

**Changing Markets, New Technology, and Violent Content: An
Economic Study of Motion Picture Genre Trends**

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Abstract

We find that “violence-prone” movie genres (such as “action,” “adventure,” “science fiction” and “horror”) have markedly increased in prevalence among the top 20 U.S. box office movies over the 1967-2004 period, while “benign” genres (such as “drama” and “musicals”) have markedly declined. Using movie industry databases, we find some tendency for the increasingly prevalent genres to be “foreign-friendly,” (ie, to earn a relatively high proportion of total revenues from foreign markets), but we find no statistical relationship between the genre trends and changes over time in the aggregate proportion of U.S. studio revenues coming from foreign markets. We find a somewhat stronger tendency for rising genres to be “technology-friendly,” (ie, to make relatively intensive use of special effects and related production technologies) and for falling genres to be non-technology intensive. Overall, our results suggest that while both the influence of foreign markets and the advance of technology have credibility as explanations for movie genre trends, the weight of evidence favors the latter. We interpret the weight of evidence to support the theory that Hollywood has shifted its production resources toward more violent-prone genres because advances in production technology have made those movies relatively more attractive to audiences and/or more cost effective to produce.

I. Introduction

Violent media content has received much attention from politicians, regulators and researchers. Extensive academic and other research about media violence has revolved around controversies about parental controls, rating systems, and industry self-regulation.

The largest volume of research has involved television, and most recently, video games. A number of content studies have measured the amount of violence on broadcast and cable television (Gerbner, 1972; Signorielli, 1990; Potter, et al., 1995; Seawall, 1997, 1998). Others have addressed the effectiveness of ratings or self-regulation systems for television programs and video games (Bushman & Cantor, 2003; Cantor, Harrison & Krcmar, 1998; Kunkel et al., 2002). Hamilton (1998) presented a book length empirical study of television violence and its economic causes.

The content of theatrical motion pictures has also received public and academic attention. Longstanding political debates about excessive sex and violence in movies culminated most recently in the presidential campaigns of 1996 and 2000, and in Congressional Hearings (U.S. Congress, 2004). There has been a history of academic and other studies of the motion picture ratings system and its effects on film choice and film content (Austin, Nicolich & Simonet, 1981/1982; Oliver & Kalyanaraman, 2002; Thompson & Yokota, 2004; Wilson & Linz, 1990; Yang & Linz, 1990; Yokota & Thompson, 2000). As a prominent ingredient of television programming, theatrical movies have also received incidental coverage in content studies of television violence. Otherwise, however, movie content has had less empirical attention than television programs, and trends over time in film content have not to our knowledge been studied systematically.¹ Certainly, movies have important social influence. Feature films not only account for about nine hours of average household television viewing per week (*TV Dimensions*, 2003, p. 184), but are viewed by many millions of (mostly young) people worldwide on a variety of different media, including theaters and video.

¹ The film studies literature contains a number of works on trends in movie genres, but these are generally not statistically oriented and we do not attempt to reference them here. There have also been numerous studies of trends in television programs by type (or genre), but these have mainly concerned measures of program diversity and not focused on the program types themselves. See in particular, De Jong & Bates, 1991; Dominick & Pearce, 1976; Einstein, 2002; Grant, 1994; Lin, 1995; Wakshlag & Adams, 1985.).

In this paper, we offer an historically-based analysis of theatrical feature film content, relying primarily on secondary analysis of movie genres. We first investigate popular claims that Hollywood's movies are becoming more violent over time. To do so, we document genre trends in the top 20 box office performing movies over a 38 year period, from 1967 to 2004, to see if "violence-prone" genres (like "action," or "horror," or "science fiction") have become more prevalent over time, relative to presumably less violent genres (like "drama," "romance," or "musical").

After confirming that trends toward apparently violence-prone movie types among major films have in fact occurred over time, we proceed to investigate two main explanations for those trends. One popular explanation involves the "globalization" of Hollywood (eg, Hirschberg, 2004). Can the shift in genres be related to an increased reliance on foreign markets, for which action-oriented genres are widely perceived to be effective common denominators? The other explanation we investigate is that trends in movie content result from development over time of special effects or other production technologies that favor the cost or the audience attractiveness of some movie types (such as science fiction, for example), over others. To evaluate these alternative explanations, we employ industry databases to determine which movie genres are in fact "foreign-friendly" in terms of their historical worldwide box office performance, and which are "technology-friendly" in terms of how intensively they use special effects or other relevant technologies. Having identified such genres, we then relate them to trends over time in genre prevalence and in the proportion of revenues that distributors receive from foreign markets.

Our aims in this paper are modest. The results we report are the preliminary phase of a broader ongoing study of violent movie content. The data sets we employ in this paper require further development, and our analysis is not comprehensive. Among parts of our study still to be completed is an analysis of which genres are "home video-friendly" and how a major shift of movie distributor reliance on video markets since the 1980s may have affected movie content.

We begin in Section II below with our analysis of genre trends, followed by the study of foreign market influence and the effects of technology in Section III. We offer concluding comments in Section IV.

