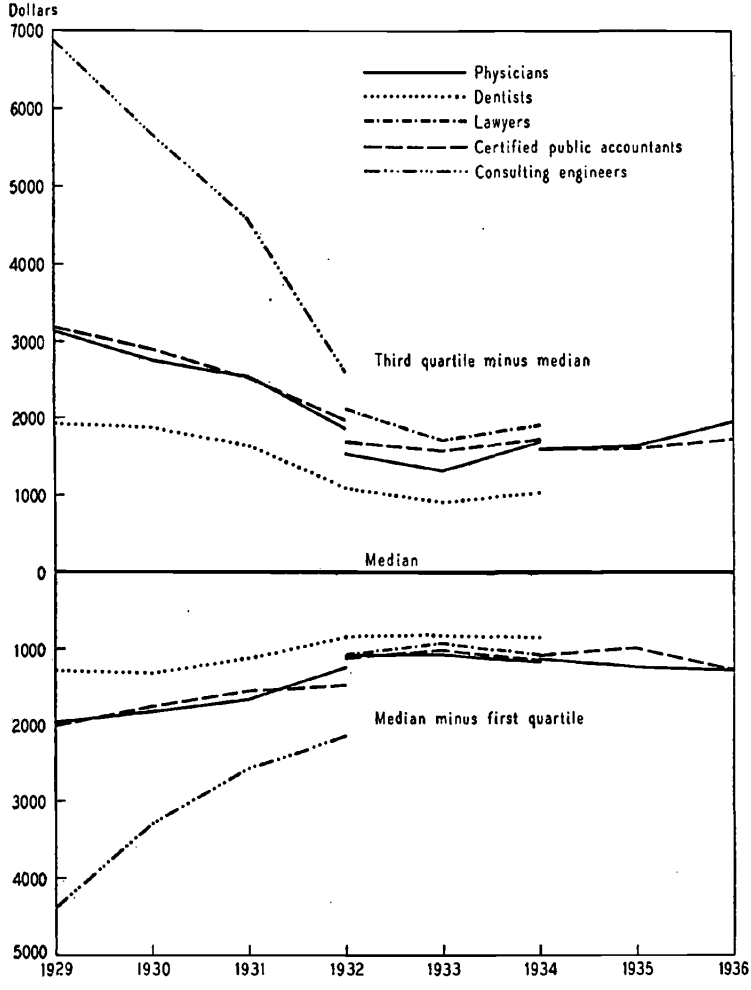


Chart 8 summarizes the information from the quartile measures of absolute variability. For each profession and sample there are two lines in the chart: the upper line shows the difference between the third quartile and the median; the lower, the difference between the median and the first quartile. The vertical distance between the two lines is the interquartile difference. Judged by both the interquartile differences and the standard deviations in Table 13, absolute variability seems greatest for consulting engineers and least for dentists. The three intermediate professions—law, medicine, and accountancy—differ little; though incomes are perhaps a bit more widely dispersed in law than in the other two professions. Adjustment of the measures of variability for the downward bias arising from attributing equal shares of the total income of a firm to its members would probably place law definitely above medicine; the effect it would have on the position of accountancy relative to medicine is less clear.[11]

The quartiles and medians in Table 12 are helpful in interpreting the meaning of the differences in absolute variability. They tell an especially interesting story for medicine and dentistry. The third quartile in medicine is considerably higher than in dentistry; but the first quartile is considerably lower. The difference between these professions means that a larger percentage of physicians than of dentists receive relatively

[11] The original standard deviations for lawyers (Table 13) exceed those for physicians in two out of three years. Both sets of adjusted standard deviations for lawyers (footnote to Table 13) exceed the original standard deviations for physicians in all three years. Two of the ten original standard deviations for accountants exceed those for physicians; five of the ten adjusted standard deviations do so if the correlation is taken as .5, and nine of the ten, if the correlation is taken as zero. The standard deviations alone thus suggest that medical incomes display smaller absolute variability than legal incomes, but about the same variability as accountancy incomes.

It is not feasible to correct the interquartile differences for their downward bias. It seems reasonable, however, that such a correction would place accountancy as well as law above medicine. Six of the ten original interquartile differences for accountants exceed those for physicians, and even more would if the interquartile differences for accountants were corrected for their downward bias.

high incomes; at the same time, a larger percentage of physicians than of dentists receive relatively low incomes.

Except for the interchanged positions of accountancy and law, the order of the professions by absolute variability is the same as their order by income level. Do the differences among

ORDER (FROM LARGE TO SMALL) BY	
ABSOLUTE VARIABILITY	INCOME LEVEL
Consulting engineering	Consulting engineering
Law	Certified public accountancy
Certified public accountancy and medicine	Law
	Medicine
Dentistry	Dentistry

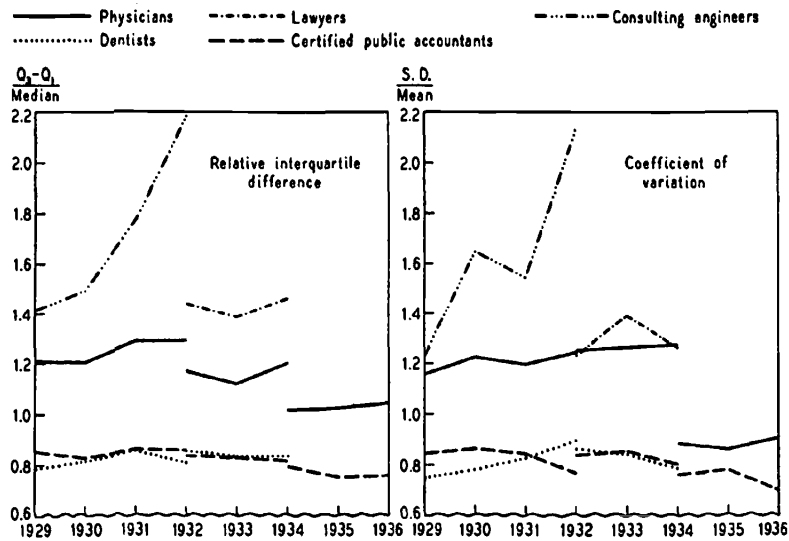
the professions in absolute variability merely reflect differences in the levels around which incomes vary? In other words, if variability were measured in percentages rather than in dollars might not the professions display approximately equal variability?

A negative answer is given by the two measures of relative variability—the relative interquartile difference and the coefficient of variation—depicted in Chart 9. Both tell much the same story. Relative variability is about the same for accountancy and dentistry, smaller for both than for any of the other professions, and largest for engineering. The relative interquartile difference is larger for lawyers than for physicians; the coefficient of variation, about the same. This discrepancy in the conclusions suggested by the interquartile difference and the coefficient of variation reflects a relatively larger number of extremely high incomes in our samples for physicians than in our samples for lawyers.[12] If we take account of the downward bias in the measures of variability for lawyers, accountants, and engineers, it seems reasonable to conclude that the order of the professions by relative variability of in-

[12] As shown in Table 13, the coefficient of variation is larger for law than for medicine in 1933, but smaller in 1932 and 1934. However, if, for both the legal and medical samples, the highest income is excluded, the coefficient of variation for law exceeds that for medicine in 1932 and 1934 as well.

CHART 9

Two Measures of Relative Variability of Income



come (from large to small) is : engineering, law, medicine, accountancy, and dentistry.[13] The largest differences between successive members of this sequence seem to be from engineering to law and from medicine to accountancy. This order is confirmed by the other measures of relative variability in Table 13 and by Chart 10, which presents Lorenz curves for 1929 and 1933—the initial peak and the trough of the business cycle covered by our data.[14]

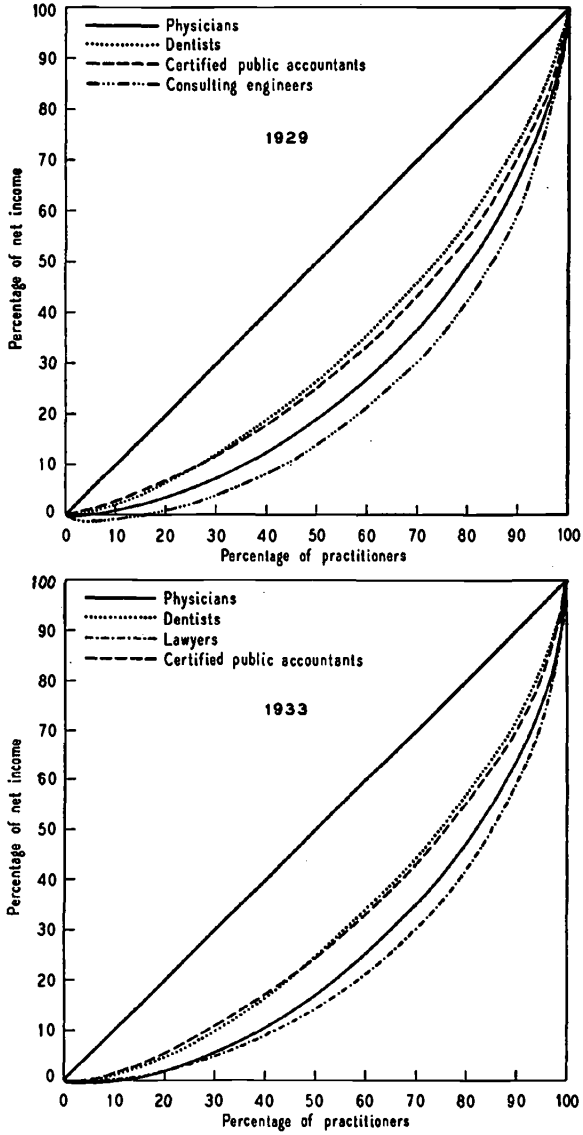
The similar order of the five professions by income level, absolute variability, and relative variability, while interesting

[13] Only one of the three original coefficients of variation for lawyers, but all the adjusted coefficients, exceed the corresponding coefficients for physicians (Table 13). Similarly, five out of seven of the original coefficients for accountants, but all except one of the adjusted coefficients, exceed those for dentists. Correction for the downward bias in the coefficient of variation thus seems to place law definitely above medicine, and accountancy above dentistry. However, the figures for dentists are solely for American Dental Association members and might be expected to be somewhat larger if they covered all dentists.

[14] See Ch. 3, footnote 5, for a description of the Lorenz curve.

CHART 10

Distribution of Income, 1929 and 1933



and suggestive, cannot be regarded as conclusively established. The number of professions is so small that chance alone might give rise to a considerable degree of similarity though it would be unlikely to give rise to so marked a degree of similarity as that observed; [15] in addition, considerable doubt attaches to the exact position assigned the professions by each criterion. The apparent association between relative variability and income level for the professions other than accountancy may well be accidental; the differences among them in relative variability may be the product of very different factors that happen in this instance to vary with income level. This possibility deserves special emphasis since the factors adduced in Section 3 of this chapter to explain the observed differences in relative variability seem to bear no necessary relation to income level.

c Variability of income for a longer period

A profession includes substantially the same individuals in successive years. Measures of the variability of annual income such as those used in the preceding section can be misleading because they take no account of this simple fact but are computed for each year as a self-contained unit. For example, suppose that two professions have identical frequency distributions of income in each year; that in one profession each individual maintains the same position in the income distribution from year to year, while in the other the positions of individuals change markedly, many of those at the top of the distribution in one year being at the bottom in another, and con-

[15] The probability that a degree of agreement in excess of that observed would arise from chance alone can be determined by computing the statistic χ_r^2 for the 5x3 table of ranks. χ_r^2 is 10.67 and would be exceeded by chance less than once in a hundred times. For a description of this test and for the tables used in determining the probability of exceeding the observed value of χ_r^2, see Milton Friedman, 'The Use of Ranks to Avoid the Assumption of Normality Implicit in the Analysis of Variance', *Journal of the American Statistical Association*, Dec. 1937, pp. 675–81, and 'A Comparison of Alternative Tests of Significance for the Problem of *m* Rankings', *Annals of Mathematical Statistics*, March 1940, p. 88.

versely. Clearly, there would be a real difference in the income structure of the two professions that could never be discerned from measures of the variability of annual income. In the first profession, income for a period longer than a year would vary exactly as much among the members of the profession as annual income; in the second, it would vary much less than annual income.

Fortunately, our data enable us to investigate the variability of income for periods longer than a year since each sample gives information on the incomes of the same individuals in three or four successive years. For this purpose, the data do have one shortcoming: they probably overstate the stability of individuals' incomes. The request that a respondent report his income for several years probably led some to report the same figure for each year, even though their incomes had varied. However, the resulting bias is probably not important, since the same income was reported for all years on relatively few returns.

Measures of the variability of income for a period longer than a year could be derived directly by computing the income of each individual for a two-, three-, or four-year period, and constructing the corresponding frequency distributions. We have not used this arduous method. Instead we have estimated the coefficient of variation for two- and three-year periods indirectly from the coefficients of variation of annual income and the correlation coefficients between the incomes of the same individual in different years. These correlation coefficients had to be computed for another purpose (see Ch. 7). None of the other measures of the relative variability of annual income can be easily converted into measures for a longer income period. The estimates of the coefficients of variation, as well as of the correlation coefficients used in deriving them, are given in Table 14.

Comparison of the coefficients of variation for two- and three-year income periods with those for a one-year period reveals a lessening of the differences among the professions, and some shift in their positions. For a one-year period, the

TABLE 14

Rough Estimates of Coefficient of Variation for One-, Two-, and Three-year Income Periods

	CORRELATION COEFFICIENT		COEFFICIENT OF VARIATION FOR INCOME INTERVAL OF		
	Consecutive pair of years [1]	Nonconsecutive pair of years, 1 year intervening [2]	1 year [3]	2 years [5]	3 years [5]
Consulting engineers [4]	.672	.628	1.64	1.50	1.44
Lawyers [4]	.844	.795	1.30	1.24	1.22
Physicians	.933	.914	1.23	1.21	1.20
Certified public accountants [4]	.869	.758	.83	.80	.78
Dentists	.921	.875	.82	.80	.80
% by which largest figure in column exceeds smallest			100	88	80

[1] For physicians, dentists, lawyers, and engineers, arithmetic average of all consecutive-year correlation coefficients in Table 56. For accountants, arithmetic average of 1929–30, 1932–33, 1933–34 correlation coefficients.

[2] For physicians, dentists, lawyers, and engineers, arithmetic average of all correlation coefficients in Table 56 for nonconsecutive years, one year intervening. For accountants, arithmetic average of 1929–31, 1932–34 correlation coefficients.

[3] For dentists, lawyers, and engineers, arithmetic average of all coefficients of variation in Table 13. For physicians and accountants, arithmetic average of coefficients of variation from 1933 and 1935 samples only.

[4] Data for lawyers, accountants, and engineers are for individual practitioners only.

