Statistical Methodologies
Research Project
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Brief Description

The US commercial radio industry has seen major changes since the passage of the 1996 Telecommunications Act, which significantly increased the caps on the number of radio stations in a single market and total number of stations one company could own. A similar ruling in 1992 to allow radio duopolies had a similar effect. Concerns that ownership consolidation does not serve the public interest have grown louder, but proponents of consolidation argue that economies of scale and a desire to avoid redundant programming on multiple stations in a single market owned by a single company makes it more economically feasible for large companies to develop specialized radio formats to better serve niche markets.

Research Question and Hypothesis

To examine the effects of consolidation on radio station format options available, this research project asks how the number of different radio station formats in the United States has changed in the years before and after the passage of the 1996 Telecommunications Act. My first hypothesis that over time, there is a greater total number of different formats. My second hypothesis is that over time, there were more stations per format among the least-reported formats. The third hypothesis is that the changes will be most drastic in the years immediately before and after the passage of the Act. The null hypothesis is that there is no significant difference in the distribution of stations among the various formats from one year to another. As there may be other reasons for any differences that are observed, the hypothesis is directional but not causal.

Literature Review

In an article in the December 2001 issue of Journal of Radio Studies, Todd L. Wirth analyzed the extent to which nationwide format oligopolies exist. The paper does a good job of explaining rationales for and against format specialization.

In another article in the same issue, Todd Chambers analyzed the effects of deregulation in small markets by looking at the number of radio station owners, news outlets, wire services, and the level of format diversity in smaller markets. Chambers does not have any data for 1998 thru the present, and only analyzed small markets.

Description of Data Sources

The data for this research are taken from the annual tally of radio stations printed in the Broadcasting & Cable Yearbook, a recognized authority in the field. Although the Yearbook has been published for many years, summary data has only been included since 1992. From 1992 thru the latest Yearbook for 2001, each yearbook has included a table relevant to this research project: U.S. Radio Formats by State and Possession. This table lists the total number of AM stations, FM stations, commercial stations, and noncommercial stations for the entire United States, and then listed the total number of stations for each format. Stations report all formats for which the station plays more than 20 hours of programming per week. For this reason, the sum of all reports for all formats is greater than the total number of stations in existence. The formats reported do change slightly from year to year.

Methodology

Data Entry

I entered all of the data from photocopies of the relevant pages from the Yearbooks into Microsoft Excel and then imported the data into SPSS for Windows version 11.5. To find any errors made in the data entry, I entered data from another series of Yearbook tables and

compared the values. Whenever there was a discrepancy, the format was flagged and I double-checked that the data was entered correctly. In doing this, I found that the data in the Yearbooks was not always consistent. I asked a representative of the publisher about this and was told that the data for the tables in the Yearbooks was not necessarily generated at the same time.