II. Trends over time in movie genres

Using *Variety* lists and other industry sources, we measured trends in the prevalence of 16 movie genre labels among the top 20 U.S. box-office performing movies from 1967-2004. While inclusion of earlier years would be desirable, we deemed annual industry box office data before 1967 to be too unreliable for this purpose. The top 20 movies are a small fraction of the 400 to 600 theatrical features typically released each year in the United States since the 1970s, or even of the 150-200 films typically released by Motion Picture Association of America (MPAA) member studios, which generally earn 80-90% or more of total U.S. box office revenues (Litman, 1998). The top 20 movies, however, earned an average of 45.1% of total US box office revenues from 1988-2002 (with no apparent trend over that period). These top films are also Hollywood's main entries in the world film market, and they account for the bulk of public and critical interest. For genre information, we relied on the *imdb.com* Internet database. See Appendix A for methodological details of the genre trend analysis.

Table 1 summarizes the overall results of the time trend analysis for our 760 film database (38 years x 20 movies). The first column indicates the total number of times each of the 16 genre labels used by *imdb.com* appeared in the top 20 lists. The *imdb.com* database makes use of 19 different genre labels, which are frequently assigned in multiple combinations to individual films (eg, "action/adventure/romance"). The three *imdb* labels we omitted were "documentary," which appeared only six times in our top 20 lists, and "film noir" and "short," which did not appear at all. As the first column indicates, there is a wide dispersion in the number of times each genre or genre index appears in the database.

Also indicated in the lower rows of Table 1 are two alternative combinations of genres that we arbitrarily label as "violence-prone," and two combinations labeled as "benign." Specific definitions of these indexes are shown in Table 2. All four of these indexes are defined to include all movies that have *at least one* of the labels in the relevant group assigned to it. As the labels indicate, the first violence-prone index is intended to have a wide scope, while the "narrow" version excludes four genres ("animation," "crime," "fantasy," and "western") that we expect to be more on the

margins of violence-prone. The broad and narrow versions of the “benign” labels are included for contrast, made up of genres that we identified *a priori* as non-violence prone.

Other columns of Table 1 show 5 year averages for the % of the movies in each year’s Top 20 list to which each label/index was assigned. Indicated by these data are a number of apparent trends. Figure 1 illustrates five year average trends (3 years for the ending 2002-04 period) for the five most frequently appearing genres in the database, which together accounted for 60.9% of all genre label appearances, and all of which showed significant change. As indicated, appearances of “action,” “adventure,” “thriller,” and “comedy” all increased, from 16% to 48%, 14% to 42%, 10% to 35%, and 35% to 45% respectively. “Drama,” the most prevalent of these five genres in the 1967-71 period (appearing in 50% of cases), became the least prevalent of the five in 2002-2004 (appearing in 27% of movies). Also showing a rapid rise in Figure 1 is the broadly defined “violence-prone” index, which applied to 55% of the 1967-71 movies, and to 80% of the 2002-04 top movies.

To evaluate trends statistically, we estimated a separate simple time trend model for each of the 20 genres/index labels in the study:

$$(1) Y_i = a + bt_i + e_i,$$

where the Y are genre labels, t indicates years, 1, 2, ...38, and e_i is an error term.

Table 3 shows resulting coefficients and their statistical significance for the 20 regressions. Ten of the 16 individual labels showed a significant increase over time. “Action,” followed by “thriller” and “adventure,” led the individual increases, while only three labels, “drama,” “musical,” and “western,” declined significantly. Observe, however, that some of the labels that showed statistically significant changes, notably “war” (31 cases) and “western” (32 cases), appeared relatively infrequently in the database and are thus of relatively minor overall importance to the historical changes.

Large and significant rates of increase were also shown by both “violence-prone” indexes. The broadly defined “benign” index, by contrast, showed no change, while the narrowly defined benign index significantly declined.

The above results involving time trends in genre prevalence since the 1960s may be misleading in an important respect. As the last row of Table 1 shows, the average number of genres assigned per movie by *imdb.com* increases steadily and substantially over the period from 2.1 in 1967-01 to 3.3 in 2002-04. Because methodological details about *imdb.com*'s genre coding process were not available, we could not be certain whether increases over time in the percentage of movies to which a particular genre was assigned occurred because of some change in the methodology of assigning genres or for a substantive reason. An interesting interpretation related to this study emerges from these data: namely, that Hollywood movies have in fact become more “homogenized” over time, or that they have more common denominator elements in them, thus requiring a larger number of genre labels.²

As an alternative measure of trends in genre prevalence, we deflated time trends in all the individual genre labels by the average number of genres recorded per movie in each year. Regression results for the deflated genres also appear in Table 3. Only ten of the 16 individual labels (compared to 13 in the undeflated case) showed significant changes. In summary, “action” “fantasy,” “thriller,” “adventure” and “animation” all show significant increase, while “drama,” “musical,” and “western,” along with “crime” and “war” (at the weaker 10% level) all decreased significantly. For perspective, recall from Table 1 that one of the genres that significantly increased (“animation”), and three of those that significantly declined (“musical,” “western,” and “war”), applied to less than 10% of the 760 movies over the full period, and were thus of relatively minor overall influence in the long term trends in movie content. Finally, it is unclear how the violence-prone or benign indices should be deflated over time, so a genre-deflated regression analysis was not conducted. Recall that the indices are defined to apply to all movies for which any one of several genre labels is used. Since the statistical probability that a given movie has any one particular genre label increased over time, any “genre inflation” effect will thus be magnified for the undeflated index measures shown in Table 1.

