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The Economics of Foreign Language Media in the U.S:

An Empirical Study of Radio Markets

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Abstract

Using data for 320 radio stations operating in the 50 largest Arbitron Metro Radio Markets during 2004 that offered at least some programming in one or more of 19 different foreign languages, we find in most cases that the proportion of foreign language programming in these market is less than the foreign language speaking group's proportion of the population. We find strongly positive statistical relationships between the size of foreign language populations in the radio market and the amount of radio programming in their respective language that is available. We also find a "preference externality" effect: consistently negative relationships between the amount of foreign language programming available and size of the English language population. Generally, foreign language programming availability increases at a decreasing rate as foreign language populations grow. We find similar results for another measure of radio programming variety, the number of foreign language formats per market, and for a measure of programming quality, the percentage of news/talk programming that is locally produced.

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Wildman and Karamanis (1998) observe that there has been a general presumption in the United States that racial and ethnic minorities are "underserved" by radio or television programming that is directly oriented toward their preferences. The Federal Communications Commission has in fact had a long-standing concern with such apparent shortcomings of service to minorities by broadcast media. For example, a history of taxation and licensing provisions has given preference to minority broadcast station owners (Mason, Bachen, and Craft, 2001).[1]

Radio markets in the U.S. offer an opportunity to study media service to minority populations systematically. In this paper, we investigate the availability and content of foreign language radio programming in the top 50 Arbitron Metro Radio Markets in the United States during 2004. We report on programming offered in 19 different foreign languages within these markets, according to the Bacon's Radio Directory (2005). Using corresponding demographic information for a subset of these foreign language speaking groups from the U.S. Census, we demonstrate the extent of "underservice" that may occur, and we establish economic relationships between market size, foreign and English language population sizes, and other indicators of the quantity and quality of the foreign language programming.

Among the main research questions we address: Does the amount of foreign language radio programming that is offered tend to be smaller than, greater than, or approximately reflective of the relevant language group's proportion of the market's population? Does the amount of available foreign language programming tend to increase at the same rate, or at a faster or a slower rate than the relevant foreign language population increases? Similarly, how does variety (as measured by the number of different formats available) and quality (as measured

by the proportion of originally produced programming) vary with population? How does the availability of foreign language programming vary with English proficiency of the language group, and with the size of other population groups in the market, namely the dominant English language speaking population?

Several authors have focused on the issue of program supply to minority audiences by studying how audiences having different racial/ethnic compositions are valued by advertisers. Webster and Phalen (1997) found a significant negative relationship between advertising rates and the proportion of non-whites in a market, and an FCC-sponsored study by Ofori (1999) reported lower CPMs for radio stations targeting minority audiences. In an individual radio station-level study, Napoli (2002) reported significantly lower advertiser valuations for black and Hispanic audiences. In a related paper, Brown and Cavazos (2002) study advertising rates and their relationship to African-American representation in prime-time broadcast television program casts. They find strong preferences by black audiences for programs with African-American casts, and also that such programs statistically underrepresent the proportion of blacks in the general U.S. population. McDowell and Dick (2005) find that Black music radio stations and Hispanic/Ethnic stations have relatively low ratios of revenue share to audience share, and attribute those variations to differences in audience sizes and advertisers' valuation of audiences for different radio formats.

Rogers & Woodbury (1996) investigated how market size affects the availability of minority programming. Using a universe of 115 local radio markets, they found that the presence of black and Hispanic audiences leads to high program diversity in terms of 11 defined radio formats.

In his study of radio programming and listening in 246 U.S. radio markets, Waldfogel (2003) found that blacks and Hispanics have relatively distinct and intense preferences for black-oriented and Hispanic-oriented radio stations, respectively. He further found that as the population size of these groups increases, the quantity of radio programming oriented to them, as well as overall radio listening, increases. Of most interest, Waldfogel further found negative relationships between white population size and black/Hispanic program variety and listening, although these effects were statistically significant only for models involving the supply of programming, and not listening behavior. The economic logic underlying these findings is that due to fixed costs of establishing and operating a radio station and a listener's demand for variety, the number of "black-targeted" ("Hispanic-targeted") stations, and the amount of black listening (Hispanic listening) should increase with larger black (Hispanic) populations. Other things equal, however, the number of minority-oriented stations and the amount of minority listening accounted for by them should decrease with the size of the white population because of "preference externalities." In effect, minority listeners with less intense preferences for minority-oriented programming are competed away by an increasing variety and quality of white-oriented programming, although those programmers are presumably seeking primarily to serve the white population.

In addition to presenting the first systematic economic study of foreign language radio in the U.S., and reporting on the underservice issue, our database offers an opportunity to test the preference externalities hypothesis in an alternative framework, and to investigate the functional forms of the relationships between potential audience size and the quantity, quality, and variety of radio programming.

We begin with a brief theoretical discussion of the expected relationship between the availability of specialized programming and the size of audience groups to which that programming is directed. We then discuss our database and methodology, followed by some descriptive data, then the results of our statistical models, and finally conclusions.

The Economics of "Underservice"

What is the theoretical basis for the hypothesis that minority population groups are likely to have a proportion of available media directed to them that is less than that directed to "majority" (i.e., in our case, native English-speaking) populations? One can identify various contributing factors, notably income or other differences that may reduce incentives of producers. Other things equal, however, a common theme of other possible explanations is that greater economies of scale in producing programming for a majority group has spillover effects, leading to a disproportionate supply of majority-oriented programming. That result may obtain either if minority listeners value program variety or if they value program quality in addition to the ethnic or language-specific focus of media programming. Or there may be asymmetric language barriers. If a majority group speaks only the majority language, for example, while a minority group speaks both a native language and the majority language, the supply of minority-focused programming should tend to be disproportionately low.

A numerical example demonstrates the latter assertion most simply in the case of language barriers. Let us say that a radio market consists of 24 native English speakers and 16 native Spanish speakers, and that total listening is fixed. Say further that none of the native English speakers also speak Spanish, but that 8 of the 16 native Spanish speakers understand English and the other 8 understand only Spanish. For simplicity, say that the 8 dual language native Spanish speakers value variety and will simply divide themselves equally among the

available stations. On the supply side, say that 10 viewers are required to support a single radio station of uniform program quality and that there is free entry.

Simple algebra indicates a unique equilibrium in which there is one Spanish language station and three English language stations, each breaking even. The 10 listeners supporting the Spanish stations consist of the 8 non-English speakers plus 2 (that is, 1/4) of the bilingual group. The 30 listeners of the English language stations consist of the 24 native English speakers and 6 (or 3/4) of the bilingual native Spanish speakers. In this sense, the Hispanics are "underserved," having 40% of the population but only 25% of the Spanish-language programming. Obviously, these contrasts can become more extreme for small ethnic populations.

