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THE LEGACY OF ACCESS COMPETITION

BY THE MID-1920s, the remnants of access competition had been completely eliminated. The political and ideological victory of the regulated monopoly paradigm, advanced under the banner of universal service, has been so complete that the accomplishments of that period have been eclipsed. Nevertheless, the twenty-five year bout of dual service competition left an indelible impression on the American telephone network. The geographic scope of the network and popular adoption of telephones had been pushed to surprisingly modern levels.

Our picture of the popularization of the telephone by 1920 has been distorted somewhat by the modern emphasis on telephone penetration ratios as the indicator of telephone development. At the end of the dual service era, household penetration was about 30 percent and the simple penetration ratio (i.e., the number of telephones in service per 100 population) was only 13 percent. In most developed countries with universal service today, the penetration ratio is about 45 to 55 percent. Those bare numbers overlook two important facts about the dual service era, however. One is that by 1920 the U.S. telephone network was geographically universal; that is, it reached virtually all settled areas with public exchanges and lines. The other is that there were major regional variations in penetration. Many parts of the United States-particularly those where independent competition was strongest-had already achieved household penetration levels above 50 percent.

The Geographic Scope of the Telephone Network by 1920

Access competition did not put a telephone in every home, but as far as we can determine from the available statistical sources, it did put a telephone exchange or line in practically every community. By 1920, the physical infrastructure for supporting universal telephone service was essentially in place. By “physical infrastructure,” I mean public telephone exchanges linked by trunk lines to the national network. The presence of an exchange is the best indicator of

geographical coverage, because it is the most important factor determining whether access was available in a given location. Table 12-1 shows the number of public exchanges, the number of Bell and independent exchanges, the growth rate of exchanges, and the number of places with dual service competition.

The 1920 census documents 15,692 incorporated places of all sizes in the United States.³⁵⁵ According to AT&T records, there were 19,550 places with a telephone exchange in November 1917.³⁵⁶ The 1917 telephone census counted 12,294 telephone exchanges with annual incomes over \$5,000. The remaining 3,858 exchanges were probably serving small rural communities. For the 40 percent of the U.S. population who in 1920 still lived in unincorporated areas, there also were 30,317 rural lines as of 1912.³⁵⁷

Undoubtedly, some remote parts of the country were unreached by telephone lines or exchanges, but an impressive level of coverage had been attained. No other country or region achieved a comparable degree of continent-wide coverage so rapidly. Indeed, the number of public telephone exchanges in the United States has changed only marginally since 1917. (In fact, growth in exchanges slowed noticeably after 1907, when the phase of system overlap ended.) Fifteen years later, in 1932, the number of exchanges had increased by only 3 percent. In 1990 15,227 telephone central offices in the continental United States reported to the Federal Communications Commission. That is significantly less than the 19,550 total counted by AT&T in 1917, but about 3,000 more than the 12,294 exchanges with an income greater than \$5,000 reported in the 1917 Telephone Census. The comparison between 1917 and 1990 statistics is of necessity rough and imprecise. Telephone companies under a certain size do not report to the FCC, but the reporting criteria have changed since the 1920s. Some of the additional exchanges counted in 1990 may have existed in 1917 but were owned by companies too small to count. The lack of precision does not detract much from the essential observation: *despite the huge growth in population, users, penetration levels, and traffic between 1920 and 1990, the number of telephone central offices has changed relatively little.* The geographic extension of the American telephone network came during the years of access competition.

Telephone Penetration by 1920

Access competition also produced major changes in the quantity and type of users. The telephone became a rural as well as an urban device, a household item as well as a business tool. Penetration expanded at a rapid pace to the highest levels in the world, although here the picture becomes more complex. Some parts of the country actually began to approach the ideal of universal household penetration; for other regions, notably the South, that goal remained a long ways off.

During the Bell monopoly, telephony had developed almost exclusively as an urban service. Access competition turned that situation on its head. In 1920 38.7 percent of American farms reported telephones, whereas the average of all American households was 30 percent. In other

³⁵⁵ Bureau of the Census, POPULATION 1920, 50, Table 31, *Distribution of population in groups of cities classified according to size, and in rural territory: 1890-1920.*

³⁵⁶ Memorandum, Acting Statistician, Jan. 9, 1918, Box 13, AT&T-BLA.