² Compare, for example, the six genres for *Shrek2* (adventure/family/animation/comedy/fantasy/sci-fi) and the six for *The Incredibles* (animation/family/adventure/action/comedy/sci-fi) in 2004 with the single labels assigned to *Valley of the Dolls* (drama) and *The Odd Couple* (comedy), in 1968. While the increase over the whole study period in average genres per movie is only about 50%, examples such as these tempt the conclusion that the 1960s were simpler days of better defined movie content.

In summary, this segment of our analysis suggests that there have been marked increases in several movie genres that seem conducive to violence, but marked declines in some others, such as “musical” and “drama,” that seem less conducive to violence. Trends in the *a priori* defined violence-prone and benign genre groupings support this conclusion. According to these indices, there has been a marked and steady rise since the late 1960s in the proportion of top films that have violence-prone movie elements, while there has been no increase, or a slight decline, in top movies having at least some non-violence-prone elements. Thus, while there are exceptions to the tendency, a turn toward violence-prone genres in major films does appear to be a dominant trend.

III. Explanations

We consider in this section two alternative explanations for genre trends in top performing U.S. movies, again with a focus on genres that may be related to violent content: the changing importance of foreign markets for U.S. movies, and the development of special effects and related technologies.

A. The influence of foreign markets

Our first step is to determine which movie genres are in fact what we call “foreign-friendly,” or that “travel well” across international borders. For this purpose, we make use of a database compiled from annual lists of the top 50 box office movies in the U.S. for the years 1993-2002. Our top 50 lists exclude reissues and foreign films, resulting in a total sample of 487 films, which we then coded according to the 19 genre labels applied by *imdb.com*. A genre is “foreign friendly” if the movies to which it is assigned have above average revenue proportions from foreign (non-U.S.) markets. Ideally, we would make a determination of foreign-friendly genres using data for the entire 1967-04 period, but systematic data for both domestic and foreign box office receipts were unavailable before 1993. During the 1993-2002 period, however, the average foreign revenue/total revenue ratio remained roughly constant. See Appendix B for methodological details.

The second column of Table 4 shows basic descriptive results: the mean foreign revenue % of the movies to which each genre or index is assigned, with indications of

whether the individual genre mean is significantly different from the overall mean. These results seem to largely confirm popular notions that well-traveling genres tend to be action-oriented. “Action,” “adventure,” “sci-fi” and “thriller” show significantly higher than average foreign revenue proportions, as do both violence-prone index measures. Musicals, in spite of low representation in the 1993-02 sample, also had foreign revenues significantly above the mean percentage. “Comedy,” the most frequently appearing genre label in the full set of Top 20 lists, was the only category indicating lower than average foreign proportions--thus fulfilling its general reputation as a movie type that does not translate well across cultures. Note from Table 4, however, that the average differences from the 43.9% mean foreign revenue proportion are generally minor. Neither the broadly or the narrowly defined “benign” indexes were significantly different from the sample mean.

Relying only upon these descriptive data to identify “foreign-friendly” genres is problematical because more than one genre is typically applied to each movie. A skew in the pairing of genres can thus lead to bias. Say, for example that genre “A” is a true driver of disproportionately high foreign revenues, while genre “B” is truly neutral. If B happens to be paired with A relatively frequently, however, the descriptive data will indicate a misleadingly high level of foreign-friendliness for the B genre, due just to the influence of A.

In an attempt to measure true marginal effects of each genre label, we regressed the ratio of foreign to total box office revenues on the 16 different genre labels, where each genre was represented by a dummy variable (1 or 0), depending on whether the label applied, for the full sample of 487 movies. We tested the results for multi-collinearity and heteroscedasticity, but found no such problems in the dataset.

The regression results are shown in the last column of Table 4. The pattern of coefficient signage and significance generally reflects the descriptive data, with one notable exception. “Romance” is strongly significant in the regression, having a positive marginal effect on the foreign percentage of approximately 4.9, while “romance” shows no difference from the mean in the descriptive data. This divergence arises from the frequent pairing of “romance” with “comedy,” which occurs in 62 of the 99 “romance” label cases. While the descriptive data show that “romance” has an average foreign

revenue percent of 44.3%, romances without the comedy pairing (including such movies as *Indecent Proposal*, *Legends of the Fall* and *Titanic*) have a 51.6% average foreign percentage, compared to the overall mean of 43.9%.³ The regression results are necessarily imperfect, since marginal effects may be nonlinear and the individual labels are not truly independent, but they provide a useful alternative to the descriptive data.

A comparison of these descriptive and regression results with the genre time trends above suggests a tendency for the genres that increased in prevalence over time to also be foreign friendly. Of the five “inflation-correction” (deflated) genres that showed a significant increase over time (the last column of Table 3), three of them (“action,” “thriller” and “adventure”) were identified as foreign-friendly and this correspondence held in two cases (“action” and “thriller”) for the regression results. Results for the less prevalent “musical” genre, however, were contrary. Musicals fell in importance over time, but earned an above-average proportion of foreign revenues in our 1993-2002 sample. None of the five declining genres were identified to be significantly foreign-friendly or otherwise. Recall also, however, that both indexes of violence-prone movies rose over time and earned somewhat higher than average proportion of revenues from foreign markets.