[5] The formulae used in computing the coefficients of variation for two- and three-year income periods are:

$$V_2 = V_1\sqrt{\frac{1 + r_{12}}{2}};$$

$$V_3 = V_1\sqrt{\frac{1}{3} + \frac{4r_{12} + 2r_{13}}{9}},$$

where V_1, V_2, and V_3 are the coefficients of variation for income periods of one, two, and three years respectively; r_{12} is the correlation coefficient between incomes in two successive years; r_{13} is the correlation coefficient between incomes in two nonconsecutive years with one year intervening. These formulae assume that the average annual income is the same in all three years and the standard deviation of annual income is the same in all three years. In addition, the second formula assumes that r_{12} is equal to r_{23}, i.e., that the correlation coefficient between incomes in the first and second years of the three-year period is the same as the correlation coefficient between incomes in the second and third years.

If we make a less restricted assumption, namely, that the coefficients of varia-

TABLE 14, NOTES (cont.)

tion in the different years are equal but the means and standard deviations separately need not be equal, and retain the assumption about the correlation coefficients we obtain the formulae

$$V_2 = V_1\sqrt{1 - \frac{G^2_{12}}{2A^2_{12}}(1 - r_{12})};$$

$$V_3 = V_1\sqrt{1 - \frac{2}{9A^2_{123}}\left[(G^2_{12} + G^2_{23})(1 - r_{12}) + G^2_{13}(1 - r_{13})\right]},$$

where G is the geometric mean of the arithmetic means of annual incomes, A, their arithmetic mean, and the subscripts to G and A, the years averaged. Since the geometric mean is equal to the arithmetic mean when the items averaged are equal, but less than the arithmetic mean otherwise, the coefficient of variation is reduced less by using a longer income period when the average income differs from year to year than when it is the same. Under the assumptions on which the last two formulae are based, the figures in the table overestimate somewhat the reduction in the coefficient of variation effected by using a longer income period.

largest coefficient of variation exceeds the smallest by 100 per cent; for a two-year period, by 88 per cent; and for a three-year period, by 80 per cent. The coefficient of variation is larger in accountancy than in dentistry for a one-year period, equal for a two-year period, and smaller for a three-year period. Despite these changes, the major conclusion of the earlier analysis is unaffected. Even for a three-year period, incomes vary decidedly more in engineering than in law and medicine, and more in these than in accountancy and dentistry. Except for engineering, not even the degree of variability is altered much. Apparently, in the other professions the income differences among individuals summarized by the measures of relative variability persist with extension of the period for which income is measured.

2 FACTORS MAKING FOR DIFFERENCES IN LEVEL OF INCOME, WITH SPECIAL REFERENCE TO PHYSICIANS AND DENTISTS

We can analyze in detail the factors making for interprofessional differences in average income for only two of the five

professions covered by our primary data—medicine and dentistry. Lawyers are excluded because of the inadequacy of our data; we were able to determine their position relative to the other professions but not to assess the difference between average income in law and in the other professions.[15a] Consulting engineers and independent certified public accountants are excluded because the high income of these groups requires no detailed analysis.

The high income of these groups simply reflects the fact that they are small and select segments of broader professional groups, comprised of persons who perform the more difficult tasks and who have become independent in the main because they could thereby make more effective use of their training and skill. Independent certified public accountants numbered in 1930 about 10,000, all certified public accountants, 15,000, and all accountants and auditors, 192,000. Similarly, consulting engineers numbered in 1930 approximately 10,000, whereas all engineers numbered 226,000. The average income of these specialized groups might be expected to exceed the average income of other accountants and engineers.[16] Nor is it surprising that it exceeds the average income of independent practitioners in law, medicine, and dentistry, professions in which independent practice predominates.

A detailed comparison of the incomes of accountants and engineers with the incomes of the other professional groups would be justified only if our data were for all accountants and all engineers. The income differences among, let us say, all accountants and all lawyers or physicians could not be attributed to the mere technical fact that a narrow segment of one occupational group is being compared with another

15a The margin of uncertainty in our data for lawyers is exemplified by the fact that, according to the 1935 legal sample, the average income of lawyers in 1932–34 was about 2 per cent higher than the average income of physicians in the same years, while, according to the 1937 legal sample, it was about 50 per cent higher.

16 See Ch. 6, Sec. 3c for a discussion of the difference between the incomes of salaried and independent professional men.

broad occupational group, but would reflect basic economic factors such as the number of persons interested in entering various professions and able to do so, the number of persons already in the various professions, and the demand for their services. An analysis of the considerations that lead men to choose one profession rather than another must run in terms of the alternatives as they view them—not, of course, in terms of the particular niches, high or low, that they later attain. In selecting a profession, a person will usually contrast accountancy as a whole with other pursuits. Even if he does set the top grade of the profession, certified public accountancy, as his goal, he will probably realize that it will be some years after he has begun the practice of accountancy before he will become certified. In addition, he can seldom be sure in advance whether he will practise independently or as a salaried employee. The opportunities that arise after completion of training are likely to determine this issue. Similar considerations apply to men considering engineering, or one of its specific branches, as a profession. A man may 'decide' to be a civil, mechanical, or electrical engineer; he can hope but he cannot very well decide to practise at the 'top level' of his chosen profession—that is, practically speaking, to become a consulting engineer.

Our data for medicine and dentistry, however, permit fuller analysis. Although these data are also limited to persons in independent practice, in both professions independent practice predominates. The proportion of all practitioners in salaried employment is small, probably well under one-fifth, and is about the same for both professions (see Table 1). Their inclusion would not affect the average income of either group considerably; the difference between the averages would be affected even less. Moreover, our data yield estimates of differences in income level between medicine and dentistry that are sufficiently reliable to justify intensive analysis.

The comparison we propose to make in this section is between the level of income of all physicians and of all dentists.

A question might be raised whether the much greater importance of specialization in medicine than in dentistry does not make this comparison inappropriate. May not young men really choose between general practice in medicine and general practice in dentistry, or between specialized practice in medicine and specialized practice in dentistry, rather than simply between medicine and dentistry? The answer to this question seems to us to be clearly in the negative. During the period when the physicians and dentists covered by our data were trained, and in the main even today, few prospective physicians or dentists could be sure in advance of the type of practice they were going to follow. Specialization was a hope for some, a possibility for most, and an undesirable outcome for only a few. And upon graduation from professional school few men immediately became specialists and then remained specialists for their entire career. Young men ordinarily started as general practitioners. In the course of time, some developed special interests and acquired a reputation and clientele that permitted them to concentrate on those special interests and made it worth while for them to do so. Others developed special interests too, but were unable to concentrate on them because they could not attract sufficient clientele. Still others remained general practitioners from inclination. Probably the bulk of the men who became specialists had little or no extra training and incurred little extra cost (a condition that has changed somewhat during recent years with the establishment of separate boards and requirements for the specialties). Since most persons thinking of becoming physicians or dentists consider specialization a possibility, the earnings of specialists are no less relevant to their choice of occupation than the earnings of general practitioners. The relevant occupational groups for a comparative analysis are therefore physicians as a whole and dentists as a whole, just as we saw above that the relevant groups are accountants as a whole and engineers as a whole.[17]

[17] The fact that physicians as a whole and dentists as a whole are the relevant occupational groups for our present purpose does not, of course, mean that the greater specialization in medicine has no influence on the levels of income in

The average income of all physicians, according to the estimates in Table 11, is approximately 32 per cent larger than that of all dentists.[18] Moreover, this difference between the countrywide averages understates the difference between the average incomes of physicians and dentists in the same community and in practice the same number of years; i.e., according to the data summarized in the next two paragraphs, adjusting the average incomes for the difference between physicians and dentists in their distribution by number of years in practice or by location would widen rather than narrow the gap between the averages.

Estimates for 1929 of the average net income of dentists in general practice by year of graduation from dental school, and the percentage distribution of physicians by number of years in practice, are given by Maurice Leven.[19] The average income of the dentists is $4,790. Assuming dentists distributed by years in practice as physicians are, i.e., weighting the average income of the dentists in each 'years-in-practice' group by the percentage of physicians in that group, gives an average of $4,764, which is slightly *lower* than the original average. Data for 1933 from the *California Medical-Economic Survey* con-

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the two professions, or that the differences between the incomes of specialists and general practitioners are not of interest in their own right. Perhaps the major effect of the greater specialization in medicine on levels of income is through the greater variability of income in medicine than in dentistry for which it is partly responsible. This effect is discussed below in Sec. 2b. The income differences among physicians and dentists classified by type of practice (general practitioners, partial specialists, and complete specialists) are discussed in Ch. 6, Sec. 3a.

[18] See the Appendix to this chapter (Sec. 2), for a detailed examination of the statistical validity of the observed difference of 32 per cent.

[19] *Practice of Dentistry*, p. 125, and *Incomes of Physicians* (University of Chicago Press, 1932), p. 114. Leven's dental sample of 4,189 dentists in 20 states includes 311 dentists whose incomes he used only in obtaining the average for the sample as a whole because the year of graduation was either unknown or before 1890. The average we use excludes these 311 dentists. The distribution of physicians by number of years in practice is based on a random sample of 11,766 physicians in the 1929 Directory of the American Medical Association taken proportionately from cities of different size.

firm these results.[20] The average income of the physicians covered by this survey is $3,567, of the dentists, $2,769. The average income of physicians, weighted by the years-in-practice distribution of dentists, is $3,705. The average income of dentists, weighted by the years-in-practice distribution of physicians, is $2,635. Both methods of adjusting for the difference in distribution by years in practice widen the spread between the averages for the two professions.

Evidence on the influence of geographic location and size of community is provided by our own data. If we omit from our 1935 samples the 29 returns for physicians and the 12 returns for dentists for which size of community or region is unknown, the average 1934 income of physicians is $3,324, and of dentists, $2,616. Weighting the averages for each profession in each size of community class in each region by the number of returns for the other profession in the corresponding class gives averages of $3,482 for physicians and $2,595 for dentists. Both comparisons suggest that correcting for differences in location would widen the spread between the average incomes.

What factors explain the large and seemingly persistent difference between the average incomes of physicians and dentists living in the same community and in practice the same number of years? Medicine and dentistry are related professions requiring somewhat similar abilities and training. Many of the persons choosing one of the professions might be expected to have considered the other as an alternative. Moreover, since the preliminary training required for the two professions is virtually identical,[21] the final choice between them can be post-

[20] *Formal Report on Factual Data* (California Medical Association, 1937), pp. 80, 88. This survey provides data for 2,686 physicians and 1,595 dentists on average net income in 1933 by the number of years since completion of training as well as the corresponding frequency distributions of the samples. These figures, as well as those cited in the text, exclude 51 physicians and 20 dentists whose period of practice was unknown.

[21] The period of training after high school required before admittance to professional school is ordinarily shorter for dentistry. However, the predental curriculum, as far as it goes, is almost identical with the corresponding portion of the premedical curriculum.

poned longer than between most other professions. If entry into the two professions were equally easy or difficult, one might expect an adjustment of the levels of return in them that would equalize their net attractiveness in the eyes of a considerable fraction of those in a position to choose between them. Any difference in income would then be explained by the type of adjustment discussed in the introduction to this chapter, i.e., the levels of return would be 'equilibrium' levels, in the sense that they would be relative returns resulting from the free and moderately rational choice of profession by prospective entrants.[22]

It is clear from the discussion in Chapter 1 and from the data on entrants there presented that the actual levels of return are not 'equilibrium' levels in this sense. During recent years, more than four times as many persons applied annually for admission to American medical schools as for admission to American dental schools. If we correct for persons who were applying again after having previously been refused, between three and a half and four times as many persons were seeking to become physicians as dentists, although there were only slightly over twice as many physicians as dentists in practice.[23] The number seeking to enter medicine would doubtless have been even greater, were not potential entrants aware of the greater difficulty of entry into medicine; and the number seeking to enter dentistry is doubtless swelled by persons who think they may be or actually are unsuccessful in gaining entry into medicine.

Apparently, at existing levels of remuneration, prospective practitioners consider medicine more attractive than dentistry: were entry into the two professions equally easy, there would be a tendency for the number of physicians to increase relatively to the number of dentists and for the gap between average incomes to narrow. The observed difference in in-

[22] See Sec. 2d below for a more rigorous definition of 'equilibrium' levels of return.

[23] See Ch. 1, Sec. 2, especially footnote 40f.

comes is therefore apparently greater than the 'equilibrium' difference.

The figures on entry are *alone* sufficient to establish this qualitative conclusion. But we must go beyond them and tread on much less firm ground to determine how much of the more than 32 per cent difference between the average incomes of physicians and dentists living in the same community and in practice the same number of years is attributable to factors connected with the free and moderately rational choice of profession by prospective entrants and how much to the greater difficulty of entry into medicine. In analyzing income differences between the professions and other pursuits in the preceding chapter, we made no attempt to answer the parallel question in precise quantitative terms. It seems worth attempting to arrive at such an answer for medicine and dentistry, if only to illustrate more comprehensively and exactly the considerations on which the answer depends. These fairly clearly defined and relatively homogeneous professions, for which data are reasonably plentiful, lend themselves to such an analysis far better than such vague and heterogeneous groups as the professions, on the one hand, and all other pursuits, on the other. Though phrased in terms of medicine and dentistry, the analysis is of fairly general applicability. The factors considered are important not only for these professions but for others, and for many nonprofessional pursuits.

a Effect of differences in length of training

One of the major factors making for a difference in average income is the difference in the period of training. Typically, physicians beginning practice have had from eight to ten years of training after high school; dentists, from five to seven.[24] The physician's three additional years of training entail special costs for tuition fees, professional equipment, books, and the like. Moreover, if we may assume an equally long expected active life for physicians and dentists, the addi-

[24] The periods of training cited represent current experience rather than legal requirements; the latter are usually somewhat lower (see Ch. 1).

tional years of training shorten the period during which the physician earns an income. More important than either, however, is the cost arising from the postponement of income. The prospective physician or dentist must consider that if he chooses medicine each annual installment of income will be received three years later than if he chooses dentistry. At an annual interest rate of 4 per cent each installment of income from medicine would have to be approximately 12.5 per cent larger than the corresponding installment from dentistry in order that the 'present value' of the two installments, at the time of making the decision, may be equal.[25] The influence of the first two items, the additional special costs and the shorter working life of physicians, is more difficult to estimate. However, the exceedingly rough data we have assembled suggest that the figure of 12.5 per cent just cited would have to be raised to about 17 per cent to take these into account; i.e., that the expected annual return from medicine would have to be 17 per cent more than from dentistry to make the two professions equally attractive financially (or actuarially).[26] It should be noted that this figure of 17 per cent is valid only for the expected (arithmetic mean) annual return. Because of the difference between the frequency distributions of income in the two professions, a different (and lower) figure would be valid for median incomes, and still another for modal incomes. We have not attempted to estimate corresponding figures for such other measures of the level of income, since they would add nothing to the substance of the analysis but would merely permit its restatement in different terms.