³⁵⁷ Telephone Census of 1912, Table 18, 29 (1915).

words, rural areas on average had higher levels of penetration than urban areas. The disproportionate rural adoption of the telephone occurred because geographic isolation made expanded communication more valuable to rural inhabitants. The social density of urban environments made it easier to rely on public telephone stations or other forms of communication. Telephone service was also more expensive in the cities because of the larger scope of local exchange service. And large cities had a greater proportion of poorer, immigrant populations. The main point, however, is that no one contemplating the development of the telephone business in the 1880s or 1890s would have predicted that. The telephone was supposed to be an urban-oriented tool. Only the spontaneous, “disorderly” phenomenon of access competition allowed the full scope of rural demand to emerge.

Table 12-2 is a state-by-state breakdown of farm telephone penetration in 1920. The statistics show surprising levels of telephone diffusion in the North Central states. They also reveal extremely wide regional variations in penetration. In the North Central states, farm households stood on the brink of achieving universal penetration. Ohio, Indiana, Illinois, Kansas, and Nebraska reported subscription rates between 60 and 80 percent. The most surprising statistic relates to Iowa, where 86 percent of the 213,439 farms reported telephones in 1920. One can hardly fail to notice that of the ten states with the lowest farm penetration, eight are Southern. The four lowest states—South Carolina, Louisiana, Florida, and Georgia—have levels of telephone penetration scarcely one-tenth that of the North Central states.

That result can be explained only partly by variations in wealth. A linear regression between average farm value by state and the state’s telephone penetration among farmers yields a moderate but statistically significant correlation coefficient (R^2) of .29.³⁵⁸ Independent competition is a weaker but also statistically significant factor. States with higher levels of rural telephone penetration tend also to be those in which a high proportion of the users were served by independents in 1907 ($R^2=13$).³⁵⁹ The huge size of the regional disparity, however, suggests that other important cultural and socioeconomic differences were at work. Statistical analysis of telephone penetration in the 1980s and 1990s yields a much stronger correlation between wealth and variation in penetration levels. Further consideration of that puzzle is outside the scope of this work.

Another sense in which access competition pushed the United States toward universal service is the extension of telephone service to homes. The telephone had been primarily a business tool prior to independent entry. The ratio of business to residential subscriptions was about 9 to 1. The years between 1900 and 1910 saw the number of residential telephone subscriptions surpass the number of business telephones in most cities with an exchange. The growth of residential subscribership reflected access competition’s relentless drive to increase the value of networks by increasing their scope, as well as falling prices for equipment.

³⁵⁸ $R^2=.29044$, $F=17.6$, Significance of $F=.0001$.

³⁵⁹ $R^2=.13148$, $F=6.5$, Significance of $F=.0144$.

TABLE 12.1
TELEPHONE EXCHANGE GROWTH AND ACCESS COMPETITION,
1888-1918 (In cities over 5,000 in population)

Jan.1	Bell Exchanges	Independ. Exchanges	Total Exchanges	Growth rate %	# Dual Service cities
1888	1160	0	1160		0
1889	1194	0	1194	3	0
1890	1228	0	1228	3	0
1891	1241	0	1241	1	0
1892	1297	0	1298	5	0
1893	1351	18	1369	5	3
1894	1409	98	1507	10	28
1895	1439	300	1739	15	98
1896	1613	520	2133	23	187
1897	1799	800	2599	22	220
1898	1962	1250	3212	24	244
1899	2134	1700	3834	19	286
1900	2426	2220	4646	21	342
1901	2773	2780	5553	20	408
1902	3005	3400	4605	15	449
1903	3365	3900	7265	13	466
1904	3740	4400	7140	12	483
1905	4080	4800	8880	9	478
1906	4532	5200	9732	10	471
1907	4889	5400	10,289	6	466
1908	5108	5505	10,613	3	458
1909	5043	5680	10,723	1	451
1910	4968	5850	10,818	1	443
1911	4933	6010	10,943	1	408
1912	5014	6170	11,184	2	342
1913	5182	6333	11,515	3	310
1914	5245	6433	11,678	1	293
1915	5289	6500	11,789	1	277
1916	5300	6560	11,860	1	261
1917	5397	6590	11,987	1	179
1918	5676	6618	12,294	3	147