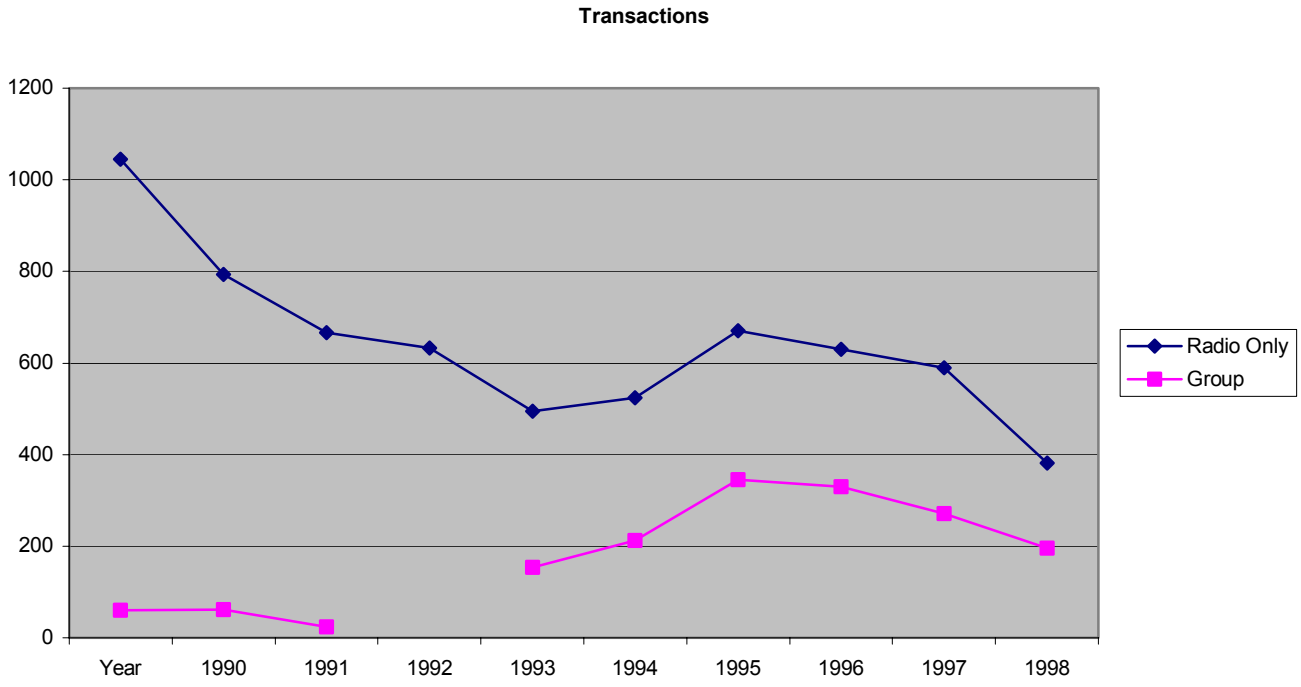
Weighting

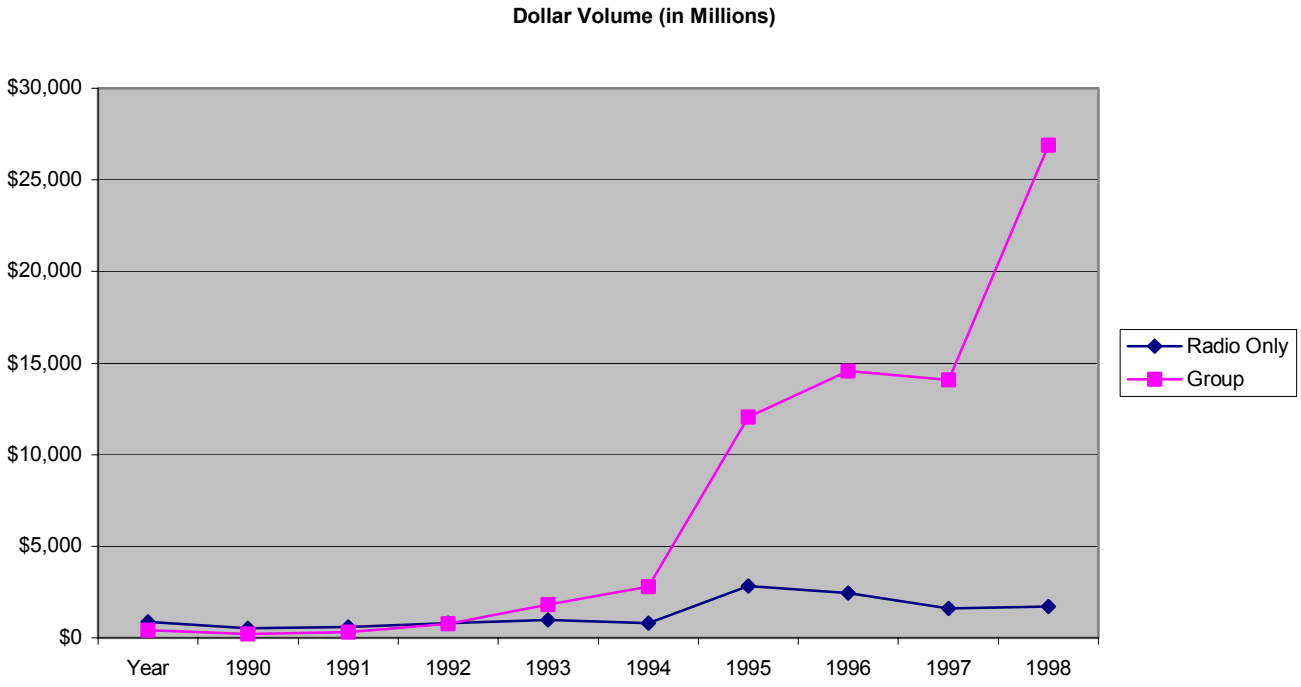
The point of this research project is compare formats across time. Simply analyzing the counts in the different yearbooks will be inaccurate because the total number of stations increased throughout the sample period. To adjust for this change, all format counts were weighted so that they reflect 1992 counts by multiplying the actual count by the total number of radio stations on air on January 1 of that year and dividing by the total number of radio stations on air on January 1 in 2001, according to the Record of Radio Growth Since Television Began table on page D-733 of the 2001 Yearbook.