It is evident that this same basic result of undersupply to minorities can be obtained via other assumptions. An interesting variation, for example, involves program quantity and quality. If all listeners prefer programming that is oriented toward their native language group, but all listeners also value program variety and quality, then examples can easily be constructed to show that even if language proficiency is symmetric, then listening, along with the aggregate variety and quality of programming, will be disproportionately higher for the majority group. Basically, this occurs because economies of scale in producing programming for the larger size group gives producers an incentive to produce a greater variety of higher quality programming focused toward the larger group. The majority population disproportionately listens to the majority-focused programming because of cultural compatibility as well as higher variety and quality. The minority group, however, is disproportionately attracted to the majority programming because its greater variety and quality work counter to its cultural incompatibility.

Finally, what form should we expect a positive relationship between population size and programming availability to take: linear, increasing at a decreasing rate, or increasing at an

increasing rate? If, for example, a population of 1000 is required to support one station and the quality of programming is uniform and consistent, then 2000 people (@ 1000 per station) should attract entry of 2 stations, etc.—a linear relationship. If listeners value variety, program availability could increase even faster than population size. On the other hand, if stations increase the quality of their programming as potential audience expands, as we would expect from Shaked and Sutton (1983) and subsequent empirical evidence (Waldfogel, 2003), then we would expect the supply of programming hours oriented toward minority groups to increase at a decreasing rate as population expands.

Data and Methodology

Our primary database is constructed from the 2005 Bacon Directory of Radio Stations and the 2000 United States Census. The Bacon Directory for that year contains detailed technical and operational data on individual radio stations operating in the United States during 2004, notably the following information used for this study: the county in which the station is located, its band, wattage, format, programming language or languages, and the percentage of news and talk programming that is originally produced.[2] Our study covers the largest 50 Arbitron Metro radio markets.[3] Individual radio stations were judged to be within an Arbitron market if the county of its location, according to the Bacon directory, was contained in that Arbitron metro. The Bacon Directory is relatively comprehensive in terms of radio station coverage. The number of FCC licensed stations reported to be operating at the end of 2004 was 13,525, while the Bacon Directory contained entries for 12,278 stations.[4]

A variety of corresponding demographic information for the general populations of Arbitron markets, and for individuals “five years old and above who report that they speak a language other than English at home” was collected from the 2000 Census.

Table 1 shows summary characteristics of the Top 50 Arbitron markets and the stations operating within them, reduced to quintiles. As indicated by the last three columns, we identified a total of 320 stations that were reported by the Bacon Directory to be (a) licensed in one of the counties contained in these Arbitron markets, and (b) offering at least some programming in one or more of 27 different languages other than English, in 2004.[5] Two hundred and twenty-seven (227) of these stations broadcast one of these languages full-time, and the remaining 93 reported their programming time to be divided among two or more different languages, including English. The large majority of the foreign language programming that we identified was in Spanish. While 281 of the stations were broadcasting in Spanish, only 45 broadcast in one of the other 26 languages. Roughly the same Spanish to non-Spanish ratio (200 to 27) obtained for stations broadcasting a single language fulltime.

As the end columns of Table 1 also show, the top 50 Arbitron markets contain a little over half of the total U.S. population, about 72% of the Spanish speakers and about 83% of 21 foreign language speakers other than Spanish. The familiar tendency for ethnic groups to concentrate within large cities is reflected by their generally greater fractions of total population in the largest sized Arbitron markets.

Similarly, it is apparent that larger markets tend to have disproportionate percentages of the foreign language stations. It is likely, in fact, that the top 50 Arbitron markets contain virtually all full-time radio stations that are broadcasting in foreign languages other than Spanish. Based on the full Bacon Directory listings, we found no radio stations in Arbitron metros beyond the 49th largest that offered any foreign language programming other than Spanish and only 5 of the 27 full-time non-Spanish stations were in Arbitron markets smaller than the 17th largest.

Although we do not have specific data, it is evident that the majority of all stations with Spanish-language programming are licensed within the top 50 Arbitron markets.

Although the total of 2687 stations licensed within the top 50 Arbitron markets that we identified represented only 22% of all radio stations operating in the US, these stations account for a substantially greater fraction of industry revenues. The top 50 Arbitron radio markets were reported to generate approximately 40% of total radio industry revenues.[6]

Levels of Radio Service

Among the 27 total language groups we identified, our statistical analysis to follow covers only the 19 for which we could obtain complete data; the total number of stations offering programming in these 19 languages, however, remained the same at 320.[7] Descriptive data organized by these language groups appears in Table 2. As shown in the last column, Spanish was by far the largest foreign language speaking group in the U.S. in 2000, accounting for about 14.0% of the population in the Top 50 Arbitron markets, followed by Chinese, with 1.3%, with all others well under 1%. Comparably, 44 of the top 50 markets had some foreign language service, although Spanish again dominated, having service in 39 of the top 50 Arbitron markets, compared to a maximum of 7 markets for Chinese. Stations broadcasting a foreign language only part-time indicate the same basic pattern. While 27 languages had some service within the top 50 markets (which occurred by definition of our study criteria), only 8 of the language groups were served at all by a full-time station.

Figures 1 and 2 show graphically the relationship between the proportion of foreign language minority populations and the proportion of radio programming available to those groups, respectively for Spanish language stations and for combined stations offering programming in one or more of the 18 other foreign languages. Our primary measure along the

vertical axes of these figures, foreign language, fulltime equivalent stations, measures the amount of available foreign language programming.[8] The clusters along the horizontal axis of both figures, especially Figure 2, suggest a large number of cases in which a resident foreign language group has no native language radio service.

These levels of service data are summarized statistically in Table 3. Eighteen of the 19 foreign language groups have some population representation in all 50 Arbitron Markets, but with the exception of Spanish, the availability of any foreign language radio service is uncommon. A summary analysis of the Table 3 data we conducted indicates that in the 1098 Arbitron market-language pairs for which there are some speakers, only 91 cases (8.3% of the 1098) had any foreign language service. In those cases where the foreign language-speaking groups did have at least some radio service in their own languages, however, the supply of programming was much more representative of the presence of the foreign language speaking groups. In 48.4% of those cases (44 of 91), the percentage of full-time equivalent stations serving the relevant foreign language group exceeded that language group's proportion of the Arbitron market population.