To further investigate the influence of foreign markets on genre prevalence, we measured the extent to which the genre trends corresponded with aggregate trends in the proportion of Hollywood’s revenues coming from foreign markets. As a first step, we sought to determine how the proportion of studio revenues from the sale of theatrical features coming from foreign markets had changed over the study interval. Figure 2 indicates the change over time using two such measures. The first measure is a “best estimate” of total foreign revenues from all media to all U.S. studios (major and independent) as a fraction of total domestic plus foreign revenues from the distribution of theatrical films. These estimates are based on annual reports by Kagan Research, supplemented by the authors’ estimates for earlier years. As an alternative measure, we use the annual ratio of foreign to total MPAA member theatrical rentals from distribution

³One might argue that the parsing of such marginal effects of individual ignores the subtleties of genre pairings, implying, for example, that romantic comedy should be considered a separate genre. Those who assign the genre labels, however, use single genres as the building blocks.

of movies to theaters, as reported by Vogel (2001). See Appendix B for methodological details.

As indicated in Figure 2, the general trends in these two measures are similar. The remarkable feature of the trends is that while there has been substantial growth in the foreign-to total ratio since about 1980, the foreign revenue share generally declined from the late 1960s until then, and was at least as high in some earlier years than in the 1990s or early 2000s. Thus, the “globalization” of Hollywood is hardly a new phenomenon.

As a final step, we conducted a series of single variable time series regressions to test for significant relationships between the aggregate foreign share ratio and the trends in genre prevalence, where the latter is defined to be the % of movies among the top 20 lists that the genre label is assigned to. The four columns of Table 5 show alternative estimates using the undeflated (original) and deflated genre labels, based on the “Best Estimate” and “MPAA theater only” series.⁷ A weakly negative relationship in two of the regressions for “comedy” corresponds to the foreign unfriendliness of that genre. In general, though, significance of the coefficients in the individual genre regressions is very weak and sporadic and appears to show no meaningful relationship with foreign friendliness of the various genres.

B. The Effects of Technology

Since the industry’s beginnings, there have been dramatic strides in the technology of producing theatrical features. Compare, for example, the paper puppets of the *Wizard of Oz* in 1939 to the battle scenes of *The Lord of the Rings: Return of the King* (2003). It is reasonable to expect that these advances in technology have differently affected the economic viability of the various movie genres. One might imagine that “action,” “fantasy,” and “science fiction,” for example, would be much more affected by special effects technology than would be “drama” or “romance.”

Waterman (2004) shows that technological advance in the production of information products, like movies, can affect demand and production decisions in two ways. One is that technology can be “quality enhancing,” making “technology-friendly” genres like “action” or “science fiction” relatively more attractive to audiences, inducing studios to shift production resources to those genres, resulting in relatively higher

revenues from them. A second factor is that technology can reduce production costs, such as the expense to hire thousands of extras for large crowds or battle scenes. These uses can be seen as “cost reducing” since their purpose is basically just to substitute for more expensive live action. While the end result of such factor cost reductions can ironically be an increase in total production costs as producers increase their use of the cheaper technologies, the cost reduction factor may also result in a relative shift of production resources to technology-friendly genres. We might therefore expect genres which have most benefited from special effects and related technology to be those that grow most in economic importance.

To identify technology-friendly movie genres, we relied upon end credits information for the Top 20 movies over the 1993-2004 period, yielding a total sample of 240 films. For each movie, we calculated the percentage of total end credits that were accounted for by three groups: special effects and visual effects personnel, stunt artists, and sound technicians (TECHP-Broad). As an alternative measure, we calculated the proportion of total credits that were accounted for only by special effects and visual effects (TECHP-narrow). We then related these measures of technology intensiveness to the genre label information from *www.imdb.com*. See Appendix C for a complete description of our methodology.

Table 6 displays summary analysis for the 16 subject genres and the four indexes. The second and third columns of Table 6 show basic descriptive data by genre for variations around the sample mean of the two basic technology-friendly measures we employed. Although the broad measure (TECHP-Broad) had nearly twice the mean as the narrow measure (TECHP-Narrow), the pattern of results for the two measures is very similar. Technology-intensive credit counts for “action,” “adventure,” “family,” “fantasy,” and “sci-fi” are significantly above the mean by both measures, and “animation” and “thriller” are above it by one of the measures. “Comedy,” “drama,” and “romance” are below the mean by both measures, and “crime” below it in one measure. Results show significantly higher than average technology-friendliness for the violence-prone indices, and in three of four cases, significantly lower than average technology-friendliness for the benign indices.

Results for regressions that parse the marginal effects of each individual genre are shown in the last two columns of Table 6. These results show a very similar, though somewhat less pronounced, pattern of signage and significance for the various genre labels. (Tests for multi-collinearity and heteroscedasticity in these models were negative.)

Overall, the descriptive and regression results seem to correspond to popular notions of technology-intensive film types. Note, however, that our 1993-2004 sample contains very few films in some genre categories, notably “musical,” “war,” and “western.” Statistical tests are unlikely to show significance in such cases whatever the true effects.