TABLE 12.2
TELEPHONE PENETRATION IN FARM HOUSEHOLDS, 1920

(Rank)	State	Rate %	(Rank)	State	Rate
(1)	Iowa	86	(25)	Colorado	37
(2)	Kansas	78	(26)	Nevada	36
(3)	Nebraska	77	(27)	Idaho	33
(4)	Illinois	73	(28)	Texas	32
(5)	Indiana	66	(29)	NJ	32
(6)	Missouri	62	(30)	California	32
(7)	Ohio	62	(31)	Wyoming	28
(8)	Minnesota	62	(32)	Delaware	27
(9)	S. Dakota	59	(33)	Kentucky	27
(10)	Wisconsin	59	(34)	Maryland	25
(11)	Vermont	58	(35)	Utah	25
(12)	Conn.	52	(36)	Arkansas	23
(13)	Mass.	52	(37)	Tennessee	23
(14)	Oregon	51	(38)	Virginia	18
(15)	Michigan	50	(39)	Montana	17
(16)	N. Hamp.	50	(40)	Arizona	16
(17)	Maine	49	(41)	Alabama	15
(18)	NY	48	(42)	NCarolina	12
(19)	N. Dakota	47	(43)	NM	11
(20)	Penn.	44	(44)	Miss.	10
(21)	W. VA	43	(45)	Georgia	9
(22)	Wash.	42	(46)	Florida	8
(23)	R. Island	31	(47)	Louisiana	6
(24)	Oklahoma	37	(48)	SCarolina	6

Sources: 1920 Farm Census, Table 62, p.50.

TABLE 12-3
TELEPHONE PENETRATION AND WEALTH IN FARM HOUSEHOLDS, 1920

State	Rank in \$\$	Rank in Farm tels	Ind Tel %, 1907
Iowa	1	1	84
Kansas	10	2	81
Nebraska	4	3	69
Illinois	6	4	51
Indiana	20	5	75
Missouri	24	6	71
Ohio	22	7	63
Minnesota	11	8	67
S. Dakota	5	9	93
Wisconsin	15	10	56
Vermont	33	11	45
Conn.	19	12	02
Mass.	25	13	03
Oregon	12	14	33
Michigan	29	15	51
N. Hamp.	37	16	22
Maine	38	17	30
NY	23	18	26
N. Dakota	8	19	78
Penn.	18	20	39
W. VA	39	21	75
Wash.	16	22	36
R. Island	27	23	02
Oklahoma	35	24	56
Colorado	13	1	84
Nevada	2	2	81
Idaho	4	3	69
Texas	6	4	51
NJ	20	5	75
California	24	6	71
Wyoming	22	7	63
Delaware	11	8	67
Kentucky	5	9	93
Maryland	15	10	56
Utah	33	11	45
Arkansas	19	12	02
Tenn.	25	13	03
Virginia	12	14	33
Montana	29	15	51
Arizona	37	16	22

Alabama	38	17	0.30
NCarolina	23	18	0.26
NM	8	19	0.78
Miss.	18	20	0.39
Georgia	39	21	0.75
Florida	16	22	0.36
Louisiana	27	23	0.02
Scarolina	35	24	0.56

\$\$ rankings taken from Average Value per Farm, 1925, Agric. Census, Table 14, p.60.
Independent share of telephones taken from 1907 Telephone Census.

The large exchange in Louisville, Kentucky, serves as a typical example. In 1902, the first year of dual service competition in Louisville, the subscriber breakdown was as follows:

TABLE 12.4
SUBSCRIBER BREAKDOWN, LOUISVILLE, KY, 1902

	Bell Co	Home Co	Duplicates	Totals
Bus. lines	3,293	3081	(1,376)	4,998 (54%)
Res. lines	3169	1851	(741)	4,629 (46%)
Totals	6462	4932	(2,117)	9,277

From 1902 to 1910, residential users increased from 46 percent to 59 percent of all users in Louisville. Of the 6,746 net new users added during the period, 5,151 of them (76 percent) were residences. For the Bell exchange, residential subscribers were the only source of growth during that period.

TABLE 12.4, CONT'D
SUBSCRIBER BREAKDOWN, LOUISVILLE, KY, 1910

	Bell Co	Home Co	Duplicates	Totals
Bus. lines	3,230	5,396	(2,023)	6,603 (41%)
Res. lines	4,421	5,899	(900)	9,420 (59%)
Totals	7,651	11,295	(2,923)	16,023

Household diffusion of the telephone was more extensive in smaller cities. Statistics for five medium-sized Illinois towns (pop. 10,000 to 50,000) between 1909 and 1912, for example, show that residential subscribers often accounted for more than 70 percent of the users.