$$weighted\ count_{year} = original\ count_{year} \times \frac{total\ on-air\ stations_{year}}{total\ on-air\ stations_{1992}}$$

Significance of Sample Time Frame

The Telecommunications Act of 1996 took effect on February 8, 1996. Although the Yearbooks contain only annual totals, the 46 Years of Station Transactions chart on page A-89 of the 2001 Yearbook clearly indicates that a significant change took place after the passage of the Act. The two graphs below show the total number of transactions in these two categories for the years 1990 to 1999 and the total dollar volume of the transactions. Group transactions can include multiple stations.



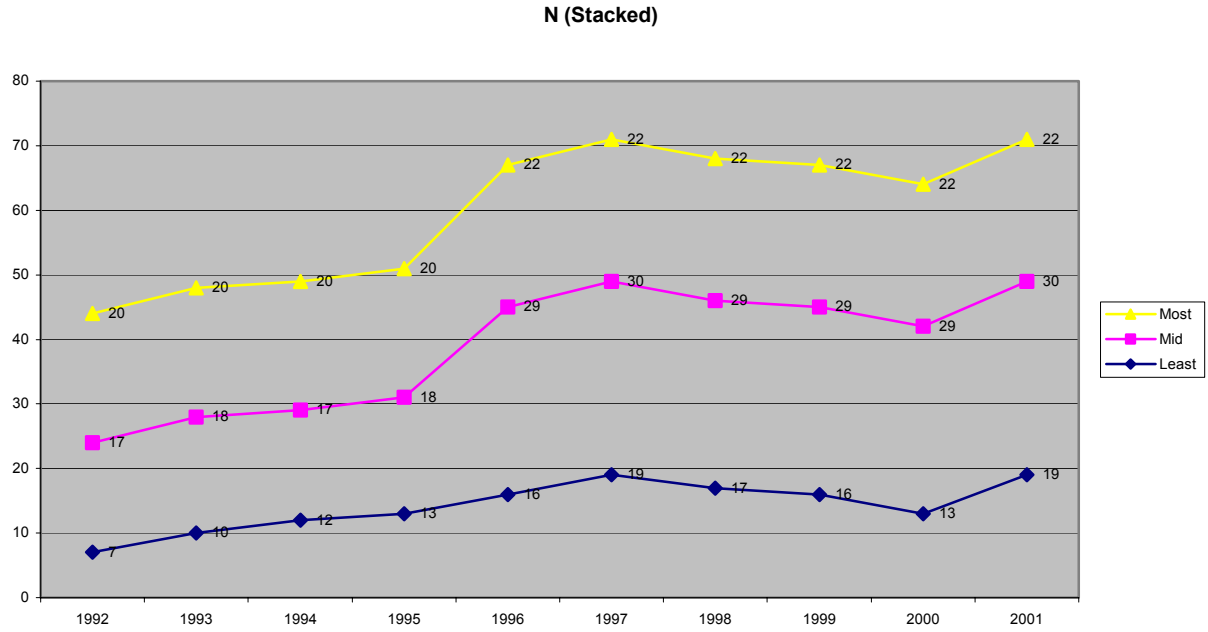


It is clear from looking at these graphs that there was a drastic change in 1996. What this study attempts to analyze is how this change affected the variety of formats available.

Grouping

Because station formats change from year to year, it would be inaccurate to analyze each format individually. As an example, 550 stations reported broadcasting MOR (middle of the road) programming in 1992. In 2001, only 265 stations reported broadcasting MOR, but 83 stations reported broadcasting AOR (album-oriented rock) programming, which didn't even exist as a format in 1992.

To compensate for the fluctuation of formats through the eleven years of the sample data, I attempted to split the formats into the least-reported, middle-reported, and most-reported groups. Formats were grouped based on the first reported count, regardless of whether the counts for subsequent years fell into the range of a different group. The boundary points for the three groups were 2 and 200. Formats that had 1 or 2 stations reporting were classified as group 1 (Least), formats that had between 3 and 199 stations reporting were classified as group 2 (Mid), and formats that had 200 or more stations reporting were classified as group 3 (Most). As can be seen from the graph below, this kept the number of formats within each group balanced as best as possible.