Comparisons with the data of Table 3 suggest a pattern of comparability between technology-friendliness and (“inflation-corrected”) trends in genre prevalence. Considering the broader technology measure (TECHP-Broad), the descriptive data indicate that four of the five genres which significantly rose in prevalence over time (“action,” “thriller,” “adventure,” and “fantasy”) were technology friendly, and one of the five that fell in prevalence, “drama,” was technology-unfriendly. Results were similar for TECHP-Narrow. (The differences for TECH-P Narrow were that “Thriller” was insignificant; “animation” positive, and “crime” negative.)_The index measure results also corresponded. The *a priori* violence-prone indexes rose over time and were technology-friendly, while at least by the narrowly defined benign index, falling prevalence over time corresponded to less than average technology intensiveness.

In terms of the regressions results, two of the five rising genres were technology friendly in terms of the broad measure, and one of the falling genres was technology-unfriendly. For the narrow measure, three signs also matched, all for rising genres. Further, there were no conflicts in signage of significant coefficients, and the three genres for which signs matched were among the five most prevalent in the database.

Unfortunately, we do not have direct indications of trends over time in technological advance in movie production. It is reasonable to expect, however, that technological advance has at least been monotonic throughout the period.

C. Summary

An abbreviated summary of the correspondence between results of the foreign-friendly and the technology-friendly genre analyses with the deflated genre time trends since 1967 is shown Table 7. For each of the 8 genre labels that significantly increased or decreased in prevalence over time (at at least the 5% level), a “yes” means correspondence of signage for significant results in the indicated foreign friendly or technology friendly (in terms of the broader measure) analysis, a “no” indicates inconsistent signage, and a “-“ indicates an insignificant test. The 8 genre labels are listed in the order of the percentage of total movies that the genre is applied to within the database.

Comparisons between the foreign-friendly and the technology-friendly results are limited by differences in the measurements used and in the size of the samples, but general patterns are evident. In both cases, the correspondences are generally positive. In the foreign-friendly analysis, there are more positive than negative correspondences, and positive cases are among the most prevalent genres. For the technology case, consistency is generally more prevalent, notably among all five of the most common genres, and there are no inconsistencies. Note, also that the tendency for correspondences to be scarce among less frequently occurring genres is to be expected because of a lack of sufficient cases to generate a significant result.

Correspondence results for the four indices are notable, though less useful since all are biased upward due to genre inflation. Increases over time in both the violence-prone indices corresponded to the foreign-friendliness and the technology-friendliness of both. At least the narrowly defined benign index fell in prevalence in spite of the inflation, and was significantly technology-unfriendly. Both of the benign indices were foreign-friendliness neutral, another suggestion that the technology-friendly correspondences to genre time trends are stronger.

Overall, the weight of evidence is that both the influence of foreign markets and the advance of technology have credibility as an explanation for trends in movie genres—notably toward genres that are more violence-prone. The patterns appear less persuasive in the foreign market case, however. Also discouraging to the foreign market explanation

is the lack of any meaningful correspondence between the genre labels that grew in prevalence and the actual percent of Hollywood's revenues coming from foreign markets.

IV. Conclusions

We have reported preliminary results of an investigation into long terms trends in movie genres and the economic forces underlying those trends. Our data indicate that at least since the 1960s, "action," "adventure," "fantasy" and "thriller" have significantly increased in prevalence among the Top 20 U.S. movies, while the incidence of "drama" and "musicals" have significantly declined over the period. These trends appear to correspond to popular notions that movies prone to violent content have an increased presence among the top performing films in the United States and worldwide.

We also find that the rising genres, especially the more common ones, have an overall tendency to be both "foreign friendly" (in terms of the proportion of revenues they earn from foreign markets) and "technology friendly," (in terms of their reliance on special effects and related technologies). In our judgment, however, the weight of the statistical evidence favors the technology explanation; statistical correspondences were generally more consistent and complete. The strongest economic force in evidence is thus that production resources have shifted toward types of movies that have benefited most from the march of technological progress--both because those kinds of movies can be made relatively more attractive to audiences, and because those technologies, other things equal, are cost saving. Both the forces of foreign markets and technology, however, have probably made some contribution to the evident trend toward more action-oriented, violent movies among Hollywood's premier output.

We acknowledge again the preliminary nature of our results. Further statistical work with our database--and especially, an investigation of the influence of video markets-- remains to be conducted. The various possible economic influences on genre trends also need to be combined into an integrated analysis that attempts to determine their relative weights as explanations. Perhaps of most importance, our *a priori* assumptions that certain genres are prone to violence, and others are not, are clearly questionable. A desirable step in our continuing research wouldl be using content

analysis based measures of movie violence to determine which genres actually are the most violent.

We also acknowledge in conclusion that economic forces alone are obviously not the only influences on genre trends in movies. Surely, for example, the long term decline in western films (and TV shows) since the 1950s and 1960s is due largely to unquantifiable cultural influences. We can not expect, then, to find complete explanations by means of statistical analysis of economic forces. The influence of market forces is powerful, however, and by focusing on overall patterns of the data, we hope to advance our knowledge of Hollywood's long term movement toward violent movies in important and useful ways.

Appendix A: Data Selection and analysis of 1967-2004 time trends.