The relevance of this figure of 17 per cent for an analysis of actual income differences may be questioned. Young men choosing a profession have neither the knowledge of costs

25 By 'corresponding' installments we mean installments received the same number of years after *beginning practice*. There will obviously be a difference of three years in the dates at which these installments would be received. The figure 12.5 is equal to 100 $[(1.04)^3 - 1]$, assuming annual compounding.

26 A detailed explanation of the way the figure of 17 per cent was derived and of the assumptions underlying it is given in the Appendix to this chapter (Sec. 1a).

and returns nor the mathematical training needed to arrive at such an estimate; moreover, even if they had this knowledge, few would take the trouble to make an exact numerical calculation. And, of course, many men have so definite a liking for one profession or another that pecuniary calculations play a minor role in their choice. The computation and presentation of a figure with the aura of exactness possessed by '17 per cent' may seem an attempt to force into a rigid and precise mold a process that is essentially vague and unprecise. But if few or no individuals go through the reasoning or calculation underlying our estimate, many do try to take account in some way of the differential costs attached to the choice of one profession rather than another. Implicitly or explicitly, they do attempt to estimate the difference in incomes that will compensate for these costs. It seems reasonable to suppose that they are as likely to overestimate as to underestimate; and, on the whole, we may expect the estimates to cluster about the correct value. And 17 per cent is our best (though admittedly rough) *estimate* of this correct value. It summarizes the objective facts that impinge more or less strongly and more or less accurately on individual evaluations of costs and returns. It is of little use in explaining the behavior of any one individual; it may be significant in explaining the behavior of the group of prospective entrants as a whole.

b Effect of variability of income

So far we have considered only what might be called the 'actuarial' aspect of the choice of a profession. Consequently, we have been concerned solely with the arithmetic mean incomes of physicians and dentists, since these are the figures required for an analysis of 'expected' returns. Presumably individuals' decisions are affected not only by the expected arithmetic mean income but also by the variability of income within the profession, i.e., by the likelihood of receiving incomes that deviate more or less from the average.

As we saw in the preceding section of this chapter, physicians' incomes display greater absolute and relative variability than dentists'. The wider variety of services rendered by physicians gives wider scope for diversity of talent and for specialization of activity (see Sec. 3 below). In consequence, a larger percentage of physicians than of dentists receive exceedingly low incomes and at the same time, a larger percentage of physicians than of dentists receive exceedingly high incomes. Median incomes in medicine and in dentistry are closer than mean incomes. Indeed, the median incomes computed from our original samples are about equal for the two professions: the median income of physicians ranges from $4,223 in 1929 to $2,400 in 1933; the median income of dentists, from $4,080 in 1929 to $2,414 in 1933 (Table 10). However, if the medians for dentists were corrected for the restriction of our samples to American Dental Association members they would be below those for physicians—though how much below we are not in a position to say.[27] Similarly, the modal incomes in the two professions—the most frequent incomes—are closer than the mean incomes and indeed may be lower in medicine than in dentistry, though again the bias in our dental samples makes a definite statement impossible.

Whether wide variability of income acts as an attraction or a deterrent is not clear. Does the gambling instinct outweigh the urge for security and lead more young men to choose medicine than would do so if the variability of income were the same? Or is the reverse true? There is no empirical basis for either conclusion; and on subjects such as these, *a priori* speculation is peculiarly subject to error. Nevertheless, we may hazard the guess that the greater variability of income acts as an attraction. The urge for security among the parents of prospective entrants is likely to be more than counterbalanced by a natural overvaluation of their progeny's ability and

[27] It should be recalled that we lowered the *arithmetic mean* income of dentists 12.4 per cent to correct for the restriction of the samples to American Dental Association members. We do not know whether a larger or smaller correction should be applied to the medians.

chance of success; and among the prospective entrants themselves the gambling instinct is likely to be the stronger.[28] If these observations are correct, then, if *all other things were the same,* a difference in expected average income just sufficient

[28] "Two different causes contribute to recommend them [the liberal and honorable professions]. First, the desire of the reputation which attends upon superior excellence in any of them; and, secondly, the natural confidence which every man has more or less, not only in his own abilities, but in his own good fortune. . . .

The overweening conceit which the greater part of men have of their own abilities is an ancient evil remarked by the philosophers and moralists of all ages. Their absurd presumption in their own good fortune has been less taken notice of. It is, however, if possible, still more universal. There is no man living who, when in tolerable health and spirits, has not some share of it. The chance of gain is by every man more or less over-valued, and the chance of loss is by most men under-valued, and by scarce any man, who is in tolerable health and spirits, valued more than it is worth. . . .

The contempt of risk and the presumptuous hope of success are in no period of life more active than at the age at which young people choose their professions. How little the fear of misfortune is then capable of balancing the hope of good luck appears still more evidently in the readiness of the common people to enlist as soldiers, or to go to sea, than in the eagerness of those of better fashion to enter into what are called the liberal professions." Smith, *Wealth of Nations,* pp. 95–7.

"There are many people of a sober steady-going temper, who like to know what is before them, and who would far rather have an appointment which offered a certain income of say £400 a year than one which was not unlikely to yield £600, but had an equal chance of affording only £200. Uncertainty, therefore, which does not appeal to great ambitions and lofty aspirations, has special attractions for very few; while it acts as a deterrent to many of those who are making their choice of a career. And as a rule the certainty of moderate success attracts more than an expectation of an uncertain success that has an equal actuarial value.

But on the other hand, if an occupation offers a few extremely high prizes, its attractiveness is increased out of all proportion to their aggregate value. For this there are two reasons. The first is that young men of an adventurous disposition are more attracted by the prospects of a great success than they are deterred by the fear of failure; and the second is that the social rank of an occupation depends more on the highest dignity and the best position which can be attained through it than on the average good fortune of those engaged in it." Marshall, *Principles of Economics,* pp. 554–5.

That the present instance is of the second rather than the first of the types considered by Marshall is fairly clear, both from the wide dispersion and the extreme skewness of the frequency distribution of incomes in medicine and from the existence even in our samples of a few incomes in medicine much larger than any reported in dentistry.

to compensate for the extra financial costs incident to the choice of medicine, combined with a greater variability of income in medicine, would mean that more individuals would choose medicine than dentistry as a career.

c Nonpecuniary factors affecting the choice of a profession

But what are these 'other things' assumed the same in the preceding sentence? And what is their effect on the rates of return that would be considered 'equivalent' by prospective entrants? In the main, they include those nonpecuniary advantages and disadvantages that must be valued and added to or subtracted from expected earnings in order to obtain what Marshall has designated an occupation's "net advantages".[29] The decisions of prospective entrants to a profession are affected not only by expected pecuniary returns but also by such subjective and intangible factors as the prestige value attached to the profession, the opportunity it offers for rendering service and making 'social contacts', the conditions under which professional work is performed, and personal predilections for one type of work rather than another. Here again, empirical analysis is difficult. But there would probably be little disagreement with the conclusion that, if pecuniary returns were equal, the "net advantages" would very definitely be on the side of medicine. Medicine, indeed, involves less regular and longer hours, less personal freedom, the inconvenience of 'home' calls at any hour of the day or night, and consequently, greater physical and mental strain. Another factor that may be important is that the individual choosing medicine must ordinarily reckon on postponing both marriage and the attainment of financial independence longer than if he entered almost any other profession. On the other hand, medicine is held in higher general esteem than dentistry, offers greater opportunity to render service, partakes more of a 'professional' and 'scientific' character as opposed to a 'commercial' one, and involves work that most people would probably consider more 'interesting'.

It seems clear that although a 17 per cent excess of the aver-

[29] *Ibid.*, pp. 73, 557.

age income of physicians over that of dentists might make the two professions equally attractive financially, medicine would be the more attractive if nonpecuniary factors were considered as well; i.e., if incomes differed by 17 per cent, more persons would choose medicine than would choose dentistry—and we suspect, very many more.[30]

As this analysis implies, individuals differ in their evaluation of the advantages and disadvantages of a particular profession. Some would prefer dentistry to medicine even if medicine promised a much larger income, although presumably fewer would do so the larger the expected excess of the income from medicine. Conversely, some would prefer medicine to dentistry even if dentistry promised a much larger income, although again presumably fewer would do so the larger the expected financial advantage of dentistry. Not only may individuals regard other advantages as more than compensating for a financial sacrifice, but also they may not consider themselves equally suited for the two professions. An individual who has a relatively greater aptitude for dentistry may well feel that *he* will be able to earn more in dentistry even though average income is larger in medicine, and conversely. The difference in aptitude may be so great for some individuals as to rule out one or the other profession completely; these will be little affected by relative returns in the two professions. Our analysis assumes that there are many whose aptitudes are not so specialized—clearly a valid assumption for two professions

[30] An interesting check on the validity of our conclusion that the nonpecuniary advantages are on the side of medicine is provided by the replies of a group of college freshmen and sophomores to the questions whether they would expect higher incomes from medicine or dentistry and which profession they would prefer. Of the 73 replying, 40 thought medicine would yield the larger income, and 35 of these preferred medicine. Of the 33 who thought dentistry would yield the larger income, 26 preferred medicine. Thus most students preferred medicine whether or not they expected it to yield the larger income; a slightly larger proportion of those who thought medicine would yield the larger income preferred medicine than of those who thought dentistry would yield the larger income. The students to whom the questions were put were in the main not premedical or predental students, although a few may have been. We are indebted to C. L. Harriss for having conducted this experiment for us.

as similar as medicine and dentistry; for these, differences in aptitude will enter into the choice of a profession but will not determine it.

If all individuals evaluated identically the pecuniary and nonpecuniary factors, the 'equilibrium' difference in income, as we use that term, would necessarily be the difference that would make the two professions equally attractive to *all* prospective entrants, and hence would depend solely on conditions of supply. Since individual evaluations are not the same, the actual difference between the 'equilibrium' levels of return depends also on the relative demand for the services of the two professions.

d Influence of demand

The larger the demand for medical services relatively to the demand for dental services, the larger the ratio of physicians to dentists that is consistent with any specific ratio between their incomes; or, alternatively, the larger the ratio between their incomes that is consistent with a specific ratio between their numbers. Under given conditions of demand, the 'equilibrium' difference is the difference that induces prospective entrants to choose medicine and dentistry in just the proportion required to maintain the existing ratio of physicians to dentists, i.e., to maintain the existing ratio between their incomes. In other words, to any given difference in average income, say 17 per cent, corresponds a definite ratio of (1) physicians to dentists, and (2) persons seeking to enter medicine to persons seeking to enter dentistry. The assumed difference of 17 per cent is the 'equilibrium' difference if the second of these ratios is just large enough to maintain the first, i.e., roughly speaking, if the second ratio is about equal to the first.[31] The 'equilibrium' difference is more than 17 per cent

[31] The qualification 'roughly speaking' is necessary because differences in age distribution, ability required, etc., may mean that the ratio of applicants would have to differ somewhat from the ratio of practitioners to keep the latter constant.

if the second ratio is smaller than the first, and less than 17 per cent if the second is larger than the first.[32]

At present, average incomes differ by over 32 per cent, there are slightly over twice as many physicians as dentists, and from three and a half to four times as many persons seeking to become physicians as dentists. To reduce the difference in average income to 17 per cent, the number of physicians would have to increase relatively to the number of dentists. It is, of course, impossible to say exactly how much, but it may be hazarded that, at most, there would have to be about three times as many physicians as dentists.[33] If so, about 75 per cent of all entrants to the two professions would have to choose a medical career promising a difference of 17 per cent in average income in order that such a difference, once achieved, might be maintained, i.e., in order that 17 per cent might be the 'equilibrium' difference. On the basis of our preceding analysis and of the number of persons currently seeking to enter the two professions, the choice of medicine by an even greater proportion of new entrants seems not unreasonable. We are led to the highly tentative conclusion, based on many questionable figures and uncertain assumptions, that the equilibrium rate

[32] This theoretical statement is in some degree inexact, since, under given conditions of demand, it is entirely possible for more than one ratio of the number of practitioners to be consistent with a fixed ratio of incomes, if the number of practitioners in the two professions combined varies. Exactness would have required phrasing the discussion in terms of absolute incomes and of the absolute number of practitioners and of new entrants in each profession. The conclusions would in no wise have been altered, but the exposition would have been more complicated. The theoretical nature of the concepts used is discussed in greater detail in Sec. 3a of the Appendix to this chapter.

[33] The ratio of 3 to 1 as a maximum estimate is suggested by the following considerations:

1) If the ratio of the total sum spent on medicine to the total spent on dentistry were to remain constant, a rise in the ratio of the number of physicians to the number of dentists from the present figure of 2.1 to 2.4 would suffice to reduce the ratio of average incomes from 1.32 to 1.17.

2) The reduction of the ratio of incomes from 1.32 to 1.17 as a result of a rise in the ratio of the number of practitioners from 2.1 to 3.0 would imply a 27 per cent increase in the ratio of the total amount spent on medicine to the total spent on dentistry.

See also the Appendix to this chapter (Sec. 3b, footnote 23).

of return in medicine would not exceed that in dentistry by more than about 17 per cent; i.e., that 17 per cent can be accepted not only as the difference in income that would make the two professions equally attractive financially, but also as an upper estimate of the equilibrium difference.

e Barriers to rapid adjustment

The observed difference between the average incomes of physicians and dentists in the same community and in practice the same number of years is over 32 per cent; about twice as large as our upper estimate of the 'equilibrium' difference. Before attaching any great importance to this divergence, we must investigate the possibility that it is merely a transitional phenomenon.

The long training required for both professions necessarily makes for slow adjustment of the number of practitioners to changes in cost or in conditions of demand. The great majority of the men now practising medicine and dentistry were affected in their choice of profession by conditions prevailing a decade or more ago. Consequently the excess of the observed over the 'equilibrium' difference might be interpreted as reflecting a rise in the demand for medical services relative to the demand for dental services, or a decline in the extra costs attached to the choice of medicine and, hence, in the 'equilibrium' difference. And, according to this interpretation, sufficient time has not yet elapsed for complete adjustment to the new conditions.