Primary Analysis

The following hypotheses need to be tested:

H1: Over time, there is a greater total number of different formats.
H2: Over time, there were more stations per format among the least-reported formats.
H3: The changes will be most drastic in the years immediately before and after the passage of the Act.
H0: There is no significant difference in the distribution of stations among the various formats from one year to another.

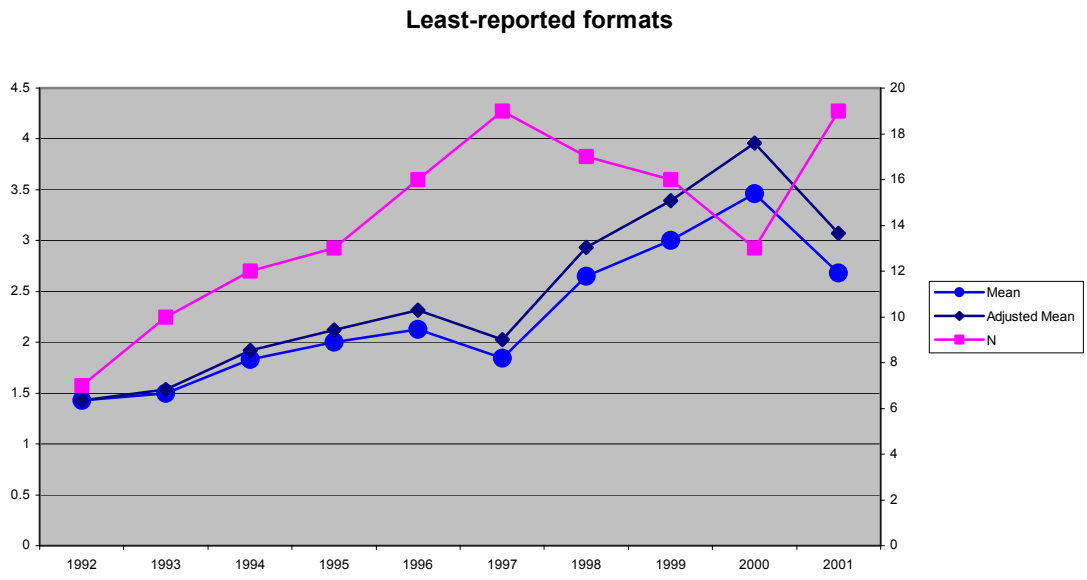
H1: Over time, there is a greater total number of different formats

The chart in the previous section shows that there were 44 different formats reported by stations in 1992, and this number increased to a peak of 71 in the years 1997 and 2001. The greatest increase was from 1995 to 1996—before and after passage of the Act. Only four formats that were reported in 1992 were not reported at all in 2001: Jewish, German, Serbian, Drama/Literature. There were 61 formats added to the listings since 1992. Although quantitative analysis of these new groups is not possible with the data used for this study, the new formats

seem to fall into four distinct groups: ethnic (21), religious (5), non-musical (9), and new music formats or sub-formats (26). All of this supports hypothesis 1.

H2: Over time, there were more stations per format among the least-reported formats

To test the second hypothesis, I calculated the mean count for all stations in the least-reported group. These values were then weighted to adjust for the increase in total radio stations. The graph below shows both the weighted and unweighted means, along with the total number of formats in the least-reported group each year. Note – the y-axis scale on the left side of the graph is for the means, and the scale on the right side is for the count of formats (N). The graph shows that the numbers of stations in the least-reported group increased from 1992 to 1996, dipped in 1997, and then increased until 2001, where it dipped again.



Levene's test for equality of variances indicates that the variances between 1992 data and 2001 data is unequal. This is understandable considering the different number of cases, the different means, and the different standard deviations. But the difference between the two groups is significant to the .007 level, supporting hypothesis 2.