TABLE 12.5
RES/BUS SUBSCRIBER BREAKDOWN,
ILLINOIS EXCHANGES, 1909-12

Decatur IL, 1912 (pop. 31,000)				
	Bell Co	Indep Co	Duplicates	Totals
Bus. lines	1,161	850	(551)	1,460 (24%)
Res. lines	3,307	1,308	(460)	4,155 (69%)
Farm lines	198	192	N/A	390 (06%)
Totals	4,666	2,350	(1,011)	6,005
Freeport, IL, 1909 (pop. 18,000)				
	Bell Co	Indep Co	Duplicates	Totals
Bus. lines	281	788	(142)	927 (19%)
Res. lines	1,094	2,903	(101)	3896 (81%)
Totals	1,375	3,691	(243)	4, 823
Galesburg, IL, 1909 (pop. 22,000)				
	Bell Co	Indep Co	Duplicates	Totals
Bus. lines	333	601	(194)	740 (18%)
Res. lines	598	2,943	(57)	3,484 (82%)
Totals	931	3,544	(251)	4,224
Champaign/Urbana, IL, 1912 (pop. 30,000)				
	Bell Co	Indep Co	Duplicates	Totals
Bus. lines	575	542	(300)*	817(25%)
Res. lines	1,364	1,315	(710)	2,509(75%)
Totals	1,939	1,857	(470)	3,326
Aurora, IL, 1909 (pop. 30,000)				
	Bell Co	Indep Co	Duplicates	Totals
Bus. lines	568	694	(394)	868(20%)
Res. lines	2,100	1,549	(93)	3,556(80%)
Totals	2,668	2,243	(487)	4,424

Source: 1909 statistics: 17 TELEPHONY 688 (May 1909); 1912 statistics: AT&T Legal and Regulatory Library, State of Illinois.

The distribution of residential and business subscribers looks very similar to what one would see today. The levels of household penetration achieved in those cities also is not as far from the current pattern as one might think. According to the 1910 Census, the average number of persons per household in the United States was about 4.5. Using the conservative figure of 4.0, we can estimate how many households there were in those communities by dividing the total population by 4.0. The total number of residential telephones (corrected for duplication) can then be used to derive a household penetration figure. The results, at least for that limited sample of the country, are impressive:

TABLE 12.6
ESTIMATED HOUSEHOLD PENETRATION RATES, ILUNOIS, 1909-12

City	1910 Pop.	Households(pop/4)	Residential Telephones	Household Penetration %
Decatur	31,000	7,750	4,155	54
Freeport	18,000	4,500	2,400	53
Galesburg	22,000	5,500	3,283	60
Cham/Urb	30,000	7,500	2,509	33
Aurora	30,000	7,500	3,556	47

Thus, while the average for the country as a whole in 1920 was about one telephone for every three households, there were many communities in the United States that had telephones in more than half of their households as early as 1910.

If telephone development in the United States by 1920 is contrasted with Europe, the uniqueness of the U.S. experience is even more evident. With the exception of Sweden, there was no significant episode of independent competition in Europe (not coincidentally, Sweden has achieved the highest telephone development levels in Europe). The U.S. development trajectory diverges sharply from the European one during that period. Table 12-6 shows how widely the U.S. and European growth rates diverged. The historical precociousness of U.S. telephone development becomes even clearer if the U.S. penetration rate for 1920 is compared to the European rate forty years later. If the seven major western European countries (West Germany, France, Spain, Italy, the United Kingdom, Switzerland, and Sweden) are combined, the ratio of telephones to population for Europe in 1961 (table 12-6) was still lower than the U.S. rate for 1920 (12.69).³⁶⁰

TABLE 12-7
US AND EUROPEAN PENETRATION GROWTH, 1895-1912

	USA	Europe
1895	0.36	0.25
1902	2.30	0.30
1912	8.80	0.70

Source: AT&T Co., Telephone Statistics of the World, 12 May, 1912.

The United States was still some distance from today's level of 94 percent household penetration, and large regional disparities existed. Nevertheless, the competitive period had by 1920 created the kind of geographic and social penetration capable of supporting the modern notion of universal-service-as-social-ubiquity. The social role of the telephone had been utterly transformed. Later, the policy expectations applied to the telephone by government legislators and regulators began to reflect that new social role. But it is important to understand the sequence: market processes made the telephone a popular and geographically ubiquitous item first; government policy to extend and support that notion came second.

³⁶⁰ THE WORLD'S TELEPHONES, 1961, New York, AT&T Co., at 2.