This interpretation is of doubtful validity. There is no evidence to suggest that demand for medical services has risen relatively to demand for dental services; indeed, a rising level of education and living could more plausibly be expected to favor greater attention to dental care than to the more obvious and longer recognized need for medical care. Other things the same, this would have resulted in an observed difference less than the 'equilibrium' difference. The possibility that the observed difference has as yet failed to catch up with a decline in the extra costs attached to the choice of medicine, and, hence,

in the 'equilibrium' difference, seems equally unlikely. The data underlying our estimate of the 'equilibrium' difference relate not solely to the last year or two, but to a longer period, dating back at least to 1929. The major part of the equilibrium difference as approximated would have been little affected had the approximation been made for, say, the middle or late 'twenties. Hence the change in the excess costs attached to becoming a physician, required by this interpretation, would have had to take place at the very latest about ten years prior to the end of the period covered by our income data. Sufficient time would thus have elapsed for the process of adjustment to have started, although not necessarily to have been completed. But, if the adjustment had started, the gap between incomes in medicine and dentistry would have narrowed during the period for which we have income data, whereas it has, if anything, widened.

The period covered by our data is perhaps too short to justify a definitive judgment whether the income differential is transitory. And the possibility is not barred that the recent trends in relative demand were in favor of medicine rather than dentistry. At the same time, such evidence as is available runs counter to an interpretation that would assign differential trends in demand or costs a significant part in explaining the divergence between the observed and 'equilibrium' differences in medical and dental incomes.

f Difficulty of entry

It seems reasonable to conclude that this divergence between the observed and 'equilibrium' difference is primarily attributable to the greater difficulty of entry into medicine than into dentistry noted in Chapter 1.[84]

There are three possible explanations of this difference between medicine and dentistry in ease of entry. One is that it reflects a factor omitted from the analysis underlying our estimate of the 'equilibrium' difference, namely, the relative sup-

[84] See particularly the discussion in Ch. 1, Sec. 1 and 2.

ply of 'innate abilities' needed in the two professions. According to this explanation, the greater difficulty of entry into medicine is a result of a greater scarcity of the 'innate abilities' needed in medicine than of those needed in dentistry. This may be part of the explanation; two considerations—one *a priori,* the other empirical—give reason to doubt that it is the entire explanation. In the first place, much the same type of ability seems to be needed for both professions. In the second place, the particular applicants admitted are presumably those whom the medical schools deem ablest; yet, only a slightly smaller proportion of applicants who have previously been refused are accepted than of new applicants—that is, those applying for the first time. The percentage of new applicants accepted in 1927, 1928, and 1929 can be estimated as 59.4, 56.4, and 52.3, respectively, and the percentage of applicants previously refused who were accepted as 56.0, 54.4, and 48.1.[35] The time elapsing between the first refusal and subsequent application may, indeed, have been spent in additional training and a larger proportion of the applicants previously refused than of new applicants may apply to medical schools with relatively low percentages of refusals. Nevertheless, it seems probable that the supply of innate ability is sufficient to furnish each year more medical students than are admitted to medical schools. Certainly the opposite view has not been established.

A second possible explanation is that the difference in ease of entry reflects a scarcity of training facilities, so that the admission of more students would crowd the existing facilities and impair standards. The persistence of the difference does not of itself undermine this explanation. Facilities may have been expanded in response to the demand for medical training, but standards of education and the quantity of equipment required for each student may have risen equally rapidly. An adequate judgment of this explanation would require a far more intimate and detailed knowledge than we possess of

[35] See Ch. 1, footnote 23.

physical and human facilities, the possibilities of expanding them, the equipment needed to provide adequate training, changes in the nature of training deemed adequate by qualified judges, etc.

A third possible explanation is that the difference in ease of entry reflects a deliberate policy of limiting the total number of physicians to prevent so-called 'overcrowding' of the profession. An adequate judgment of this explanation would be exceedingly difficult and is well outside the scope of this study. It would require an analysis of the motives, acts, and influence of each group involved in controlling entry into medicine—the American Medical Association and its Council on Medical Education, the individual medical schools and their national association, the state boards of medical examiners and their national federation.[36]

As already suggested, we are in no position to judge the relative importance of these possible explanations of the greater difficulty of entry into medicine. But the effect of this greater difficulty of entry seems clear: it has made possible or has maintained a level of income in medicine exceeding that in dentistry by more than can be attributed to the free working of the much-abused law of supply and demand. If we accept our highly tentative figure of 17 per cent as an upper estimate of the excess of mean income in medicine consistent with completely free and moderately rational choice of profession, then about half of the observed difference between the mean incomes of physicians and dentists is attributable to the greater difficulty of entry into medicine.

3 FACTORS MAKING FOR DIFFERENCES IN THE VARIABILITY OF INCOME

In our analysis of levels of income, we treat each profession as a unit and emphasize its homogeneity. From the standpoint of a young man balancing the advantages of one profession against another, differences among professions are more im-

[36] See in this connection Ch. 1, Sec. 1.

portant than differences within professions. Not knowing what position he will ultimately attain in the profession he chooses, he must contrast one profession as a whole with another. In an analysis of variability of income, we must emphasize the heterogeneity of each profession. From this standpoint, the important aspect of a profession is the variety of services rendered and prices charged.

The personal nature of professional services limits the quantity that any practitioner can render. Expansion through the employment of assistants is possible but cannot go far because the professional man himself must take prime responsibility. Differences among professional men in the quantity of services they sell can therefore lead to differences in income only at the lower end of the income scale; the major part of the variability of income must reflect primarily differences in the prices charged.

If professional services were standardized and competition pervaded the market for them, price differences could not arise within a profession. The professional man who charged a high price would lose his customers; the professional man who charged a low price would have more customers than he could handle. But professional services are not standardized and competition is far from perfect. The professional man renders services whose quality cannot easily be judged by a layman objectively; the 'customer' often does not even know what he wants to buy; he buys what the professional man tells him he needs. Since he can seldom judge directly the quality of the highly specialized services, he must discriminate among professional men on the basis of reputation, personal integrity, personality, and the like. Hence, the market for professional services is dominated by differentiation of product and imperfection of competition. Different practitioners can charge different prices for services that seem similar, though they may not be so; and each can charge different prices to different customers, as the widespread use of the 'sliding scale' testifies.[37]

[37] See Leven, *Incomes of Physicians*, pp. 61–4, and *Practice of Dentistry*, pp. 65, 205.

Each has customers he will not lose by charging higher prices than his rivals, and each knows that he cannot attract large numbers of new customers by charging lower prices.

Though differentiation of product characterizes all professions it is not equally important and does not lead to the same variety of prices in all. How widely prices will vary depends on (1) the 'real' quality variation in the services rendered by professional men, (2) the role played by subjective criteria of quality, and (3) the importance consumers attach to purchasing services that they think are 'better'. Medicine and dentistry exemplify how differences in these factors can lead to differences in the variability of income. (1) Medical services are probably intrinsically more variable in quality and less standardized—note the much greater specialization in medicine than in dentistry. (2) Subjective criteria have greater scope in medicine both because medical services are less easily judged and because consumers more often purchase—and know that they are purchasing—the same type of dental service from time to time than the same type of medical service. (3) Medical services are ordinarily deemed more essential than dental, i.e., an individual's demand for medical services is more inelastic; a smaller incentive is required to induce an individual to patronize a dentist he considers inferior to another than to patronize a physician he considers inferior. All three factors work in the same direction and help to account for the greater variability of medical than of dental incomes. The only factor that might work in the opposite direction would be a greater possibility in dentistry than in medicine of expanding the quantity of service rendered by a professional unit; but if there is such a difference, it can scarcely be large.

The very much greater variability of income in engineering than in accountancy can be accounted for by the same factors. Much of the accountant's work is routine and recurs regularly —the books must be audited periodically and each audit is similar to the preceding. Consulting engineers, on the other hand, are usually required only in connection with a new undertaking, different from preceding ones. Their services are

seldom required periodically. Hence, (1) there is greater intrinsic variability in the kind of work consulting engineers perform; (2) the purchasers of their services rarely have an opportunity to 'shop around', to experiment under similar conditions now with one engineer, now with another, or even to specify very exactly the kind of work required; (3) more importance is attached to the proper choice of a consulting engineer, since the costs incident to a bad choice are larger.

The degree to which the factors so far discussed can produce variability of professional income is conditioned by the variability among consumers in the resources they have or can command. Variability of income is pervasive: present in one sector of the economy, it is likely to lead to variability elsewhere. If all consumers had the same resources, professional men whose services were generally considered superior would still receive higher prices; but price differences would be far smaller than at present when differences in quality judgments are reinforced by differences in resources. Price differences are now so great as to lead to extensive stratification of practitioners in terms of the economic status of their clientele.[38] The role played by the variability of resources among purchasers is responsible for our limitation of the comparisons made above to professions serving essentially the same market: physicians and dentists serve ultimate consumers almost exclusively, engineers and accountants serve business enterprises and governmental bod-

[38] In a study of dentists' incomes in 1929, the respondents were requested to specify the percentage of their patients whose annual family income was less than $1,500, between $1,500 and $3,000, between $3,000 and $6,000, and over $6,000. Of 3,600 replying, 2,133 reported that 60 per cent of their clients were included in one of these classes; only 27 had a clientele so scattered that 60 per cent were not included within two classes. Among the 2,133 dentists, a much larger percentage of complete and partial specialists than of general practitioners had a clientele concentrated in the upper income groups. That is, of course, what would be expected from and would be expected to lead to the higher incomes of specialists. An analysis of charges for specified dental services likewise reveals, with few exceptions, that the higher the income class from which most of the practitioners' clients come, the higher the average charge. See Leven, *Practice of Dentistry*, pp. 39–42, 62–3, 217. (The figure of 3,600 for the number of dentists replying to the question on the economic status of their clientele is derived from other figures given by Leven.)

ies. We have not compared law with any other profession, because law serves both ultimate consumers and business enterprises.

Business enterprises almost certainly vary more in the resources they have or can command than ultimate consumers, and we suspect that this is true also of the business enterprises that are prospective purchasers of accounting and engineering services. This difference in the variability of resources would tend to make for greater variability of income in engineering and accountancy than in medicine and dentistry. Another factor that would work in the same direction is the greater possibility in the business than in the curative professions of expanding the quantity of service rendered by means of the employment of assistants. There is one important factor, however, that would tend to work in the opposite direction. An ultimate consumer tends to buy smaller quantities of services than a business enterprise, he buys the same type of service less frequently, and he is less addicted to economic calculation.[39] In consequence, he is much less able or likely to get objective evidence on quality or to let pecuniary considerations guide his purchases. Here, as elsewhere, differentiation of product is likely to be more widespread on the market for consumers' goods than on the market for producers' goods.

We have no basis for judging the quantitative importance of these counterbalancing tendencies. We know only their joint effect on variability of income: the order of the professions by relative variability of income (from large to small) is engineering, law, medicine, accountancy, and dentistry.

[39] See Wesley C. Mitchell, *Backward Art of Spending Money* (McGraw-Hill, 1937), pp. 3-19.

APPENDIX TO CHAPTER 4

1 HOW THE EFFECT OF DIFFERENCE IN LENGTH OF TRAINING IS ESTIMATED [1]

a Physicians and dentists

As stated in Section 2a of the text, medical training is approximately three years longer than dental. How can we estimate the difference in average incomes that would compensate for the extra costs entailed by this three-year difference? Let

u = number of years by which working life in dentistry exceeds working life in medicine;
t = number of years of extra training in medicine;
V = present value of the returns in dentistry for all except the last u years of the dentist's working life;
v = present value of the returns in dentistry for these last u years;
c = present value of the extra costs incident to acquiring a medical education;
i = interest rate at which future returns and costs are discounted; this is the rate implicit in the three present values just defined.

V, v, and c may be computed as of any date. For convenience, we take them to refer to the date of beginning the practice of *dentistry*.

For the two professions to be financially equivalent, each installment of income from medicine should bear to the 'corresponding' installment of income from dentistry, i.e., to the installment received the same number of years after beginning practice, a ratio

$$(1) \qquad k = \frac{V + v + c}{V}(1 + i)^t.$$

[1] A friend suggests that a not unimportant by-product of this section is that it demonstrates the difficulties involved in a serious attempt to choose between professions on strictly financial grounds, and the uncertain applicability of the most careful calculations to the fortunes of a given individual in the uncertain future. An appreciation of these difficulties and uncertainties goes far toward explaining and perhaps justifying the loose methods by which young men seem to form their expectations and choose their occupations.

The numerator of the fraction is the present value of the income sacrificed by an individual choosing medicine plus the present value of the extra costs of a medical education. It therefore indicates what the present value of the physician's series of returns would have to be, if they were received at the same dates as the dentist's returns, in order to equal the total financial sacrifice made in choosing medicine. The denominator of the fraction is the present value that would be sacrificed by the physician if there were no difference in working life or in educational costs. The fraction gives the figure by which each installment of income entering into V would have to be multiplied in order that the present value of the installments should equal the numerator of the fraction.[2] The second part of the formula, $(1 + i)^t$, allows for the fact, so far neglected, that each installment of income from medicine is received t years later than the 'corresponding' installment from dentistry.

Since k is the ratio between 'corresponding' installments of income, it can be interpreted as the ratio of the average annual income from medicine to the average annual income from all but the last u years of dentistry. In order to compute the ratio of average incomes, where for both professions the averages are for the entire working life, we need to know the ratio of the average income from dentistry during the last u years to the average income for the rest of the period. Call this ratio p, and let y equal the length of the dentist's working life in years. Then R, the ratio of the average income in medicine to that in dentistry, where both averages are for the entire working life, is given by

$$(2) \qquad R = \frac{yk}{(y - u) + up}.$$

The numerical values used in the computations are:

$u = 3$	$c = \$722$
$t = 3$	$i = .04$
$V = \$93{,}084$	$p = 0.9$
$v = \$2{,}316$	$y = 45$

2 The installments of income entering into V are not assumed to be equal, but may be taken to vary in any desired fashion with the number of years in practice. It is assumed, however, that the income of physicians varies with the number of years in practice in the same way as the income of dentists, since the ratio between 'corresponding' instalments of income is treated as a constant. Section 1 of Chapter 6 indicates that this assumption accords reasonably well with the facts (see especially Chart 20).

From these, k is found to be 1.162, and R, 1.169. The facts and assumptions underlying these figures are:

1) The relevant costs during training are taken to include solely special expenditures for education. They do not include living costs, i.e., board, lodging, clothing, etc. This restriction of costs to tuition fees, professional equipment, and the like, is the only procedure consistent with our treatment of future returns. If living expenses were included as costs during training, it would logically be necessary to include them also in whole or in part as costs during the years when income is received, and to make some assumption about the part of the living costs in each profession to be considered in some sense an 'occupational expense' rather than expenditure for ultimate consumption. Such a procedure is neither feasible nor logically desirable. Similarly, the income that might have been earned during the training period is not to be considered a cost. For a comparison restricted to medicine and dentistry the only relevant alternative income is what the medical student might have earned as a dentist during his last three years of training. But this is already taken into account in the present value of the dentist's expected returns; to include it as a cost for the medical student would allow for it twice.