We measured trends in the genres of the top 20 U.S. box-office performing movies from 1967-2004. We assembled the top twenty performing movies for each year from 1967 to 1987 from annual *Variety* lists of top box office movies, and for years from 1988 to 2002 from the Nielsen–EDI Master database and for 2003-2004 from www.boxofficemojo.com. Those steps created a total base of 760 movies.

The *Variety* data, especially in earlier years, are not ideal. One shortcoming of these data is that they report calendar year performance, so that movies released in the Christmas season, for example, may split their revenues between 2 years and tend to be lower ranked in both relative to their cumulative performance. Informal comparisons, however, indicated no systematic bias in the prevalence of individual genres for this reason. Before 1967, *Variety* annual reports of top performing films for the year were in some years at least based on “anticipated” rather than actual revenues. Like *Variety* statistics, the Nielsen-EDI data from 1988 to 2002 are also based on producers’ reports of movie performance, but this database covers virtually all movies released in the United States. (See Waterman, 2005, for further discussion of these data and their shortcomings.)

Genre information for this and other parts of this study are obtained from the www.imdb.com Internet database, which covers virtually all significant theatrical feature films released worldwide since the industry’s beginnings. The *imdb.com* database makes use of nineteen different genre categories, two or more of which are assigned to a single movie in many cases. Systematic information about *imdb.com*’s methods for compiling genre information are not available. It seems evident that they are assembled from a variety of different sources. For older films, for example, at least preliminary genre information is apparently taken from film guidebooks published by the American Film Institute and other organizations. In the process of its becoming the dominant Internet source for film information, *imdb.com* acquired firms, such as *TVGen*, that offered similar information about film genres.

Appendix B: Foreign-friendly analysis

To measure the degree to which the various film genre labels were associated with higher or lower reliance on foreign markets, we compiled lists of the annual Top 50 movies for the years 1993-2002, based on their lifetime box office revenues in the U.S. from the website www.boxofficemojo.com.⁴ The top 50 movies represent on average approximately 70.3% of total U.S. box office receipts for this period. We then eliminated foreign produced movies (of which there were only nine) and theatrical reissues (of which there were four), yielding a total of 487 films for analysis. We included, however, U.S. co-productions, of which there were 97 or 19.9% of the final sample. As expected, the average foreign revenue proportion for these co-productions was somewhat higher, at 48.5%, vs. 43.9% for the full 487 sample. Our results may thus be biased to the extent that U.S. co-productions favor certain genres over others. It may also be that the top 50 movies as a whole have different characteristics than the top 20 that we consider in

⁴ The 2003 and 2004 movies are excluded from the study for the time being because some of them are still in theatrical release in the foreign and/or domestic market.

estimating genre trends. To be expected, statistical significance was generally lower when estimating foreign-friendliness of only the top 20 movies, but signage of coefficients was generally unchanged whether the analysis was conducted for the top 50 or the top 20 movies. As Appendix Table B-1 shows, trends over time in the mean foreign percentage are not evident in the 1993-2002 sample.

We then calculated the ratio of foreign to total theatrical revenues for each movie. The web site *www.boxofficemojo.com* reports the total worldwide revenues for the great majority of the movies in the sample. For movies that had missing foreign revenue data, we used the foreign box office totals reported in *Variety's* annual lists of top 100-125 worldwide movies. As some movies were in theatre across years, we also searched for the lists of adjacent years to compile the total foreign revenues for each movie. Finally, we coded each of these 487 movies according to the genre labels reported in *www.imdb.com*.

Finally, we generated two alternative foreign revenue percentage series: the “Best Estimate” series and “MPAA theater only” series, for all available years since 1967. The former series is defined as the percentages of total foreign revenue as a % of total world wide revenue (U.S. domestic plus foreign revenues) earned by all U.S. studios from the distribution of theatrical feature films from all media (eg, theaters, video, pay and broadcast TV) that exhibit those films. For 1981-2002, these estimates are derived from annual reports of Kagan Research (formerly Paul Kagan Associates), published in *Motion Picture Investor*. For earlier years, they are authors’ estimates. The MPAA theater-only foreign revenue percentage series is calculated as the percentage of foreign theater rental revenue (including Canada) to total worldwide theater revenues are reported in Vogel (2001, p. 53.) See Appendix C in Waterman (2005) for details about data source and calculation methods.

The time series regressions reported in Table 5 are all corrected for autocorrelation in the error terms by the Prais-Winston method, whether or not the original models passed or failed the Durbin Watson test for autocorrelation. Among the comparable uncorrected regressions (not reported in Table 5), 10 among Model set (1) (including the index models) failed the DW test, and three were in an inconclusive zone. For the three other model sets, the failed proportions were 7, 6, and 5, respectively, while inconclusive tests applied in 3, 2, and 1 cases. Only the corrected versions of all models are reported to preserve consistency. As a group, the uncorrected models showed a slightly higher rate of statistical significance, but these models also indicated no systematic pattern of consistency or inconsistency with the time series results for increasing/decreasing genre prevalence.

Appendix C: Technology friendly analysis

To determine which genre labels were associated with technology-intensive production methods, we used the 1993-2004 Top 20 movie lists (a total sample of 240 movies) as described in Appendix A. Based upon *www.imdb.com*, we collected end credits information for numbers of personnel in the categories of special effects, visual effects, animation, sound, stunts, other crew members, company credits, and total cast members. Company credits are treated as an individual credit.