Figure 3 suggests a positive relationship between the variety of foreign language formats and the comparable foreign language populations for the 19 foreign languages combined respectively. Since the formats reported in the Bacon Directory were not language specific in the case of multi-language stations, we only considered formats for full-time foreign language stations.[9] Similarly, Figure 4 suggests a generally positive relationship between the percentage of a foreign language station's news/talk programming that is locally produced, and the comparable population's size, again for full-time stations, and for all 6 languages combined. (There were not

enough non-Spanish language cases for format variety and percentage of local news/talk to illustrate the relationships usefully.)

We now turn to our regression analysis.

Empirical Models

We report a variety of models primarily intended to measure the functional relationship between the sizes of foreign language and English speaking populations and the availability and quality of foreign language programming directed toward those groups.

The general empirical model we test is:

$$FL\text{-}FESTATION_{ij} = \alpha + \beta\,(FL\text{-}POP)_{ij} + \gamma\,(E\text{-}POP)_{i} + \lambda\,(FL\text{-}PERENWELL)_{ij} + \eta\,(FL\text{-}INCOME)_{ij} + \theta\,(FL\text{-}COMMUTE)_{ij} + \delta\,(REGION)_{i} + \varepsilon_{i}$$

where *i* indicates markets, $i = 1,\cdots,50$; and *j* indicates foreign language groups, $j = 1,\cdots,19$. All variables, and the various transformations of them that we use, are defined in Table 4 below.

The primary independent variables in the empirical models are measures of the foreign and English language populations in the radio market area (*FL-POP* and *E-POP*, respectively). In general we expect that the own effect of an increase in stations that broadcast a given language will be positive with the size of that language group, but due to the preference externality effect, we expect that program availability should fall with an increase in the English language population. Comparably, the preference externality effects suggest that the percentage of the foreign language group reporting that they “speak English well” (*FL-PERENWELL*) should be inversely related to the comparable foreign language programming.

Radio market-specific demographic variables intended to correct for exogenous market-to-market variations are: median family income for the foreign language population group (*FL-INCOME*) and a measure of commuting intensity (*FL-COMMUTE*). [10] We expect positive signage for the commute variable as an indicator of radio usage. The likely effects of the income variable are difficult to predict; greater incomes attract more radio advertising, inducing more programming, but higher income may also induce consumers to substitute higher priced goods and services for free radio. Some previous studies, such as Waldfogel (2003) show a generally negative relationship. We have no prior expectations for the four regional dummies.

In the estimated models below, we apply several variations on the general model above. One variation uses logarithmic forms of the population variables as an indication of our hypothesis of decreasing effects of population sizes. We also test Robust NLS models to directly estimate the elasticities of program supply with respect to population. Finally, we test models in which the dependent variable is defined in terms of the percentage, rather than the absolute number, of all fulltime-equivalent foreign language stations in the market *(% FL-FESTATION*). Finally, we estimate comparable models for our measure of format variety (*FORMAT*) and for "*% LOCAL,"* as an indicator of programming quality.

Results

Statistical results for the variety of models are reported in Table 5-9. Since there are 19 different languages in our study, and radio usage characteristics of these groups may differ, we estimated both fixed effects and pooled ordinary least squares models. Wald's *F*-tests consistently failed to reject the hypothesis that the language-specific constant terms in the fixed effects models were different, however, so we report only the pooled OLS results. Coefficients

were generally more strongly significant in the fixed effects models, but these models otherwise differed very little.

All models exclude cases in which zero people in the Arbitron market reported speaking a foreign language. As suggested by the scatterplots below, there are also many cases in which there are zero foreign language stations. For an alternative measure of the functional form of the program supply-population size relationships, we estimated the models to exclude the zero station cases as well. Measures of R^2 fit were generally higher, in some cases much higher, for those models, but since the signage and significance of key coefficients was not qualitatively different, we do not report the zero station models here.

Overall, the demographic variables added relatively little to the models. *FL-COMMUTE* coefficient is positive and significant in several cases as expected, but insignificant in a number of other models. The *FL-INCOME* coefficient is consistently negative and significant, suggesting a domination of the time valuation effect, but the magnitudes of these variable's effects appear to be generally slight. Regional variables were generally insignificant and without pattern.

Foreign language programming availability vs. population size

Results for the number and percentages of full-time equivalent foreign language stations for all foreign languages combined are reported in Table 5. These models consistently show a significant and strongly positive relationship, as expected, between foreign language population sizes and the number or percentage of full-time equivalent foreign-language stations serving the respective groups. These models also show negative effects of English language population on program supply, confirming the expected preference externality effect, although significance of *E-POP* is marginal in the NLS estimate. To be expected, cross-effects are generally smaller than the own effects, though not for the *% FL-FESTATION* model. In the one case that it is

statistically significant (Model 1), the *FL-PERENWELL* coefficient is in the expected negative direction, also as suggested by the preference externality effect.

The linear and log-linear versions of these models are similar, but the .58 elasticity of the own-language effect in Model 3 indicates the supply of foreign language programming to increase at a decreasing rate as the foreign language population increases.

Because Spanish-language stations and populations tend to dominate our sample, separate results for the Spanish and non-Spanish language groups are of interest. Table 6 reports the Spanish language results. The own effects of Spanish language-speaking population size are consistently positive; English-language population effects are significant only in the *% FL-FESTATION* model, where they are negative as expected (Model 8).

The elasticity of own program supply with respect to size of the foreign language group is .33 in the NLS model (Model 7), again suggesting decreasing returns with regard to population size. The *FL-PERENWELL* variable, however, is insignificant in these models.

Finally, Table 7 shows comparable models for the 18 non-Spanish language groups combined. In all of these models, own language effects are again significantly positive. The elasticity of supply with regard to own population supply is again less than one (.83; Model 11), but considerably higher than in the Spanish language case (Model 7). The hypothesized negative effects of English language population size is only significant (marginally so) in the *% FL-FESTATION* model (Model 12). The *FL-PERENWELL* variable, however, is negative and significant in three of the four models, again suggesting a preference externality effect for the combined non-Spanish foreign language groups.

Format variety and population size

In these models, we measure how foreign language radio format variety changes with foreign language speaking and English language populations for full-time stations.

We expect to observe the same basic relationships as with models involving the quantity of programming reported above. Results reported in Table 8 for all languages combined and for Spanish only, generally support these expectations. (There were insufficient cases for non-Spanish language models to be estimated.) Own population effects are positive and significant in all six models, although English population effects are significantly negative only in the log-linerar model for all languages (Model 14). *FL-PERENWELL* is significant in only one case, in the expected direction (Model 13). Own elasticities of format variety with regard to foreign language populations are less than one in both NLS cases (Models 15, 18).