Group Statistics

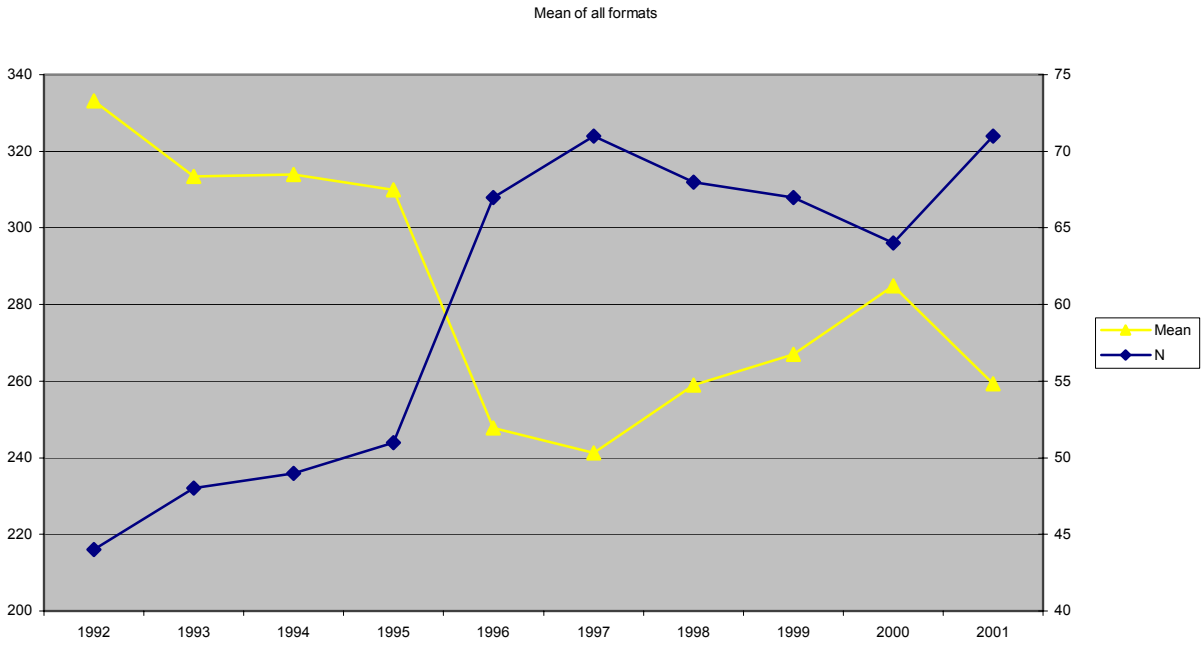
	YEAR	N	Mean	Std. Deviation	Std. Error Mean
WEIGHTED	1992	7	1.42857	.534522	.202031
	2001	19	3.09644	2.308834	.529683

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
WEIGHTED	Equal variances assumed	10.103	.004	-1.870	24	.074	-1.66786	.891927	-3.508712	.172983
	Equal variances not assumed			-2.942	22.208	.007	-1.66786	.566904	-2.842913	-.492816

H3: The changes will be most drastic in the years immediately before and after the passage of the Act

To test this hypothesis, I pooled the data into two groups: 1992 through 1995 and 1996 through 2001. Looking at the graph of the means and total number of all formats below, it seems that the mean is very dependent on the number of formats.



But as the tables below show, the difference in means before and after passage of the act is not statistically significant.