2) The costs of the six years of training in dentistry are assumed equal to those of the first six years of medical training. This assumption is clearly valid for the two or three overlapping years of preprofessional training. That it is not far wrong for the two overlapping years in professional school is suggested by data on costs of medical and dental education from two surveys of students' expenditures: one, by R. G. Leland, covering medical students throughout the country, the other, dental students in Minnesota.[3] During the rest of the period, either one or two years, the dental student receives professional, the medical student preprofessional, training. The costs are doubtless higher for the dental student, but the difference cannot be large.

3) The costs of the three extra years of medical training are assumed to total $750: $400 for the first year, $350 for the second, and zero for the third. They have been assumed to be incurred at

[3] 'The Costs of Medical Education', *Journal of the American Medical Association*, Feb. 28, 1931, pp. 682–90; 'Report of the University Relations Committee', *North-West Dentistry*, April 1936, pp. 79–89.

the middle of the year. The cost figures for the first two years are approximately those given by Leland [4] for 'Tuition and Fees' and 'Medical Books, Instruments, etc.' for the third and fourth year of medical school respectively. The last of the three extra years is usually the year of internship. Ordinarily an intern receives at least his room and board and occasionally a modest stipend. The monetary value of these returns certainly more than covers any extra professional costs. Logically, the excess should be regarded as a positive income item, counterbalancing the extra costs. In the absence of any data on its amount we have disregarded it. Similarly, we have disregarded any earnings during the other two years, although according to Leland's figures, they averaged almost $125 per student per year.

4) Training costs, other than those incurred during the first nine years by physicians and the first six years by dentists, are not allowed for. In both professions, persons desiring to become specialists frequently receive additional formal training, either before beginning practice or later. Since a much larger proportion of physicians than of dentists are specialists, the neglect of the costs of special training tends to make too small our estimate of R, i.e., our estimate of the difference in incomes that would make the two professions equally attractive financially.

5) The capital investment necessary to equip an office to begin dental practice is assumed equal to that necessary to begin medical practice and hence does not enter our formula. The 'Report of the University Relations Committee' [5] gives $1,782 as the average cost of equipment to 34 dentists who began to practise in 1934 and 1935. This is probably more than the average amount spent by beginning physicians.

6) For the present value of returns from dentistry over the entire working life, as of the date of beginning practice, we use $95,400, the figure given by Clark.[6] It is for 1920–36, is based on an interest rate of 4 per cent and an assumed working life of 45 years, and makes no allowance for differences among individuals in the age of retirement. Clark gives also a figure of $108,000 for 1920–29. The use of the smaller figure yields a slightly higher estimate of R.

[4] 'The Costs of Medical Education', Table 5.

[5] P. 84. The figure cited does not include the cost of equipment purchased while in dental school, which averaged approximately $500.

[6] *Life Earnings in Selected Occupations*, p. 43.

7) All members of each profession are assumed to have the same working life: 42 years for physicians and 45 years for dentists. These are the figures given by Clark[7] and are the only ones that would be consistent with assumption 6. Since Clark's estimates of average working life assume retirement only through death,[8] they are probably somewhat too large. In addition, the use of average expected working life instead of maximum working life is the only allowance that is made for the possibility that the actual working life is longer or shorter than that assumed. It is doubtful that this method makes sufficient allowance for the influence of differences in length of life. These deficiencies affect our results in three ways. Our estimate of R tends to be too small, first, because the assumed period over which the training costs of physicians can be recovered is too long; second, because insufficient allowance is made for the lower certainty to physicians than to dentists of 'corresponding' installments of income. Our estimate tends to be too large because we assume that the dentist is certain to receive his three extra installments of income. It is difficult to see how the corresponding adjustments would balance out, but we suspect that, on the whole, these deficiencies tend to make our estimate of R too small. However, rough computations suggest that the maximum error from this source is probably about 2 percentage points, i.e., that making accurate allowance for the probability of living to each age would be unlikely to raise our estimate by more than from 17 to about 19 per cent.

8) The average income of dentists during the last three years of their working life has been taken as $4,333, the figure given by Leven for the average income in 1929 of dentists in general practice who graduated from dental school between 1890 and 1894, i.e., in practice between 35 and 39 years.[9] The restriction to general practitioners probably tends to make this figure too low, although 89 per cent of Leven's sample were general practitioners. Moreover, this tendency is probably more than counterbalanced by two other factors: first, the figure is for dentists in practice 35 to 39 years, whereas we use it for dentists in practice 43 to 45 years, and the average income of the latter group is known to be lower than the average income of the former; second, it is for 1929, whereas

[7] *Ibid.*, pp. 43, 79.
[8] *Ibid.*, pp. 46, 79, 150.
[9] *Practice of Dentistry*, p. 125.

we use it in connection with figures for 1920–36 (see point 6 above).

9) The ratio of the average income of dentists during the last three years of their working life to their average income for the rest of their professional career is taken as 0.9. This figure is based on Leven's data and is consistent with assumption 8.

10) An interest rate of 4 per cent is used in discounting future returns and costs.

Deficiencies in assumptions 2, 3, 5, and 8 make for an overestimate of R; in 4 and possibly 7 for an underestimate. Our estimate of R (17 per cent) would therefore seem unlikely to be much of an underestimate for an interest rate of 4 per cent, and may well be an overestimate of the percentage by which the expected income of physicians would have to exceed that of dentists to make the two professions equally attractive financially.[10]

Changes in the interest rate used would affect the result considerably. The absence of data on the present value of life earnings based on any other rate makes it difficult to derive any estimates of R even as rough as the one made for a 4 per cent rate. However, some indication how changing the interest rate would affect R is given by computing the allowance necessary for the postponement of the income stream for three years. This allowance is 12.5 per cent for an interest rate of 4 per cent; 6.1 per cent for an interest rate of 2 per cent; and 19.1 per cent for an interest rate of 6 per cent. R would probably be about 11 or 12 per cent for an interest rate of 2 per cent, and 22 or 23 per cent for an interest rate of 6 per cent.

Just what interest rate should be used depends on the function it is to perform. If the interest rate is to include an allowance for 'uncertainty' of one sort or another, we ordinarily, though not always, would use a higher rate than if it is to serve solely the function of allowing for the postponement of income considered certain.[11]

[10] The conclusion reached in Section 2 would be strengthened if the correct figure were smaller than the one we use; weakened if the correct figure were larger.

[11] It is by no means clear that 'uncertainty' necessarily raises the rate at which future returns are discounted, or, what is the same thing, lowers the capital value attached to an expected income stream. Capitalizing the 'expected' income stream already takes account of one aspect of uncertainty: the 'uncertainty' implies the possibility of receiving an income stream larger or smaller than the 'expected' stream. An additional allowance needs to be made only so far

We have attempted to allow for uncertainty directly rather than through the medium of the interest rate. The uncertainty arising from variability of income we consider in Section 2b of the text: the uncertainty of success is but another aspect of variability of income. The uncertainty arising from differences in length of life we consider in assumption 7 above. The uncertainty arising from changes in income over time is relevant only so far as medicine and dentistry differ in this respect. It is doubtful that there is such a difference, but even if there is, it can hardly be large. Consequently the relevant interest rate for our purpose is one that makes no allowance for uncertainty. In view of the alternative opportunities for investment open to prospective entrants, there would probably be little disagreement that 4 per cent is not too low a figure to use as the 'riskless' interest rate but rather, if anything, too high.

b Professional and nonprofessional workers

Formulae (1) and (2) developed at the beginning of the preceding section are as applicable to a comparison between the professions and all other pursuits as to a comparison between medicine and dentistry. It is only necessary to substitute 'nonprofessional pursuits' for 'dentistry', and 'professions' for 'medicine' in the definitions of the symbols and the discussion of the formulae.

Two estimates of the ratio of incomes that would make the professions and all other pursuits equally attractive financially have been prepared. The estimates, used in the analysis in Chapter 3, Section 3, are designated R_1 and R_2, and differ solely in the values assigned V and v. Corresponding subscripts distinguish the alterna-

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as the existence of uncertainty is itself a deterring or attracting factor; the interest rate should be raised if it is a deterring factor, lowered if it is an attracting factor. Moreover, the allowance that should be made cannot be determined solely from a single expected income stream taken by itself, even if we know the items underlying the expected income stream, namely, the different income streams conceived of as possible and the probability of each. The allowance to be made will depend also on the number of investments an individual—or other economic unit—contemplates making and the degree of independence among the various investments with respect to the probabilities attached to the possible returns from each. The larger the number of independent investments, the larger the diversification of risk, and the smaller the allowance needed for uncertainty, i.e., the smaller the degree of uncertainty attached to the investments viewed as a whole.

tive values. The absence of a subscript means that the same figure is used for both estimates. We consider R_1 an upper estimate of the ratio of incomes that would compensate for the extra investment in professional training.

The numerical values used in the computations are:

$u = 4$	$V_2 = \$28{,}100$	$i = .04$
$t = 7$	$v_2 = \$500$	$p = 0.5$
$V_1 = \$14{,}939$	$c = \$3{,}060$	$y = 46$
$v_1 = \$261$		

From these k_1 is found to be 1.608; k_2, 1.482; R_1, 1.682; R_2, 1.550. The facts and assumptions underlying these figures are:

1) The nonprofessional worker is assumed to begin work, and the professional worker to begin his extra training, at the age of 18.

2) Training in the professions (t) is assumed to last 7 years, which is probably longer than the actual average period of training in all professions combined. The 9-year training period for physicians is probably longer than in any other profession. To cite a few more nearly typical examples: lawyers spend 5 to 7 years; dentists, 6 years; engineers, 4 years.

3) The annual costs of professional training are assumed to be $500 and to be incurred at the middle of the year. This figure is intended to include solely special expenditures for education (see point 1 in the preceding section), and is probably an overestimate. Costs are probably as high in medicine as in any profession, yet the available data suggest that average costs during the last two years of medical school do not exceed $400 (see point 3 in the preceding section). Earnings during years of professional training have been disregarded.

4) No allowance is made for costs incurred after the initial 7 years of training. Such costs, either for additional training or for equipment, though important for some professions, are probably negligible for the professional group as a whole, most of whom are salaried employees.

5) All members of each occupational group are assumed to have the same working life: 46 years for the nonprofessional worker and 42 years for the professional worker; i.e., u is assumed to be 4. These figures assume retirement only through death and therefore imply that the average age at death is 64 for the nonprofessional worker and 67 for the professional. Clark sets the expected average

age at death of males who were 20 in 1930 at 69 years for agricultural, professional, clerical, mercantile, and commercial workers, and at 62 years for workers in manufacturing, mining, transportation, and mechanical pursuits.[12] The nonprofessional occupations include mainly though not exclusively workers in the second group. We have set the average age at death at 64 years to allow for the admixture of workers in the first group. We have set the average age at death in professional pursuits at 67 years instead of 69 years to allow for some professional activities that may not strictly belong in the first group. The estimate of R is larger the higher the figure used for the age at death of nonprofessional workers and the lower the figure used for the age at death of professional workers. Not allowing for differences in the length of life affects the comparison between professional and nonprofessional workers in the same fashion as that between medicine and dentistry (see point 7 in the preceding section). We there concluded that this deficiency probably tends to make the estimate of R too low. However, in the comparison between professional and nonprofessional workers this tendency may be more than offset by a factor not relevant to the comparison between medicine and dentistry. It seems reasonable that 'occupational obsolescence' in general occurs at a considerably earlier age in nonprofessional than in professional pursuits, and hence that forced retirement prior to death is more common. This difference in forced retirement is probably more important than differences between the two groups in voluntary retirement. The average working life of nonprofessional workers may therefore be shorter relatively to that of professional workers than is implied by the figures we use. This deficiency would tend to make the estimate of R too high.

6) For the present value of life earnings in nonprofessional pursuits we use Clark's figure[13] for unskilled labor, $15,200, in estimating R_1, and his figure for skilled labor, $28,600 in estimating R_2. These figures are for 1920–36, and are based on an interest rate of 4 per cent and a working life of 44 years. The assumed working life is inconsistent with assumption 5. However the difference in the assumed working life is slight, and correction for it would tend to raise the present value of life earnings and hence to lower the estimate of R, since R is larger the smaller the value assigned to

[12] *Life Earnings in Selected Occupations*, p. 150.
[13] *Ibid.*, pp. 110, 131.

the present value of life earnings. We use these figures solely as rough approximations to the present value of life earnings in nonprofessional pursuits as a whole. The present value of the earnings of unskilled labor is almost certainly below and the present value of the earnings of skilled labor almost certainly above, the present value of the earnings of all nonprofessional workers. The average annual earnings corresponding to the present values cited, computed by dividing Clark's figures on 'total amount of mean life earnings' by the length of the working life, are approximately $750 and $1,430. In Chapter 3 we set the average earnings of all gainfully occupied workers at slightly under $1,000 for 1929–36 (see Table 7).

7) The average annual income during the last four years of the nonprofessional person's working life is arbitrarily taken as one-half the average annual income during his entire working life, i.e., $375 in estimating R_1, and $715 in estimating R_2. The value of p is consequently taken as 0.5. No adequate data are available for determining p. If anything, the value we use is probably below the correct value, which would tend to make R too high.

8) An interest rate of 4 per cent is used in discounting future returns and costs. The reasons for using this interest rate are discussed in the preceding section.

The value of R_1 computed on the basis of these assumptions is almost certainly an overestimate, since in general the assumptions err in a direction that would tend to make it too high. R_2, on the other hand, may well be an underestimate. though it is not impossible that it too is an overestimate.

2 THE STATISTICAL VALIDITY OF THE ESTIMATED DIFFERENCE BETWEEN AVERAGE INCOMES IN MEDICINE AND DENTISTRY

The figure we cite as the difference between the average incomes of physicians and dentists, 32 per cent, plays an important role in the analysis in Section 2 of the text. It is the basis of our conclusion that "if we accept our highly tentative figure of 17 per cent as an upper estimate of the excess of mean income in medicine consistent with completely free and moderately rational choice of profession, then about half of the observed difference between the mean incomes of physicians and dentists is attributable to the greater difficulty of entry into medicine." It is also important, if only as confirmatory evidence, for our qualitative conclusion that

the greater difficulty of entry into medicine "has made possible or has maintained a level of income in medicine exceeding that in dentistry by more than can be attributed to the free working of the . . . law of supply and demand", although this qualitative conclusion is independently validated by data on the number of persons seeking admission to medicine and dentistry, the number admitted, and the number of persons in the two professions.

The importance of our figure of 32 per cent suggests the desirability of considering, in more detail than heretofore, its statistical validity. Of particular importance are deficiencies that might make the figure too large: for only if 32 per cent is considerably too large would our conclusions be seriously affected.