Program origin

Models for the percentage of news/talk programs that are locally produced on full-time foreign language radio stations indicate how program quality responds to increasing foreign language and English language populations. Results for all language groups combined and for Spanish only (the only models that could be estimated) are reported in Table 9. Only the results for Spanish language stations had statistically significant coefficients for the foreign language and English language populations and these were in the expected directions (Model 20).

Conclusion

In this study of radio stations that broadcast foreign language programming in one or more of 19 different languages within the largest 50 Arbitron Metro Radio Markets Areas in the U.S., we generally confirm conventional wisdom that these populations tend to be "underserved"—i.e., that the proportion of foreign language programming in these markets tends

to be less than the foreign language speaking group's proportion of the population, although these effects are relatively slight for Spanish speakers. In the great majority of cases, disproportionately so for the non-Spanish language cases, no foreign language radio programming is locally available.

We find consistently strong and positive statistical relationships between the size of foreign language populations and the respective amounts of foreign language radio programming that are available. Comparable non-linear model estimates consistently show that as would be expected, foreign language program availability increases at a decreasing rate with own population size. In most models, we also find consistently negative relationships between the amount of foreign language programming available and the size of the English language population, confirming the preference externality hypothesis. Further, the percentage of the foreign language population who said they speak English well was negatively related to the amount of available foreign language programming in several cases, although insignificantly in a number of other cases.

We found similar, though generally weaker results for another measure of radio programming variety: the number of foreign language formats per market—and for a measure of programming quality, the percentage of news/talk programming that is locally produced.

A shortcoming of our study is that we have not directly considered factors such as different value of foreign language speaking audience groups to advertisers to explain differences in programming availability. Overall, however, we find clear positive relationships between own population size and the availability, variety, and quality of radio programming, and in a number of other cases, negative relationships between those measures and the size of English language populations. That is, as the English language populations—and/or the English

language proficiencies of those groups—grow, opportunities for foreign language groups to enjoy programming broadcast in their native languages tend to diminish.

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Endnotes

[1]The FCC has also acted in the past in an attempt to preserve certain radio formats, such as classical music.

[2]The Bacon Directory collects information by surveying stations over the previous year, generally between February and October in the case of 2004 (private correspondence with a Bacon Directory spokesperson).

[3]We report rankings of the Arbitron markets and their consistent counties as of early 2006 in terms of their population aged 12 and over, as reported on the Arbitron website (www.arbitron.com). The Arbitron radio market ranking and definitions change very little year by year. .

[4] *RadioNewsWeb.Com: 2005-2-12.* (2001). Retrieved September 15, 2006, from http://www.radionewsweb.com/2005-02.html.

[5]Among the 320 foreign languages stations we studied, 13 were classified by the Bacon Directory as "non-commercial" (6 full-time Spanish stations, 5 part-time Spanish stations , 1 split between Italian and German and 1 carrying 11 different languages). We include these stations in our statistical analysis although their objectives are presumably less focused on market forces. First, Berry and Waldfogel (1999) showed in another study that public radio stations tend to have a significant crowding out effect, which means that their existence tend to substitute for the presence of profit-making stations that would otherwise enter the market. Second, the contributions mechanism presumably insures that viability of these stations depends on their attracting a substantial audience. In any case, exclusion of these stations (which represent less than 5% of the total foreign language station group), did not affect our findings.

[6]Pearlman, D. (2006). *Making dollars and sense of PPM*. Retrieved September 15, 2006, from www.arbitron.com/downloads/pearlman_summary.pdf.

[7]The 8 omitted language are Creole, Yiddish, Albanian, Gaelic, Welsh, Gujarati, Tamil, and Amharic. Among these, 5 had no available Census data on population size, and 6 did not have income and commute data used in our models. The number of stations in our study remained the same at 320 since all 8 of these languages were offered along with one of the other 19 languages, and thus was of evidently minor significance.

[8] In cases where the Bacon Directory indicates that a station splits its programming, e.g., "Chinese-Vietnamese," or "Spanish-English," it is assumed to be one-half equivalent station for each language, and comparably for stations splitting among 3 or more languages. We were able to find detailed information at the websites of seven such multi-language stations in our sample about the actual proportions of programming hours devoted to the different languages. These few cases varied greatly, indicating no suggested proportional allocation. We know, however, that if a given language has one full-time station and one part-time (e.g., a two way language split), for example, the correct number of full time equivalent stations is greater than one and less than two, so that 1.5 is the best estimate**.**

[9]The number of formats is zero when there is no fulltime station for a foreign language in an Arbitron market.

[10]The *FL-COMMUTE* and *FL-INCOME* variables are defined for ethnic rather than foreign language groups specifically. The commute and income data is available only for ethnic groups. Although ethnic groups are larger than their corresponding foreign language groups, the income and commute data of ethnic groups are the closest proxy we can find for those of foreign language groups.

Table 1

Basic Population and Radio Programming Data by Group Size: Top 50 Arbitron Markets

	1-5	6-10	11-15	16-20	21-25	26-30	31-35
Total population (millions)	**47.9**	**21.4**	**17.3**	**12.3**	**11.5**	**8.4**	**7.1**
% foreign language speaking population (total of 19)	32.9	15.2	20.8	14.8	15.6	15.1	20.3
% foreign language speaking population (total of 22)	33.7	15.5	22.0	15.1	15.7	15.2	20.7
% Spanish language speaking	21.1	9.6	14.7	9.1	11.5	11.6	12.5
% foreign language speaking, except Spanish (total of 18)	11.8	5.5	6.1	5.7	4.1	3.5	7.8
% foreign language speaking, except Spanish (total of 21)	12.6	5.8	7.3	5.9	4.2	3.6	8.2
Total no. radio stations	**490**	**362**	**318**	**234**	**284**	**249**	**179**
Total no. stations with foreign language programming (full and part-time)	**92**	**47**	**47**	**15**	**28**	**23**	**22**
Spanish only	70	43	46	14	25	22	20
non-Spanish (total of 18)	22	4	3	3	4	1	3
non-Spanish (total of 26)	22	5	3	3	4	1	3
Total no. full-time stations with foreign language programming	**62**	**36**	**41**	**12**	**16**	**15**	**15**
Spanish only	44	33	40	11	16	15	13
non-Spanish (total of 18)	18	3	1	1	0	0	2
non-Spanish (total of 26)	18	3	1	1	0	0	2