We defined total special effects as the sum of regular special effects and the special effect company credits. We defined total visual effects as the sum of regular

visual effects and animation credits under “Other Crew” category. Total credits include total casts, total crew and total company credits. The website www.imdb.com also listed some uncredited credits for some movies, which do not actually appear on the actual movies. We did not count those credits in our analysis.

In most cases, animation and animation- related credits fall into the category of Visual Effects. In some cases, however (eg, Lion King (1994) animation related credits are listed in the “Other Crew” category instead of “Visual Effects”. To keep methodological consistency, we counted those animation credits in the total visual effects credits, but results for animated movies may nevertheless lack comparability to other movies.

See Waterman (2005) for details of the methodology of end credit tabulations.

To calculate the two alternative measures of technology-friendliness reported in the text, we defined TECHP-Broad to be all special and visual effects, stunt, and sound credits, as a proportion of total end credits, and TECHP-Narrow as all special effects and visual effects credits as a fraction of total end credits. As Appendix Table C-1 shows, there appears to be a slight upward trend over time in the mean values of these percentages.

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Table 1
Genre Trend Analysis: The % of Top 20 Movies in which the Label/Index Appears:
5-year averages, 1967-2004

	Total # of Appearances	67-71	72-76	77-81	82-86	87-91	92-96	97-01	02-04	Overall Average
Action	239	16	19	24	33	36	40	42	48	31
Adventure	163	14	15	18	25	16	20	30	42	21
Comedy	328	35	26	51	47	54	41	47	45	43
Crime	93	11	18	7	12	22	9	9	8	12
Drama	285	50	53	26	33	36	44	27	27	38
Family	121	12	16	10	14	18	15	21	25	16
Fantasy	91	2	3	13	11	15	12	17	30	12
Horror	54	3	6	9	5	10	5	13	5	7
Musical	47	9	11	8	7	4	6	2	0	6
Romance	110	12	6	16	15	18	18	17	13	14
Sci-Fi	94	6	6	15	14	13	10	14	27	12
Thriller	175	10	19	17	14	29	37	28	35	23
Mystery	46	5	4	4	4	3	8	12	10	6
Animation	41	4	3	3	1	5	7	11	12	5
Western	32	12	9	1	1	4	3	2	0	4
War	31	9	2	4	2	5	3	3	5	4
Indexes										
Violence prone (broad)	510	55	63	58	62	73	72	79	80	67
Violence prone (narrow)	446	42	53	51	59	65	62	70	73	59
Benign (broad)	643	83	83	87	82	89	86	84	82	85
Benign (narrow)	600	82	82	78	78	86	79	73	70	79
Average # of Genres per Movie		2.1	2.2	2.3	2.4	2.9	2.8	3.0	3.3	2.6

Table 2
Genre Index Definitions

Violence prone (broad)	action, adventure, crime, fantasy, horror, sci-fi, animation, war, western, thriller
Violence prone (narrow)	action, adventure, horror, sci-fi, thriller, war
Benign (broad)	musical, comedy, family, fantasy, drama, mystery, romance
Benign (narrow)	musical, comedy, family, drama, romance

Table 3
Individual genre time trend regression coefficients

	Undeclared		Deflated	
Action	0.184 (7.10)	***	0.007 (3.94)	***
Adventure	0.116 (4.01)	***	0.004 (2.09)	**
Comedy	0.082 (2.39)	**	-0.001 (0.48)	
Crime	-0.019 (0.81)		-0.003 (1.86)	*
Drama	-0.117 (3.32)	***	-0.014 (5.88)	***
Family	0.062 (3.32)	***	0.001 (1.20)	
Fantasy	0.115 (4.82)	***	0.006 (3.57)	***
Horror	0.025 (1.40)		0.001 (0.56)	
Musical	-0.059 (4.02)	***	-0.005 (4.54)	***
Romance	0.040 (2.05)	**	0.001 (0.45)	
Sci-Fi	0.064 (3.05)	***	0.002 (1.59)	
Thriller	0.139 (4.46)	***	0.005 (2.89)	***
Mystery	0.040 (2.05)	**	0.002 (1.25)	
Animation	0.051 (3.98)	***	0.002 (2.93)	***
Western	-0.053 (4.17)	***	-0.005 (4.95)	***
War	-0.014 (1.09)		-0.002 (1.97)	*
Indexes				
Violence prone (broad)	0.150 (5.81)	***		
Violence prone (narrow)	0.165 (6.05)	***		
Benign (broad)	0.005 (0.28)			
Benign (narrow)	-0.048 (2.20)	**		
N (for individual regressions)	38		38	

() indicates t-ratios.