The possible magnitude of three types of error can be estimated: errors due to sampling fluctuations, the correction applied to dental incomes, and differences in age distribution and geographic location.

a Sampling fluctuations

The information available is not sufficient to enable us to estimate accurately the sampling errors of the average difference between the means. However we have noted above that $180 is the maximum estimate of the standard error of the difference between the 1929–32 averages for physicians and dentists from the 1933 samples (footnote 5 of the text). The corresponding maximum estimate for the 1935 samples is $132. Consequently, $111 is the maximum estimate of the standard error of the difference between the averages for physicians and dentists from the two samples combined. These are maxima in the sense that accurately computed standard errors would necessarily be smaller. Moreover, they take no account of the use of the 1937 sample in deriving the final average for physicians. Thus, the correct *maximum* estimate of the standard error is definitely below $111.

Assume, now, that the difference between the average incomes of physicians and dentists is too *large* because of a sampling error *twice* the maximum estimate of the standard error. Under this highly unfavorable assumption, the difference between the average incomes is reduced from $1,001 to $779, and if half of the error is allocated to dentists and half to physicians, the percentage excess of physicians' incomes is reduced from 32.5 to 24.4.

b The correction applied to dental incomes

To correct our dental averages for the restriction of our samples to American Dental Association members, we multiplied the sample averages by .876. The basis for this correction factor is discussed in detail in Appendix A, where it is indicated that the extreme values justified by the available evidence are .829 and .933. Had the latter been used, the average for dentists would have been raised from $3,081 to $3,281 and the percentage difference would have been lowered from 32.5 to 24.4. As is noted in Appendix A, the validity of the correction factor that we used is independently confirmed by the results of a more recent study by the Department of Commerce covering both members and nonmembers. Comparison is possible for two years. The difference between our adjusted average and theirs is a trifle greater than 2 per cent in one year, and one-half of one per cent in the other.

c Differences in age distribution and geographic location

The income differential directly comparable to our estimate of the equilibrium difference would be the differential between physicians and dentists in the same community and in practice the same number of years. In fact, physicians and dentists are distributed differently by both number of years in practice and geographic location. We make no correction in the text for this difference because we are able to show that such correction would raise rather than lower the actual differential. In the present connection, it may be of interest to indicate the magnitude of the correction involved.

The different figures cited in the text lead to different numerical corrections. The figures leading to the smallest upward correction would raise the percentage differential from 32.5 to 34.2; those leading to the largest upward correction, from 32.5 to 45.9 (see line *a* of Table 15).

d Combined influence of the possible deficiencies

In the preceding paragraphs, we have considered the possible deficiencies one by one and have indicated that the maximum possible correction for each deficiency separately would still leave the percentage excess of physicians' incomes considerably larger than the estimated equilibrium difference. Table 15 summarizes these re-

sults and indicates the effect of various possible combinations of the deficiencies.

The assumption that would affect our conclusion most seriously is that the figures are subject to an error from sampling as large as is at all reasonable, that the correction applied to dental incomes resulted in as large an underestimate of the average income as

TABLE 15

Alternative Estimates of the Percentage Difference between the Arithmetic Mean Incomes of Physicians and Dentists

ADJUSTMENTS FOR POSSIBLE ERROR IN DENTAL CORRECTION FACTOR & FOR SAMPLING ERROR	CORRECTION [1] APPLIED FOR DIFFERENCE IN DISTRIBUTION BY YEARS IN PRACTICE AND BY LOCATION						
	None	#1	#2	#3	#4	#5	#6
	Estimated Percentage Difference						
a) None [2]	32.5	34.2	38.8	39.5	40.4	44.3	45.9
b) Maximum error in dental correction [3]	24.4	26.1	30.3	31.0	31.8	35.5	36.9
c) Maximum sampling error [4]	24.4	26.0	30.3	31.0	31.8	35.5	37.0
d) Both (b) and (c) [5]	17.1	18.6	22.6	23.3	24.0	27.5	28.9

[1] Corrections 1–6 are alternative corrections obtained by combining the averages in Section 1 of the text in all possible ways. They are numbered in the order of magnitude: #1 involves the smallest upward correction, #6, the largest.

[2] Based on the averages actually used in Section 1 of the text, they reflect the effect of correcting solely for differences in age and geographic distribution.

[3] Based on what the averages would have been if we had used .933 as the correction factor for dentists instead of .876. Our best estimate of the maximum possible correction factor, .933, assumes that the differential between the average incomes of members and nonmembers of the American Dental Association is 20 per cent, and that 60 per cent of the independent practitioners are members.

[4] Assuming a difference between medical and dental averages less than that shown by averages used in Section 1 of the text by twice our estimate of the maximum standard error of the difference.

[5] Based on what the averages would have been had both the adjustment in line (b) and that in line (c) been made.

seems at all likely, and that the minimum upward correction should be applied for differences in distribution by years in practice and location. The net effect of these assumed deficiencies would be to lower the estimated percentage excess of the average income of physicians from 32.5 to 18.6, which is still above our estimated equilibrium difference of 17 per cent. The point to observe is that even the cumulative effect of such a series of unreal and extreme assumptions is not sufficient to reverse our conclusion.

3 DEMAND AND SUPPLY CURVES FOR PROFESSIONAL SERVICES

a Theoretical

Since the analysis in Section 2 of the text implicitly uses concepts of demand and supply that differ somewhat from those ordinarily used, we describe them explicitly.

The quantities demanded and supplied are ordinarily treated as functions of a 'price' that is taken to refer to each individual item supplied and demanded; i.e., it is assumed that the supply and demand curves relate to commodities or services that sell in the same market for the same price. In an analysis of medical and dental services, however, it is not obvious even what the relevant unit of service supplied or demanded is. And no matter how this 'unit' is defined, there is clearly no single price at which it sells; rather, there is a frequency distribution of prices.

i *The supply curve.* On the side of supply, the relevant 'unit' seems to be the individual practitioner. The quantity of service any practitioner stands ready to offer depends but little on the 'price' he can get, although, of course, the quantity he actually renders doubtless does depend on the 'price' the consumer must pay. The total amount of service the profession stands ready to offer depends primarily on the number of practitioners. Over short periods the number is little if at all affected by the current economic fortunes of the profession. Individuals rarely leave the medical or dental profession to take up other pursuits; death and voluntary retirement are the principal reasons why individuals leave either profession. Similarly, the number entering the profession is determined largely by the number currently graduating from professional schools and passing the licensing examinations. Over longer periods, the number of withdrawals from the profession, but not the number seeking to enter, is still almost completely determined by noneconomic factors. The brighter the economic prospects of one profession relatively to others the larger the number who may be expected to try to enter it. Over these longer periods, economic factors affect the supply of service offered, i.e., the total number of practitioners, primarily through their effect on the number who try to enter the profession.[14]

[14] This statement assumes, of course, relatively free entry. If the number permitted to enter is fixed, the supply of practitioners will be almost completely

The 'price' that determines the 'supply' of entrants is clearly the income or returns that individuals count on receiving. But this 'price' is not a single figure. Incomes received differ greatly among communities and types of practice. Moreover, for any particular community and type of practice, individuals recognize that the return they will receive may vary within exceedingly wide limits, and, indeed, the degree of variation considered likely is one of the factors affecting their decisions. Under these conditions, what meaning can be attached to a supply curve of the sort we have implicitly used; namely, one in which the number deciding to enter a profession is treated as a function of expected arithmetic mean income?

Fundamentally, the situation is not so unusual as might appear at first glance. In order to draw any supply (or demand) curve it is necessary to make assumptions—explicitly or implicitly—about 'other things'; the supply curve would be different if these 'other things' were different. In the present instance the nature of the expected probability distribution of returns—both between and within communities and types of practice—must be treated as one of these 'other things'. We need not assume this distribution to have a particular structure identical for all values of expected mean income; we may assume instead that each value of the expected mean income corresponds to a particular structure of a probability distribution.

Drawing the supply curve under definite assumptions concerning the nature of factors other than those explicitly included in the curve does not mean that these other factors are neglected or treated as of no importance. Rather, it means that changes in them are treated as producing 'shifts' of the curve rather than movements along it. Accordingly in our analysis we first consider the nature of the supply curves under the assumption that all factors other than expected mean returns are 'neutral' as between medicine and dentistry; we then attempt to evaluate the 'shift' of these curves that results from the existing differences in these factors, including the expected probability distribution of returns.

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independent of the economic fortunes of the profession. We abstract from limitation of entry because a major purpose of determining the 'equilibrium' difference is to estimate the part of the observed difference attributable to limitation of entry, and to do this we need to know what the actual difference would be were entry free.

So far the analysis has indicated no reason for selecting expected mean income as *the* variable to be used in drawing the supply curve. Indeed, it suggests that, formally at least, any summary figure can be used as the ordinate of the curve. The median, mode, or any other characteristic of the probability distribution of returns would do as well. Any point of the supply curve is determinate solely because definite assumptions are made concerning the nature of the probability distribution of returns that corresponds to it. But this means that we can, in theory, determine the value of the median, mode, etc., that corresponds to that point. From a supply curve using one summary figure as the ordinate we can therefore easily pass to a supply curve using any other summary figure.

In practice, however, there is a very good reason for using the arithmetic mean rather than any other summary figure. If we abstract from all factors affecting the choice of a profession other than actuarial ones, the supply of new entrants depends solely on the relative arithmetic mean returns and costs.[15] The nature of the probability distribution of returns is of little or no importance. The most convenient procedure is to begin by analyzing the influence of the actuarial factors, and then modify the results by analyzing the influence of the nonactuarial factors. Since in dealing with the latter it makes little difference what summary figure is used, it is simplest to retain the arithmetic mean throughout. Moreover, as we indicate below, the arithmetic mean income seems the relevant figure for an analysis of demand.

ii *The demand curve.* On the side of demand as well as supply there is no easily specified 'unit' or single 'price'. Individuals demand 'medical service' or 'dental service'. But not only does 'medical service' cover a wide variety of services differing in quality and 'quantity'; also different prices are paid for supposedly the same quality and quantity of medical service by different 'customers' of the same physician (the 'sliding scale') and by customers of different physicians. Moreover, the character of the items composing the complex bundle 'medical service' is to a minor extent at the choice of or determined by the purchaser. The 'purchaser'

[15] This is probably most easily seen by analogy with the way insurance companies determine premiums. For example, if fire insurance premiums were based on median loss, they would be zero.

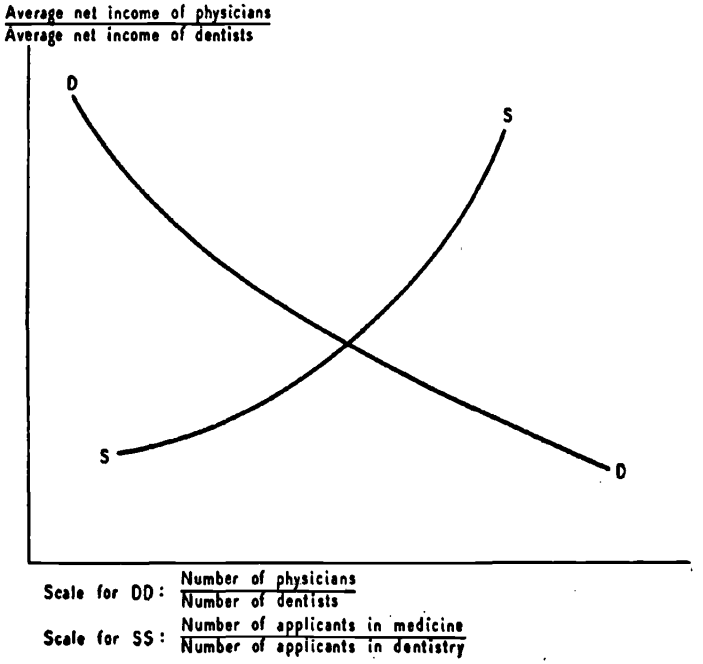
selects the physician; the physician selects the items the 'purchaser' buys. The only thing that seems relevant is the total sum that consumers as a whole are willing to spend for medical services.

The total sum that consumers are willing to spend depends, in part at least, on the total number of practitioners, both because of the reduction (increase) in monetary and nonmonetary costs—fees, cost of travel, time lost, etc.—to consumers produced by the greater (smaller) availability of practitioners and because of the habituation fostered by their presence. The importance of the number of practitioners as a determinant of the sum consumers are willing to spend is enhanced by the customary character of medical and dental scales of fees, and the almost complete absence of direct price competition. We may, therefore, conceive of a demand curve for 'physicians' in which the 'price' is the average gross income per physician and the 'quantity', the number of physicians. But we cannot use this demand curve for our purposes. It is the average *net* rather than *gross* income that is the relevant figure to the prospective practitioner. However, to each possible value of total gross income corresponds a fairly determinate value of total net income. We can therefore pass from a demand curve in which the 'price' is the average gross income to one in which the 'price' is the average net income. This demand curve can be taken as negatively inclined: although an increase in the number of physicians (or dentists) might cause an increase in the total sum spent, it seems exceedingly doubtful that it would cause a proportionate or more than proportionate increase in total expenditures on medical (or dental) service. It is this type of demand curve that is used in our analysis and that underlies our rough estimate of the increase in the ratio of physicians to dentists that would be necessary to reduce the ratio of their incomes from 1.32 to 1.17 (see Sec. 2d of the text and footnote 33).

A demand curve of this type is, of course, not theoretically determinate unless assumptions are made about the behavior of 'other things'. In the present instance the most important is how additional practitioners would be distributed among regions, size of community classes, and types of practice. The effect on average net income of any given addition to the total number of practitioners would clearly be very different if they all settled in the same community than if they were more widely distributed. To each point on a demand curve corresponds some assumption about the

distribution of the relevant number of practitioners. Clearly, the realistic assumption is that the choice of location is made by the new practitioners themselves. This, in turn, would presumably mean distributions of practitioners similar to the existing distribution.

iii *The 'equilibrium' difference.* The preceding discussion of the nature of the supply and demand curves on which our analysis is based runs in terms of each profession separately. Couched in terms of absolute average income and absolute number of practitioners, the rough scheme presented is designed to determine the equilibrium level of average income in each profession. Since we were concerned solely with a comparison between medicine and dentistry, we did not actually construct such curves. Rather, for convenience, we used a supply curve and a demand curve that applied to the two professions combined. This we did by the device of using as the ordinate (see figure), the ratio of the average income of physicians to that of dentists, and as the abscissa, the ratio of the number of physicians to that of dentists. For the



demand curve (DD) the latter ratio is for persons in practice. For the supply curve (SS) it is for persons seeking to enter the professions. The illustrative figure that presents these curves conceals a not unimportant detail. In order to make the two curves comparable, the scale used along the horizontal axis for the supply curve must be related in a special way to that used for the demand curve. The distance from the origin to any point on the horizontal axis must measure (1) the ratio of all physicians to all dentists, (2) the ratio of medical applicants to dental applicants that is needed in order to maintain ratio (1). For example, suppose that two and a half times as many medical as dental applicants are needed to maintain a ratio of 2:1 between all physicians and all dentists because of differences between medicine and dentistry in age distribution or other factors. Then, the same abscissa should represent 2:1 for the demand curve and 2.5:1 for the supply curve.