Group Statistics

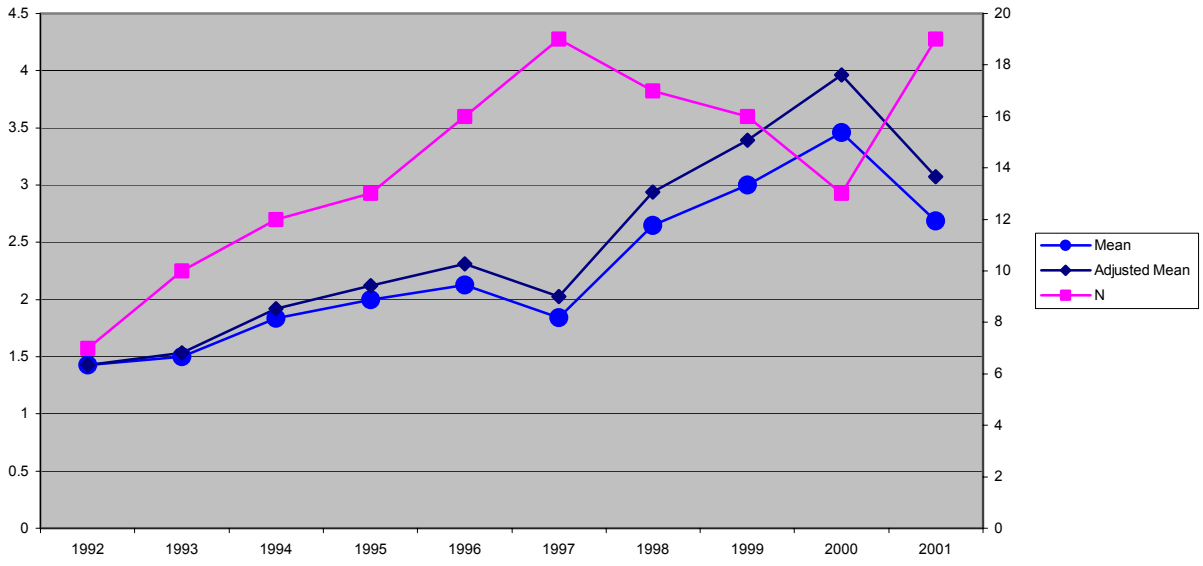
	YEAR	N	Mean	Std. Deviation	Std. Error Mean
WEIGHTED	>= 1996	408	291.16288	509.937630	25.245675
	< 1996	192	327.88775	547.055127	39.480303

Independent Samples Test

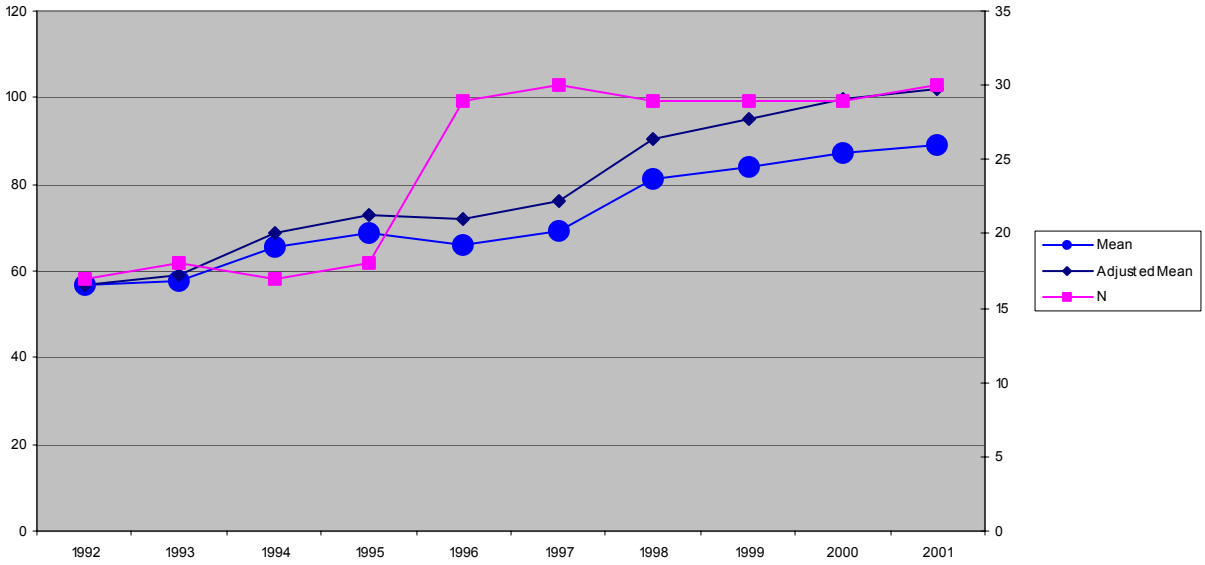
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
WEIGHTED	Equal variances assumed	.111	.739	-.804	598	.422	-36.72488	45.691120	-126.459	53.009693
	Equal variances not assumed			-.784	351.549	.434	-36.72488	46.861908	-128.890	55.440075

When each format category (least-reported, mid-reported, and most-reported) is analyzed individually, the results are more interesting. The charts below provide a visual summary of this data.