	36-40	41-45	46-50	Total of top 50 markets	All US	Top 50 markets as a % of total US
Total population (millions)	**7.2**	**5.6**	**6.4**	**145.2**	**262.4**	**55.3 %**
% foreign language speaking population (total of 19)	12.5	12.7	10.2	21.5	15.7	75.6
% foreign language speaking population (total of 22)	13.0	13.5	10.4	22.1	16.1	76.0
% Spanish language speaking	5.8	9.6	5.4	14.0	10.7	72.4
% foreign language speaking, except Spanish (total of 18)	6.7	3.2	4.8	7.5	5.0	82.4
% foreign language speaking, except Spanish (total of 21)	7.3	3.9	5.0	8.1	5.4	83.2
Total no. radio stations	**154**	**212**	**205**	**2687**	**12278**	**22**
Total no. stations with foreign language programming (full and part-time)	**11**	**23**	**12**	**320**	—	—
Spanish only	8	22	11	281	—	—
non-Spanish (total of 18)	4	1	1	44	—	—
non-Spanish (total of 26)	4	1	1	45	—	—
Total no. full-time stations with foreign language programming	**6**	**14**	**11**	**227**	—	—
Spanish only	4	13	11	200	—	—
non-Spanish (total of 18)	2	1	0	27	—	—
non-Spanish (total of 26)	2	1	0	27	—	—

Note. Among the 27 foreign language groups, 22 have their population sizes available and 19 have population sizes, commute and income data available. We base our regression analysis on the 19 foreign language groups.

Table 2

Basic Population and Programming Data by Language Group for the Top 50 Arbitron Radio Markets: (19 Foreign Languages

Foreign languages	No. markets with any foreign language service	No. markets with at least one full-time station	Total % population within the top 50 markets
Spanish	39	36	14.01 %
Chinese	7	2	1.33
Tagalog	1	0	.74
French	3	2	.66
Vietnamese	6	4	.63
Italian	6	0	.61
Korean	3	3	.53
German	2	0	.51
Russian	1	1	.44
Polish	5	4	.39
Portuguese	4	1	.36
Greek	4	0	.22
Persian	1	0	.21
Hindi	1	0	.21
Urdu	1	0	.17
Armenian	1	0	.14
Slovene	1	0	.13
Hebrew	1	0	.13
Hungarian	1	0	.07
Total	**44**	**37**	**21.50**

Table 3

Level of Service Measures for the Top 50 Arbitron Radio Markets: 19 Foreign Languages

Foreign languages	No. markets with some speaker of the language	% markets with some speakers that have foreign language service	% markets having some service in which % fulltime-equivalent foreign language stations is LESS THAN % foreign language population
Spanish	50	78.00%	59.0%
Chinese	50	14.00	42.9
Tagalog	50	2.00	100.0
French	50	6.00	33.3
Vietnamese	50	12.00	66.7
Italian	50	12.00	66.7
Korean	50	6.00	0
German	50	4.00	50.0
Russian	50	2.00	0
Polish	50	10.00	40.0
Portuguese	50	8.00	75.0
Greek	50	8.00	50.0
Persian	50	2.00	100.0
Hindi	50	2.00	0
Urdu	50	2.00	0
Armenian	50	2.00	0
Slovene	49	2.04	0
Hebrew	50	2.00	0
Hungarian	50	2.00	0

Table 4

Definitions of Variables

Variables	Definitions
$FL\text{-}FESTATION_{ij}$	No. full-time equivalent radio stations that are broadcasting in foreign language *j* in market *i* in 2004
$\%\ FL\text{-}FESTATION_{ij}$	% full-time equivalent radio stations broadcasting in foreign language *j* in the overall stations in market *i* in 2004 (multiplied by 100)
$FORMAT_{ij}$	No. formats for full-time stations broadcasting a foreign language *j* in market *i* in 2004
$\%\ LOCAL_{ij}$	% News/Talk that are locally produced for full-time stations broadcasting a foreign language *j* in market *i* in 2004 (multiplied by 100)
$FL\text{-}POP_{ij}$	Population five years and above that speak foreign language *j* at home in market *i* in 2000 (in millions)
$LN\ FL\text{-}POP_{ij}$	Natural logarithm of population five years and above that speak foreign language *j* at home in market *i* in 2000
$FL\text{-}PERENWELL_{ij}$	% population speaking a foreign language *j* at home who are able to speak English well in market *i* in 2004 (multiplied by 100)
$E\text{-}POP_i$	Population five years and above that speak English at home in market *i* in 2000 (in millions)
$LN\ E\text{-}POP_i$	Natural logarithm of population five years and above that speak English at home in market *i* in 2000
$FL\text{-}INCOME_{ij}$	Median household income for each ethnic group *j* in market *i* in 1999. Since the data is unavailable for foreign language groups, we used the data for ethnic groups corresponding to each foreign language as proxy (in thousands)
$FL\text{-}COMMUTE_{ij}$	For each ethnic group *j*, % people in workers 16 years and above who drive alone or carpool to go to work in market *i* * average commute time in minutes in market *i* in 2000. Since the data is unavailable for foreign language groups, we used the data for ethnic groups corresponding to each foreign language as proxy
$NORTHEAST_i$	$Northeast_i$ = 1 if market *i* is in Northeastern region $Northeast_i$ = 0 otherwise
$MIDWEST_i$	$Midwest_i$ = 1 if market *i* is in Midwestern region $Midwest_i$ = 0 otherwise
$SOUTH_i$	$South_i$ = 1 if market *i* is in Southern region $South_i$ = 0 otherwise

Table 5

No. & % Full Time Equivalent Stations Models for All 19 Foreign Languages (Robust OLS & Robust NLS)

Independent variables		***FL-FESTATION***			***% FL-FESTATION***
		Robust OLS		**Robust NLS**	**Robust OLS**
		Model 1	Model 2	Model 3	Model 4
		Coefficient *t-value*	Coefficient *t-value*	Coefficient *t-value*	Coefficient *t-value*
FL-POP	B_0	6.007*** *4.29*		9.405*** *9.91*	
	B_1*(power)*			.579*** *8.72*	
E-POP	B_2	-.041* *1.85*		-.124 *1.62*	
	B_3*(power)*			1.024*** *4.24*	
LN FL-POP			.553*** *6.24*		.962*** *6.79*
LN E-POP			-.292*** *3.20*		-.974*** *5.09*
FL-INCOME		-.017*** *4.94*	-.017*** *4.59*	-.006*** *3.05*	-.026*** *4.15*
FL-COMMUTE		.040*** *2.70*	-.004 *.30*	-.002 *.24*	.005 *.26*
FL-PERENWELL		-.002** *2.52*	.002 *1.11*	.001 *1.48*	.003 *1.39*
NORTHEAST		-.062 *.58*	-.230* *1.68*	-.005 *.05*	-.345 *1.63*
MIDWEST		-.033 *.41*	.045 *.36*	.176*** *2.72*	.122 *0.63*
SOUTH		.031 *.28*	.190 *1.24*	.229*** *2.70*	.225 *.92*
Constant		.371 *1.49*	.702 *.66*		7.447*** *3.89*
No. obs		820	820	820	820

F	9.59	6.49		7.75
R^2	.591	.305	.750	.328
Adjusted R^2			.747	
Root MSE	1.074	1.400	.857	2.230
Res. Dev			2063.15	

* $p < .1$. ** $p < .05$. *** $p < .01$.