If the curves are drawn in this fashion the ordinate of the point of intersection is the 'equilibrium' ratio of incomes. Our upper estimate of this ordinate is 1.17; our upper estimate of the corresponding abscissa is 3:1.

As indicated in footnote 32 of the text, the use of such curves is somewhat inexact, although the fundamental conclusions would not be altered by using demand and supply curves for each profession separately. The difficulty with the latter procedure is that one of the 'other things' about which an assumption must be made in drawing the supply curve for one profession is the average income in the other profession. This assumption is of crucial importance for the problem of the relation between incomes in the two professions. This problem would have to be treated by considering the shifts in the curve for each profession arising from changes in the income in the other profession, or, more simply, by introducing the income in the other profession as an additional variable. Our procedure simplifies the analysis greatly.

The difference between our analysis and the usual analysis has an important bearing on the nature of the problem to be studied. An analysis of professional incomes that concerned itself solely with the factors affecting 'price', i.e., with the type of supply and demand conditions outlined above, would be incomplete. In addition, an analysis is needed of the factors making for intraprofessional differences in 'prices' or returns; i.e., of the factors making for variability of income within each profession.

b Statistical

No data are available that could be used to derive a supply curve of all professional persons. Applications to medical and dental schools give one empirical point on the type of joint supply curve used in our analysis: they indicate that at a ratio of incomes of 1.32, the ratio of prospective entrants is between 3.5 and 4.1. Our investigation of the relative pecuniary advantages of medicine and dentistry and our qualitative discussion of other aspects of the choice of a profession suggest that at a ratio of incomes of 1.17 the ratio of prospective entrants would be considerably larger than 1, and we hazarded the opinion that it would be sufficiently large to lead to a ratio of physicians to dentists that would enable a ratio of incomes as low as 1.17 to be maintained. But aside from these two points—the second of which can hardly be called an empirical observation—the supply curve cannot be estimated from available data.

The prospect of deriving statistical demand curves is somewhat more promising. Data are available on the number of practitioners by states, on their average incomes, and on the per capita income of the public at large. The last variable is needed to allow for the relation between the income of the public and the number of professional men whose services they will wish to purchase. If it were not introduced into the analysis, a positive relation between number of professional men and their average income might well emerge: professional men tend both to be numerous and to receive relatively large incomes in prosperous communities.

The number of practitioners in one state can be compared with the number in another only if some adjustment is made for the size of the 'market' served by each group. The total population would seem to provide an excellent index of the size of the market for medical and dental services. Consequently, we may take the number of physicians and dentists per capita, or per 10,000 people, as measures of what might be called the 'density' of physicians and dentists.

The use of the state as the unit is somewhat arbitrary and our results might be altered if other units were used, for example, individual cities or groups of cities cross-classified by size and regional location. The analysis is restricted to states for two reasons. First, satisfactory data on the income of the public at large are

not available for any other relatively small units. Second, for most other units that might be used, the size of the market could not be considered proportional to the number of residents in the unit. For example, physicians in a large city tend to serve not only the residents of that city but also the residents of neighboring communities. The market for the services of physicians in the neighboring communities is correspondingly reduced. This difficulty seems far less serious for states, though it is doubtless present to some extent. The contribution of New Jersey to the market for New York physicians and of New Jersey and Delaware to the market for Philadelphia physicians are obvious examples.

To isolate the influence of the number of physicians per 10,000 people on average medical income, we computed a multiple regression equation for 1934 (using the 1935 medical sample) between average medical income in a state as the dependent variable and physicians per 10,000 people and per capita income as the independent variables.[16] Surprisingly enough, the number of physicians per 10,000 people seems to be uncorrelated with average income of physicians for a fixed per capita income—the partial correlation coefficient is .033.[17] Study of the interrelations among

[16] The equation fitted was of the form

$$\log y = a + b_1 \log x_1 + b_2 \log x_2,$$

where y = income per physician in 1934, x_1 = number of physicians in active practice per 10,000 people in 1934, and x_2 = per capita income in 1934. In fitting the equation we weighted the observations by the number of physicians in each state reporting their 1934 income in the 1935 sample. The number of physicians in active practice in each state in 1934 was obtained by multiplying the number of physicians listed for each state in the 1934 Directory of the American Medical Association by the 1931 ratio of physicians in active practice to total physicians in that state obtained from figures given by Leland, *Distribution of Physicians*. The 1934 population in each state used to obtain physicians per 10,000 people was taken from the official Census estimates in the *Statistical Abstract*. Per capita income in each state in 1934 was obtained from R. R. Nathan and J. L. Martin, *State Income Payments, 1929–37* (U. S. Department of Commerce, 1939), p. 6.

[17] The computed equation is:

$$\log y = 2.68 + .021 \log x_1 + .304 \log x_2.$$
$$\qquad\qquad (.296) \qquad\quad (.190)$$

The figures in parentheses are the standard errors of the corresponding coefficients. The multiple correlation coefficient, R, is .438 and is significant; the partial correlation coefficients among the variables indicated by the subscripts and defined in footnote 16 are:

$$r_{yx_1 \cdot x_2} = .033; \quad r_{yx_2 \cdot x_1} = .213; \quad r_{x_1 x_2 \cdot y} = .836.$$

the variables, however, suggests an entirely reasonable explanation of what at first seems an extremely unreasonable result. The number of physicians per 10,000 persons is highly correlated with per capita income: the simple correlation coefficient between the logarithms of the variables is approximately .86, the partial correlation for fixed average medical income, .84.[18] We have in effect but one variable: the number of physicians per 10,000 people is much the same for states that have the same per capita income. Consequently, we have few data from which to estimate the separate influence of number of physicians.

Despite the apparent absence of any relation between the income of physicians and their number, the results, on closer examination, are reasonable. We should expect that, for states with the same per capita income, physicians' incomes would be smaller the larger the number of physicians; for states with the same number of physicians, physicians' incomes would be larger the larger per capita income; and, for states with the same income per physician, the number of physicians would be larger the larger per capita income. What we find is that when per capita income is larger, so are both the number of physicians and the income per physician, but not in the same proportion. For example, if the income of the population increases by, say, 10 per cent, total *net* receipts by physicians for medical services increase by approximately 9 per cent, one-third of which is absorbed by a 3 per cent increase in the income per physician, the other two-thirds, by a 6 per cent increase in the number of physicians.[19]

[18] These are approximate because they are computed from the weighted data used in computing the multiple regression equation. The correct weights for the latter are not the correct weights for the correlation coefficients cited.

[19] Expressed in somewhat different terms, the elasticity of physicians' income with respect to per capita income is approximately 0.3; the elasticity of the number of physicians with respect to per capita income, approximately 0.6. Because of the low partial correlation between the income of physicians and their number for fixed per capita income, simple and multiple regressions yield approximately the same values for the elasticities. Consequently, the elasticities are to be interpreted as total, rather than partial; i.e., they indicate the percentage change in each variable that is associated with a one per cent change in per capita income when the remaining variable changes in the way it actually does. For this reason, the elasticity of total net receipts is equal to the sum of the other two elasticities.

It is tempting to compare these elasticities with the elasticity of expenditures on medical care shown by family budget studies. The validity of such a com-

We have data on the number of dentists by states only for 1936.[20] However, it is doubtful that the number in each state in 1936 and 1934 differed significantly. Consequently we may safely use these figures in conjunction with our data on dental incomes in 1934. More troublesome is the restriction of our income data to American Dental Association members only, while it is obviously the total number of dentists per 10,000 people that must be used. Fortunately, a more recent survey by the Department of Commerce gives data on the 1936 incomes of all dentists by states. As we shall see, these data give essentially the same results as our 1934 data.

Two differences between the data for physicians and for dentists combine to make it possible to isolate the separate influence of the number of dentists. In the first place, the correlation between dentists per 10,000 people and per capita income is somewhat lower than the corresponding correlation for physicians—the simple cor-

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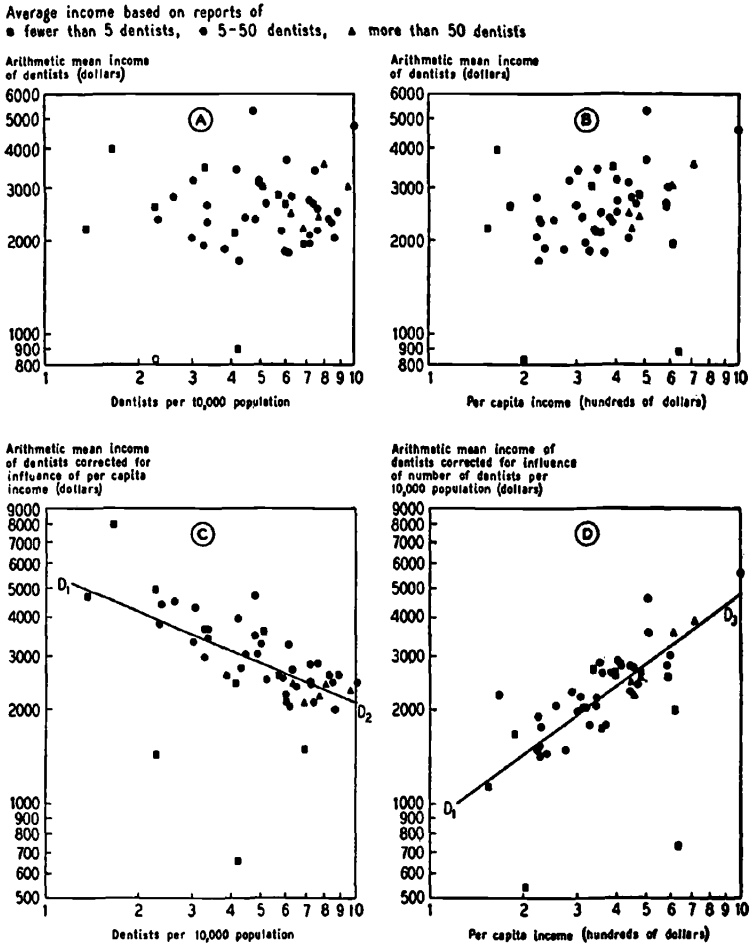
parison is, however, dubious. In the first place, expenditures by families on the services of physicians represent 'gross' rather than 'net' receipts. Second, our data indicate the effect on total receipts of an increase in per capita income associated with an increase in the number of physicians, while family budget data give the expenditures by families at different income levels but living in the same community and hence with the same availability of physicians. The elasticity of family expenditures might be expected to be between the partial elasticity of physicians' receipts when the number of physicians remains unchanged, and the total elasticities we derive. Finally, most budget studies give data solely on total expenditures on medical care, including in that category not only expenditures on the services of physicians but also payments to dentists, osteopaths, oculists, etc., and for hospital service, drugs, and medical supplies. However, various studies suggest that something over a third of total expenditures on medical care represents payments to physicians. See P. A. Dodd and E. F. Penrose, *Economic Aspects of Medical Services* (Graphic Arts Press, 1939), pp. 116–20.

In view of these limitations, about all we can say is that family budget data are not inconsistent with our findings. The estimates of average expenditures on medical care at different income levels for the country as a whole suggest that the percentage of total family income spent on medical care declines very slowly as family income increases, i.e., that the elasticity is slightly less than unity. See *Consumer Expenditures in the United States* (National Resources Committee, 1939), pp. 38–40, 77–8. A California study of family expenditures on medical care yields a similar result. See *California Medical-Economic Survey*, p. 48.

[20] Thomas, 'Dental Survey'. We adjusted the figures given by Thomas, which relate to July 1, 1936, in two ways: we substituted 6,000 for the 11,320 listed for Illinois; and we used a figure of 100 for New Mexico, the one state for which Thomas gives no estimate.

CHART II

Relation among Arithmetic Mean Income of Dentists in 1934, Dentists per 10,000 Population in 1936, and per Capita Income in 1934 Based on Data for 48 States and the District of Columbia

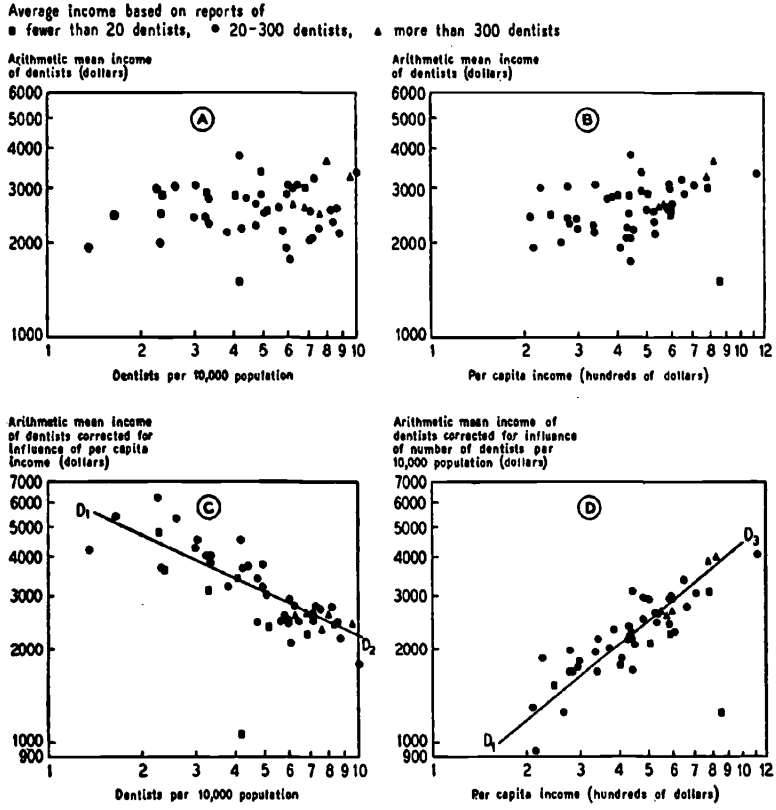


Average income of dentists is not adjusted for restriction of the sample to American Dental Association members. All scales are logarithmic. Each point relates to an individual state.

$D_1 D_2$ and $D_1 D_3$ are partial regression equations. $D_1 D_2$ shows the relation between the part of average dental income not accounted for by per capita income and the part of number of dentists per 10,000 population not accounted for by per capita income. Similarly, $D_1 D_3$ shows the relation between the part of average dental income not accounted for by number of dentists per 10,000 population and the part of per capita income not accounted for by number of dentists per 10,000 population.