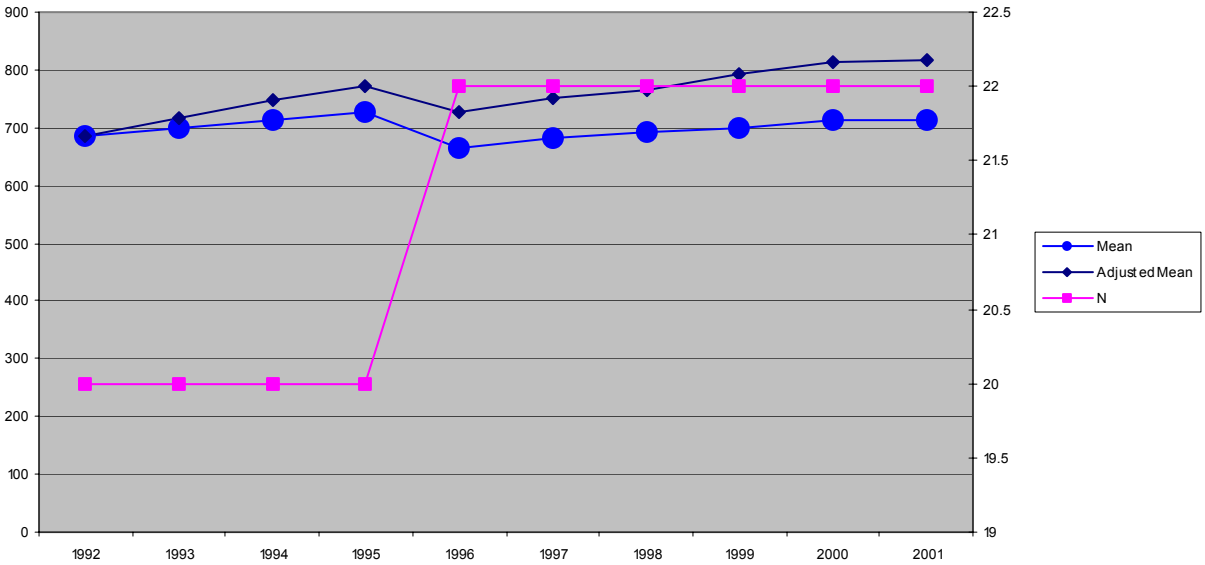
Least-reported formats



Mid-reported formats



Most-reported formats



Statistical analysis of the three categories follows.

Least-reported formats

Group Statistics

	YEAR	N	Mean	Std. Deviation	Std. Error Mean
WEIGHTED	>= 1996	100	2.90080	1.964484	.196448
	< 1996	42	1.80962	1.121578	.173063

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
WEIGHTED	Equal variances assumed	17.867	.000	3.372	140	.001	1.09118	.323607	.451390	1.730968
	Equal variances not assumed			4.168	127.240	.000	1.09118	.261807	.573120	1.609238

Mid-reported formats

Group Statistics

	YEAR	N	Mean	Std. Deviation	Std. Error Mean
WEIGHTED	>= 1996	176	89.32271	127.598610	9.618107
	< 1996	70	64.57066	76.736078	9.171716

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
WEIGHTED	Equal variances assumed	1.166	.281	1.516	244	.131	24.75205	16.322222	-7.398388	56.902485
	Equal variances not assumed			1.862	205.985	.064	24.75205	13.290160	-1.450133	50.954230

Most-reported formats

Group Statistics

	YEAR	N	Mean	Std. Deviation	Std. Error Mean
WEIGHTED	>= 1996	132	778.66346	654.606901	56.976217
	< 1996	80	729.48122	661.152199	73.919063

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
WEIGHTED	Equal variances assumed	.003	.957	.528	210	.598	49.18223	93.100524	-134.349	232.7136
	Equal variances not assumed			.527	165.522	.599	49.18223	93.329080	-135.087	233.4511

For the least-reported formats, equality of variances cannot be assumed, but the difference is significant to the .001 level. For the mid-reported and most-reported groups, the differences are not significant.

Conclusion

Analysis shows that the first and second hypotheses are supported by the data. The third hypothesis is supported only for the least-reported group. This may be an indication that for all but the least-reported formats, ownership limits did not have an effect on the number of stations reporting. The data further supports the assertion that the Telecommunications Act of 1996 actually increased the number of formats in the least-reported group. In total, the data seems to indicate that the Act actually increased the diversity of radio formats.

The sharp change exhibited in most of the graphs between 2000 and 2001 may be considered an outlier and removed from the sample, or it could indicate more changes in the coming years. This area deserves further attention, as statistical analysis may be able to provide quantitative definitions of radio format diversity.