Table 6

No. & % Full Time Equivalent Stations Models* for *Spanish Language Only

(Robust OLS & Robust NLS)

		FL-FESTATION			***% FL-FESTATION***
		Robust OLS		**Robust NLS**	**Robust OLS**
Independent variables		Model 5	Model 6	Model 7	Model 8
		Coefficient *t-value*	Coefficient *t-value*	Coefficient *t-value*	Coefficient *t-value*
FL-POP	B_0	4.196*** *2.77*		16.593*** *5.26*	
	B_1*(power)*			.325*** *3.60*	
E-POP	B_2	-.053 *.14*		-.004 *.16*	
	B_3*(power)*			2.751 *1.27*	
LN FL-POP			2.950*** *5.64*		5.376*** *5.33*
LN E-POP			.511 *.58*		-4.610*** *2.82*
FL-INCOME		-.188** *2.64*	-.200*** *3.81*	-.157*** *3.16*	-.270*** *2.94*
FL-COMMUTE		.648*** *2.77*	.396** *2.07*	.094 *.71*	.406 *1.28*
FL-PERENWELL		.011 *.30*	.007 *.17*	-.027 *.82*	.078 *.96*
NORTHEAST		-2.707** *2.27*	-2.160** *2.31*	-1.263 *1.29*	-3.843* *1.99*
MIDWEST		-2.562** *2.56*	-.501 *.48*	-.276 *.29*	-.397 *.19*
SOUTH		-1.150 *1.19*	.296 *.35*	.900 *1.06*	.168 *.11*
Constant		-3.520 *.65*	-39.674*** *4.11*		7.434 *.55*
No. obs		50	50	50	50

F	10.94	23.38		13.55
R^2	.662	.809	.923	.749
Root MSE	3.126	2.347	2.112	4.055
Adjusted R^2			.904	
Res. Dev			205.492	

* $p < .1$. ** $p < .05$. *** $p < .01$

Table 7

No. & % Full Time Equivalent Stations Models* for *18 Non-Spanish Foreign Languages Only* (*Robust OLS & Robust NLS)

		FL-FESTATION			***% FL-FESTATION***
		Robust OLS		**Robust NLS**	**Robust OLS**
Independent variables		Model 9	Model 10	Model 11	Model 12
		Coefficient *t-value*	Coefficient *t-value*	Coefficient *t-value*	Coefficient *t-value*
FL-POP	B_0	4.460*** *3.65*		3.684** *2.31*	
	B_1*(power)*			.834*** *4.46*	
E-POP	B_2	-.007 *.62*		-.046 *.85*	
	B_3*(power)*			.517 *.98*	
LN FL-POP			.058*** *4.23*		.128*** *2.84*
LN E-POP			.021 *.61*		-.172* *1.73*
FL-INCOME		-.001* *1.66*	-.001 *1.22*	-0.001 *1.48*	.001 *.22*
FL-COMMUTE		.004 *1.47*	.001 *.21*	0.004* *1.86*	.012 *1.6*
FL-PERENWELL		-.001** *2.14*	-.001** *2.59*	-0.0004** *2.01*	-.001 *1.11*
NORTHEAST		.032 *1.09*	.023 *.59*	0.031 *1.01*	.070 *.71*
MIDWEST		.038 *1.51*	.010 *.35*	0.050** *2.02*	.033 *.73*
SOUTH		.008 *.43*	-.001 *.04*	0.014 *0.8*	-.061 *1.08*
Constant		.0004 *.01*	-*.652* *1.49*		1.258 *1.21*
No. obs		770	770	770	770

F	3.53	2.84		2.78
***R*^{2}**	.313	.123	.340	.082
Root MSE	.238	.270	.238	.632
***Adjusted R*^{2}**			.331	
Res. Dev			-38.990	

* $p < .1$. ** $p < .05$. *** $p < .01$

Table 8

Format Variety Models for All 19 Foreign Languages & Spanish Only (Robust OLS & Robust NLS)

		FORMAT					
		All Foreign Languages			**Spanish**		
Independent variables		**Robust OLS**		**Robust NLS**	**Robust OLS**		**Robust NLS**
		Model 13	Model 14	Model 15	Model 16	Model 17	Model 18
		Coefficient *t-value*	Coefficient *t-value*	Coefficient *t-value*	Coefficient *t-value*	Coefficient *t-value*	Coefficient *t-value*
FL-POP	B_0	2.605*** *4.21*		4.094*** *8.98*	2.108** *2.58*		6.539*** *4.46*
	B_1*(power)*			.573*** *8.25*			.390*** *3.60*
E-POP	B_2	-.015 *1.16*		-.091 *1.63*	-.154 *.91*		-.136 *0.57*
	B_3*(power)*			.826*** *3.40*			1.289** *2.46*
LN FL-POP			.245*** *6.06*			1.327*** *4.23*	
LN E-POP			-.133*** *2.80*			-.252 *.57*	
FL-INCOME		-.008*** *4.88*	-.008*** *4.49*	-.003*** *2.96*	-.101*** *3.84*	-.109*** *4.62*	-.090*** *4.44*
FL-COMMUTE		.017** *2.52*	-.002 *.36*	.002 *.66*	.286** *2.62*	.205** *2.19*	.110* *1.83*
FL-PERENWELL		-.001*** *2.92*	.0005 *.74*	.0004 *1.13*	.01 *.63*	.012 *.57*	-.0001 *.01*
NORTHEAST		-.034 *.65*	-.102 *1.59*	-.015 *.33*	-1.277* *1.97*	-1.139* *2.00*	-.753 *1.33*
MIDWEST		-.046 *1.11*	-.007 *.12*	.056* *1.69*	-1.178* *1.93*	-.329 *.45*	-.242 *.39*
SOUTH		-.012 *.23*	.058 *.85*	.073** *1.97*	-.970* *1.99*	-.513 *1.05*	-.275 *.57*
Constant		.208 *1.61*	.406 *.77*		-.798 *.30*	-10.982** *2.66*	
No. obs		820	820	820	50	50	50
F		9.1	6.32		8.18	13.29	
R^2		.561	.299	.711	.673	.738	.894

Root MSE	.498	.630	.413	1.371	1.229	1.084
Adjusted R^2			.708			.868
Res. Dev			866.120			138.842

$^{*}p < .1$. $^{**}p < .05$. $^{***}p < .01$.