CHART 12

Relation among Arithmetic Mean Income of Dentists in 1936, Dentists per 10,000 Population in 1936, and per Capita Income in 1936 Based on Data for 48 States and the District of Columbia



Average income of dentists is for *all* dentists. All scales are logarithmic. Each point relates to an individual state.

D_1 D_2 and D_1 D_3 are partial regression equations. D_1 D_2 shows the relation between the part of average dental income not accounted for by per capita income and the part of number of dentists per 10,000 population not accounted for by per capita income. Similarly, D_1 D_3 shows the relation between the part of average dental income not accounted for by number of dentists per 10,000 population and the part of per capita income not accounted for by number of dentists per 10,000 population.

relations are .75 for 1934 income, and .81 for 1936 income. In the second place, and more important, the number of dentists per 10,000 people varies considerably more from state to state than the number of physicians per 10,000 people. Consequently, the variation in the number of dentists per 10,000 people that remains after eliminating the influence of per capita income is not only a slightly larger part of the total; it is also larger absolutely, and hence gives more information on the influence of the number of dentists than the corresponding data for physicians give on the influence of the number of physicians.

As shown by panel A on Charts 11 and 12, the original figures on average income of dentists and number of dentists per 10,000 people show a slight positive correlation. However, eliminating the influence of per capita income produces a decided negative relation (Charts 11 and 12, panel C). The solid lines D_1D_2, representing the partial regression between average income per dentist and number of dentists per 10,000 people,[21] summarize this re-

[21] The multiple regression equations and the correlation coefficients are:

1934

$$\log y = 1.794 - \underset{(.099)}{.421} \log x_1 + \underset{(.110)}{.742} \log x_2.$$

$R = .713$

$r_{y\varpi_1} = .134$ $\qquad r_{y\varpi_1 . \varpi_2} = -.531$

$r_{y\varpi_2} = .561$ $\qquad r_{y\varpi_2 . \varpi_1} = .706$

$r_{\varpi_1 \varpi_2} = .754$ $\qquad r_{\varpi_1 \varpi_2 . y} = .828$

1936

$$\log y' = 1.545 - \underset{(.082)}{.463} \log x_1 + \underset{(.091)}{.826} \log x'_2.$$

$R = .814$

$r_{y'\varpi_1} = .237$ $\qquad r_{y'\varpi_1 . \varpi'_2} = -.644$

$r_{y'\varpi'_2} = .653$ $\qquad r_{y'\varpi'_2 . \varpi_1} = .802$

$r_{\varpi_1 \varpi'_2} = .805$ $\qquad r_{\varpi_1 \varpi'_2 . y'} = .883$

where y = average income in 1934 of dentists in each state who were American Dental Association members;

y' = average income in 1936 of all dentists in each state;

x_1 = dentists per 10,000 people in each state in 1936;

x_2 = per capita income in each state in 1934;

x'_2 = per capita income in each state in 1936;

R = multiple correlation coefficient;

lation. The 1934 and 1936 data yield almost identical partial regression equations. For fixed per capita income, a one per cent increase in dentists per 10,000 people would mean a decline in the average income per dentist of .42 per cent according to the 1934 data, and of .46 per cent according to the 1936 data. Similarly both sets of data yield essentially identical estimates of the influence of per capita income (Charts 11 and 12, panels B and D). For a fixed number of dentists, a one per cent increase in per capita income would mean an increase in dental income of .74 or .83 per cent, according to the 1934 or 1936 data respectively.

The partial regression equations in Charts 11 and 12 are analogous to demand curves of economic theory. They depict the relation between the 'price' of dentists (their average income) and the 'quantity' of dentists whose services are purchased (number of dentists per 10,000 people). Both curves indicate an elasticity of demand with respect to price slightly greater than 2, suggesting that an increase in the number of dentists would mean a rise in their total net receipts. The formal similarity of the regression curves and elasticity coefficients to their theoretical counterparts is, however, somewhat misleading. The latter are assumed to indicate not only the effect on price of a change in quantity but also the effect on quantity of a change in price. The computed 'demand curves' in Charts 11 and 12 and their elasticity coefficients indicate only the former: they can safely be used to estimate the effect of a change in the number of dentists on average income; they may give entirely erroneous results if used to estimate the effect of a change

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r = simple or partial correlation coefficient among the logarithms of the variables indicated by subscripts.

The figures in parentheses are the standard errors of the corresponding coefficients. All the regression coefficients are very much larger than their standard errors.

In fitting the equations and computing the correlation coefficients, we weighted the observations by the number of dentists reporting their income. Figures on the average income of all dentists in 1936 by states were kindly furnished by the U. S. Department of Commerce and were obtained from the survey described by Herman Lasken, 'Incomes of Dentists and Osteopathic Physicians', *Survey of Current Business*, April 1939. Number of dentists per 10,000 people in each state was obtained from Thomas' figures on dentists previously cited and the official Census estimates of population. The figures on per capita income were obtained from *State Income Payments, 1929–37*.

in the 'price' of dental services on the quantity that would be purchased. The computed curves relevant to this problem have an elasticity of demand less than unity.[22]

We can summarize these results in terms of the total net receipts of dentists. When per capita income increases by, say, 10 per cent, total net receipts of all dentists increases by 12 or 13 per cent, about one-third of which is absorbed by a 4 per cent increase in the average income of dentists and the other two-thirds by an 8 to 9 per cent increase in the number of dentists. Interestingly enough, the proportions absorbed by increases in dental income and in the number of dentists are almost identical with those we previously found for physicians. We can go further in interpreting these results for dentists than we could for physicians. If, as per capita income rose 10 per cent, the number of dentists remained the same, their average income, and hence their total net receipts, would rise about 8 per cent. In fact, the number of dentists does not remain the same, but rises about 9 per cent. Since the elasticity of demand is slightly over two, a 9 per cent rise in the number of dentists, if per capita income were constant, would mean a 4 per cent drop in average dental income. The increase in the number of dentists that accompanies a rise in per capita income thus reduces the percentage rise in dental income from 8 to 4, the rise we observe. These results make possible a different breakdown of the rise of 12 to 13 per cent in total net receipts of dentists: if the

22 To estimate the influence of a change in average dental income on the number of dentists we need the regression of number of dentists on average income. In the same symbols as in footnote 21 the multiple regression equations with number of dentists as the dependent variable are:

1934

$$\log x_1 = .207 - \underset{(.158)}{.670} \log y + \underset{(.110)}{1.096} \log x_3.$$

$$R = .831.$$

1936

$$\log x_1 = -1.049 - \underset{(.157)}{.889} \log y' + \underset{(.099)}{1.262} \log x'_3.$$

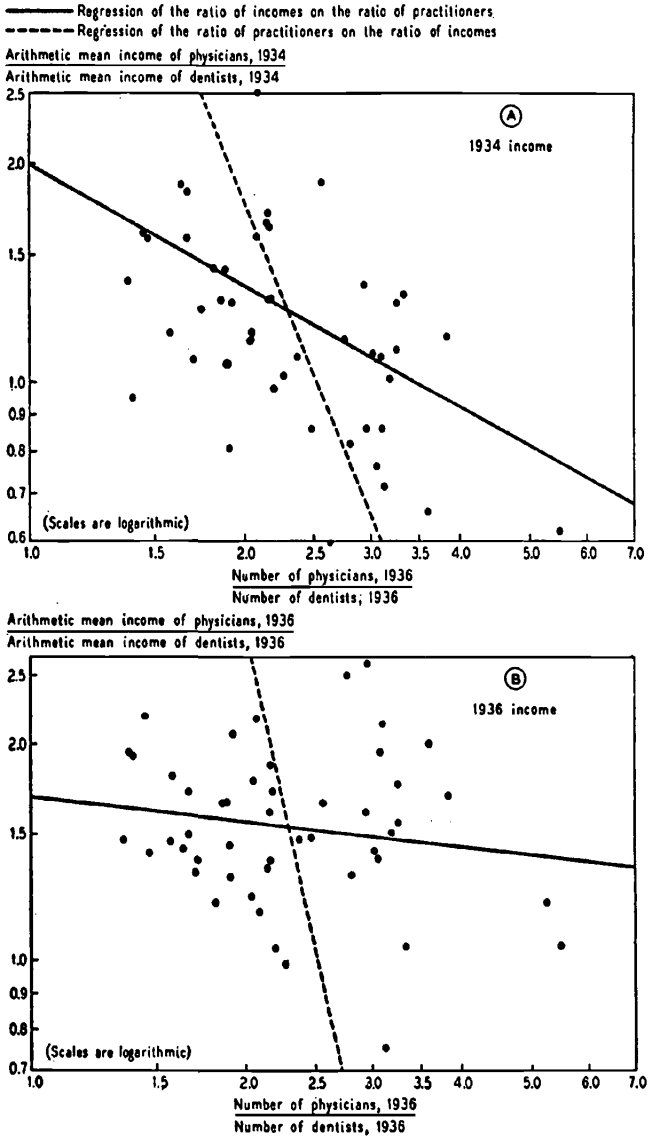
$$R = .890.$$

To maintain comparability, the same weights were used in computing the regressions as in footnote 21. Logically, these are not the proper weights: the correct weights are inversely proportional to the variances of x_1, not to the variances of y.

Once again the two regressions are similar.

CHART 13

Relation between the Ratio of Income of Physicians to Income of Dentists and the Ratio of Number of Physicians to Number of Dentists Based on Data for 48 States and the District of Columbia, 1934 and 1936



In panel A the extreme observation (1.577, 6.415) has been omitted.

number of dentists remained the same, their total net receipts would rise only about 8 per cent. The concomitant increase in number of dentists and resulting moderation of the rise in average dental income account for the other 4 or 5 per cent of the increase in total net receipts.

In the theoretical discussion in Section 2 of the text we use a demand curve in which the 'price' is the ratio of the average income in medicine to the average income in dentistry; the 'quantity', the ratio of physicians to dentists. The data so far used in our separate analyses of medicine and dentistry may also be used to obtain an empirical estimate of such a demand curve. Once again taking the state as a unit, we need simply correlate the ratio of incomes and the ratio of practitioners. Since the 'market' for medical and dental services may be assumed to vary in the same way from state to state, ratios of practitioners are directly comparable from state to state and are not affected by differences in the size of the states. Similarly, the ratio of incomes for different states may be assumed comparable and not affected by differences in the per capita income of the population as a whole.

The two panels of Chart 13 present scatter diagrams relating the ratio of incomes to the ratio of practitioners. In both panels the ratios of practitioners are for 1936, since data on the number of dentists are available for that year alone. In panel A the income ratios are for 1934; the income of dentists—the denominator of the ratio—is for dentists who are American Dental Association members. In panel B the income ratios are for 1936; dentists' incomes were obtained from the Department of Commerce survey previously referred to and are for all dentists.

The two lines in each panel are the simple regression equations between the logarithms of the variables: one is the regression of the ratio of incomes on the ratio of practitioners; the other, the regression of the ratio of practitioners on the ratio of incomes. Both panels show negative correlation, but the correlation coefficient computed from the 1936 data (−.16) is very small and is not statistically significant. The 1934 data show a considerably more pronounced but still far from perfect correlation (−.47).[28] About

[28] Because of the extreme complexity of the weights that should theoretically have been used, none were used in computing the correlation coefficients. The regression equations are:

all we can infer from these results is the existence of the negative relation theoretically to be expected. The correlation is too low to enable us to say much about the character of the relation between the two variables that, if all other things were the same, might be presumed to exist.

Analyses similar to those presented for physicians and dentists cannot be made for lawyers and accountants. The basic obstacle is the absence of any index of the size of the 'market' and the consequent impossibility of rendering comparable the figures on the number of practitioners in different states. The total population will obviously not serve for these professions: e.g., there are about five times as many accountants per capita in New York State as in Nevada, but although per capita income in the two states is fairly similar, there is no reason to expect accountants in New York State to have a decidedly lower income than accountants in Nevada. The difference in the 'density' of accountants reflects the inadequacy of population as an index of the size of the 'market' and cannot be expected to manifest itself in income differences.

The absence of an index of the size of the market makes impossible an analysis for each profession separately. There still re-

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1934	*1936*
$\log y = .299 - .552 \log x;$	$\log y' = .227 - .116 \log x;$
$\log x = .401 - .407 \log y.$	$\log x = .400 - .215 \log y',$

where y = ratio of incomes in 1934; y' = ratio of incomes in 1936; x = ratio of practitioners in 1936.

These regression equations give us some, though by no means an adequate, basis for checking the statement in Section 2d of the text concerning the rise in the ratio of physicians to dentists that would be needed to reduce the ratios of their incomes from 1.32 to 1.17 (see footnote 33 in text). It was there hazarded that it would have to rise at most from 2.1 to 3.0. According to the first regression for 1934 (the y on x regression) a ratio of practitioners of 2.1 would be associated with an income ratio of 1.32; a ratio of practitioners of 3.0, with an income ratio of 1.09. Since the other regression for 1934 would show an even more marked drop in the ratio of incomes corresponding to the same difference in the ratios of practitioners, the 1934 data substantiate our earlier conclusion. However, the 1936 data do not. According to the first regression for 1936 a rise in the ratio of practitioners from 2.1 to 3.0 would mean a decline in the ratio of income from 1.55 to only 1.49, considerably smaller than from 1.32 to 1.17. According to the second 1936 regression, ratios of practitioners of 2.1 and 3.0 would be associated with income ratios of 2.30 and 0.44 respectively. However, strictly speaking, it is the regression of ratio of incomes on ratio of practitioners—the first regression—that is relevant.

mains the possibility of an analysis for the two professions combined. We have previously indicated that in large part accountants and lawyers serve the same clientele. This suggests that the ratio of lawyers to accountants might be comparable from state to state and might be correlated with the income ratio in the two professions. For both 1934 and 1936 the correlation is negative, but so small that the data are best described as showing zero correlation.[24] Several factors may be assumed to contribute to this low correlation. Accountants and lawyers serve essentially the same business clientele, but accountants serve business enterprises almost exclusively, whereas lawyers render services to ultimate consumers as well. The market for legal services partakes of the characteristics of the market for medical and dental services as well as of that for accounting services. In addition to this theoretical difficulty, the data used are defective. The chief defect is that the available figures on number of practitioners include both salaried employees and independent practitioners while our income data are for the latter alone.

CHAPTER 5

Income and the Location of Practice

A WISE CHOICE of a profession may improve an individual's chance of earning a good livelihood; it cannot guarantee him success. The attempts of numerous individuals to choose wisely limit the opportunities for profiting by a wise choice and tend to equalize, not incomes, but the "whole of the advantages and disadvantages" of different professions. In addition, as we have

[24] The rank difference correlation is —.078 for 1934, and —.076 for 1936.