Table 9

% Local News/Talk Models* for *All 19 Foreign Languages and Spanish Only (Robust OLS)

	% LOCAL	
Independent variables	**All Foreign Languages** Model 19	**Spanish** Model 20
	Coefficient	Coefficient
	t-value	*t-value*
LN FL-POP	.658	12.113***
	.23	*3.85*
LN E-POP	-3.101	-17.792***
	.76	*3.73*
FL-INCOME	.035	.326
	.09	*1.08*
FL-COMMUTE	1.720	-2.509
	.97	*1.57*
FL-PERENWELL	-.139	-.488
	.41	*1.34*
NORTHEAST	6.803	6.779
	.60	*.51*
MIDWEST	14.953**	35.024***
	2.16	*4.74*
SOUTH	-1.661	9.129
	.22	*1.37*
Constant	87.542	252.229***
	1.80	*4.76*
No. obs	45	34
F	2.50	9.93
R^2	.141	.391
Root MSE	16.422	13.993

* $p < .1$. ** $p < .05$. *** $p < .01$.

Figure Caption

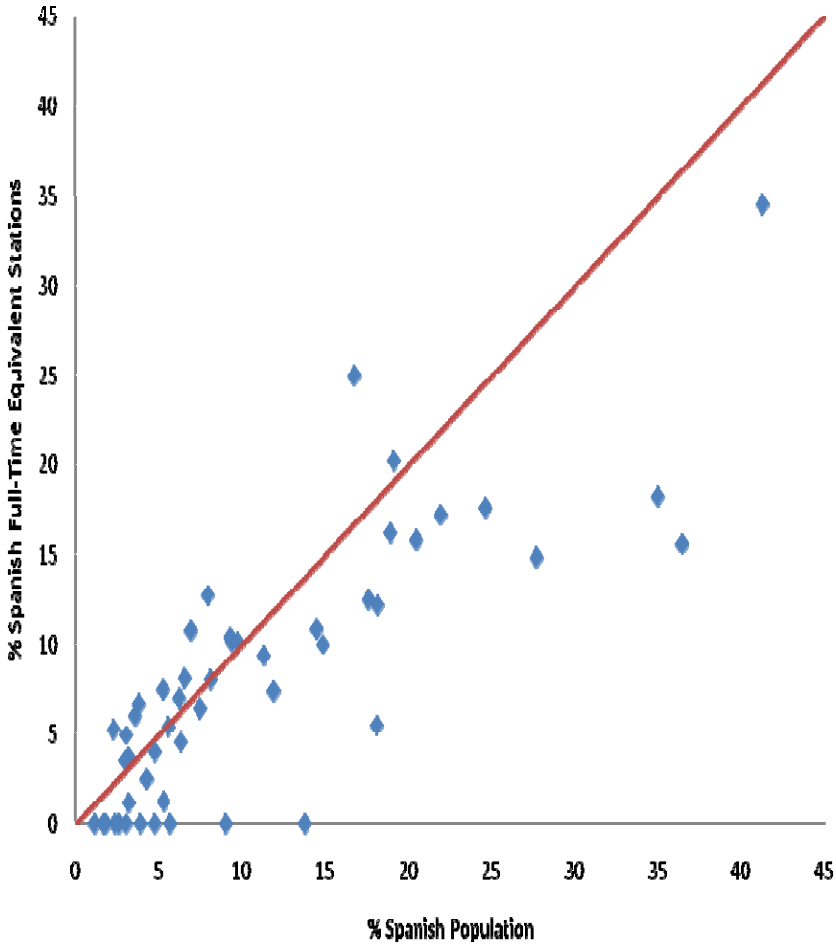
Figure 1. % Spanish stations vs. % Spanish population for full-time equivalent stations in the top 50 markets.

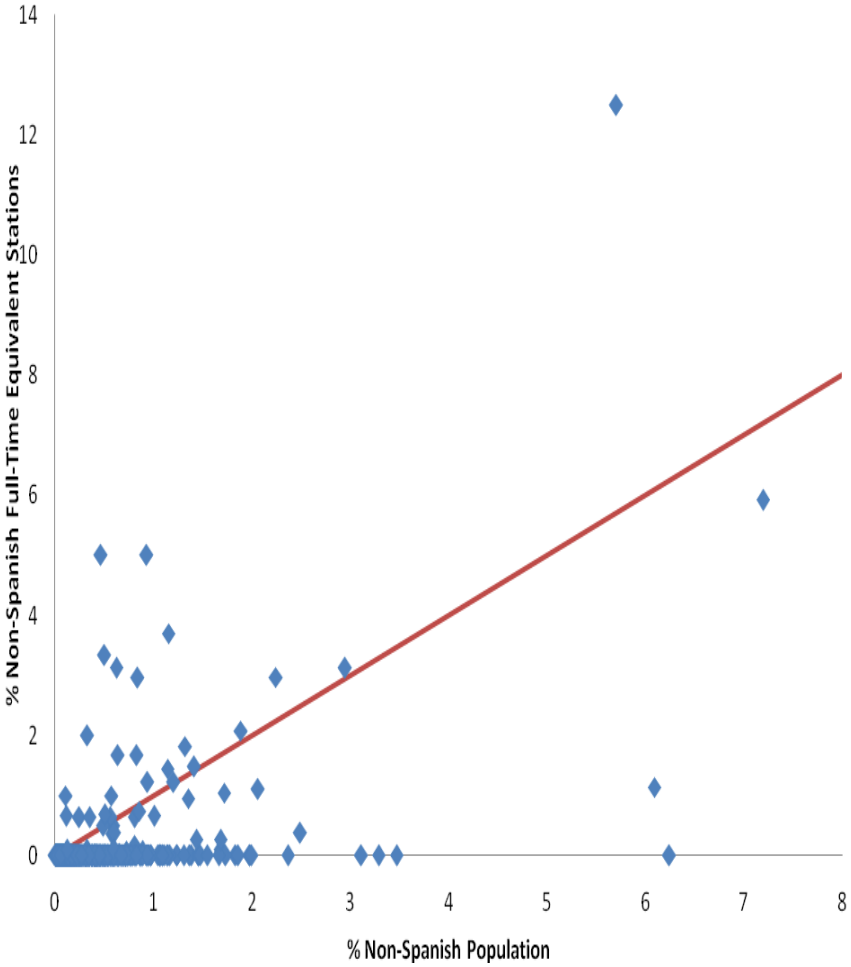
Figure 2. % Non-Spanish stations vs. % non-Spanish population for full-time equivalent stations in the top 50 markets (18 non-Spanish foreign languges).

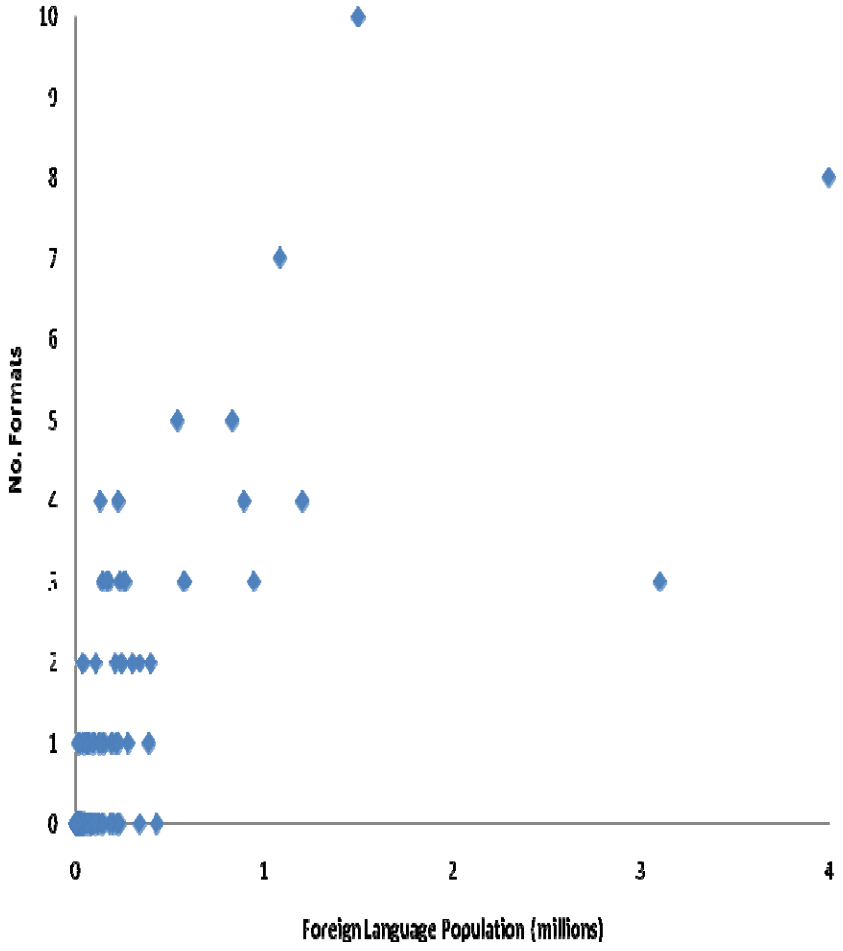
Figure 3. No. formats vs foreign language population (millions) for full-time stations in the top 50 markets (19 foreign languages).

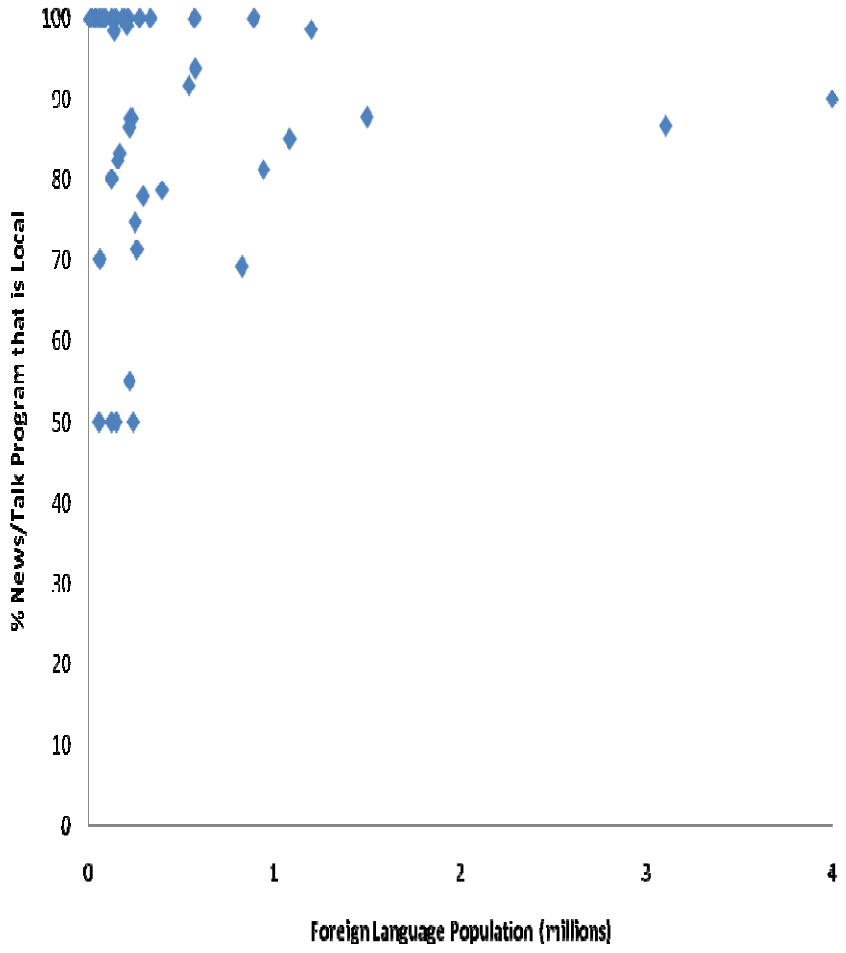
Figure 4. % News/talk program that is local vs foreign language population (millions) for full-time stations in the top 50 markets (6 foreign languages[1]).

[1] Among the 27 foreign language groups, 6 have data available on the percentage of their News/Talk programming that is local. They include Spanish, Russian, Polish, Chinese, Korean, and Vietnamese.


% Spanish Full-Time Equivalent Stations
% Spanish Population
0
5
10
15
20
25
30
35
40
45


% Non-Spanish Full-Time Equivalent Stations
14
12
10
8
6
4
2
0
0
1
2
3
4
5
6
7
8
% Non-Spanish Population


10
9
8
7
6
5
4
3
2
1
0
No. Formats
0
1
2
3
4
Foreign Language Population (millions)


100
90
80
70
60
50
40
30
20
10
0
% News/Talk Program that is Local
0
1
2
3
4
Foreign Language Population (millions)