Coefficient significance levels: *** 1%; ** 5%; * 10%

Table 4: Foreign-friendly Analysis

	N	Mean foreign %		Estimated Marginal Effects DV=foreign %	
Overall	487	0.439			
Action	172	0.491	†	0.047 (2.37)	**
Adventure	112	0.480	†	0.029 (1.45)	
Animation	31	0.474		0.035 (0.92)	
Comedy	217	0.391	†	-0.057 (2.91)	***
Crime	67	0.436		-0.004 (0.18)	
Drama	207	0.441		-0.007 (0.37)	
Family	85	0.417		-0.007 (0.27)	
Fantasy	69	0.442		0.010 (0.42)	
Horror	38	0.481		0.014 (0.44)	
Musical	13	0.555	†	0.125 (2.46)	**
Mystery	46	0.460		-0.003 (0.10)	
Romance	94	0.443		0.049 (2.46)	**
Sci-fi	52	0.510	†	0.050 (1.97)	**
Thriller	163	0.484	†	0.039 (1.85)	*
War	16	0.474		0.027 (0.61)	
Western	7	0.412		-0.025 (0.40)	
Indexes					
Violence prone (broad)	345	0.466	†		
Violence prone (narrow)	295	0.474	†		
Benign (broad)	423	0.429			
Benign (narrow)	392	0.425			
Intercept				0.410 (17.69)	***
Adj. R square				0.107	
N				487	

Notes:

() indicates t-ratios.

†: indicates a significant difference from the mean at the 5% level.

Coefficient significance levels: *** 1%; ** 5%; * 10%

Table 5
Foreign Friendliness vs. Aggregate distributor revenue from foreign markets:
Individual regression coefficients

	IV=Best Estimate Undeﬂated	IV=MPAA Only Undeﬂated	IV=Best Estimate Deﬂated	IV=MPAA Only Deﬂated
Action	-0.239 (0.44)	-0.533 (1.10)	-0.249 (0.53)	-0.493 (1.04)
Adventure	-0.229 (0.61)	-0.061 (0.17)	-0.461 (1.40)	0.002 (0.00)
Animation	0.220 (1.58)	0.199 (1.19)	0.256 (1.73) *	0.262 (1.46)
Comedy	-0.298 (0.62)	-0.734 (1.73) *	-0.922 (1.73) *	-0.741 (1.26)
Crime	0.152 (0.51)	-0.207 (0.65)	0.237 (0.61)	-0.086 (0.21)
Drama	0.775 (1.76) *	0.312 (0.64)	0.952 (1.18)	0.466 (0.62)
Family	0.131 (0.59)	-0.054 (0.21)	0.124 (0.57)	0.129 (0.50)
Fantasy	0.131 (0.59)	-0.182 (0.51)	-0.614 (1.47)	-0.126 (0.30)
Horror	0.049 (0.27)	-0.267 (1.31)	-0.001 (0.07)	-0.325 (1.33)
Musical	-0.129 (0.64)	0.099 (0.47)	-0.185 (0.62)	0.219 (0.70)
Mystery	0.219 (1.26)	0.166 (0.81)	0.237 (1.19)	0.251 (1.06)
Romance	0.012 (0.05)	-0.149 (0.56)	-0.121 (0.50)	-0.156 (0.59)
Sci-fi	-0.213 (0.73)	-0.264 (1.13)	-0.345 (1.24)	-0.305 (1.12)
Thriller	0.560 (1.17)	-0.002 (0.00)	0.598 (1.33)	0.146 (0.28)
War	0.146 (1.15)	-0.043 (0.29)	0.209 (1.09)	-0.037 (0.17)
Western	0.314 (1.68) *	0.253 (1.35)	0.432 (1.55)	0.405 (1.53)
Indexes				
Violence prone (broad)	-0.089 (0.20)	-0.426 (0.90)		
Violence prone (narrow)	-0.308 (0.61)	-0.889 (1.84) *		
Benign (broad)	0.032 (0.18)	-0.203 (1.09)		
Benign (narrow)	0.160 (0.62)	-0.278 (1.12)		
N (for individual regressions)	37	35	37	35

Notes: () indicates t-ratios.

Coefficient significance levels: *** 1%; ** 5%; * 10%

Table 6: Technology-friendly analysis

	N	Means		Estimated Marginal Effect			
		TECHP- Broad	TECHP- Narrow	TECHP- Broad		TECHP- Narrow	
Total	240	0.320	0.175				
Action	104	0.415 †	0.232 †	0.136 (7.08)	***	0.071 (4.03)	***
Adventure	75	0.407 †	0.260 †	0.024 (1.48)		0.037 (2.48)	**
Animation	24	0.342	0.251 †	-0.003 (0.09)		0.016 (0.59)	
Comedy	106	0.271 †	0.136 †	-0.056 (3.04)	***	-0.059 (3.51)	***
Crime	20	0.328	0.115 †	0.003 (0.13)		-0.035 (1.54)	
Drama	78	0.262 †	0.125 †	-0.036 (2.18)	**	-0.024 (1.61)	
Family	49	0.358 †	0.248 †	0.103 (4.47)	***	0.107 (5.06)	***
Fantasy	46	0.415 †	0.284 †	0.078 (4.23)	***	0.083 (4.89)	***
Horror	19	0.341	0.202	0.050 (1.86)	*	0.049 (1.98)	**
Musical	6	0.293	0.214	-0.037 (0.79)		-0.021 (0.49)	
Mystery	25	0.280	0.134	-0.040 (1.71)	*	-0.038 (1.78)	*
Romance	39	0.227 †	0.102 †	-0.020 (1.03)		-0.012 (0.67)	
Sci-fi	39	0.460 †	0.313 †	0.083 (4.32)	***	0.113 (6.40)	***
Thriller	76	0.359 †	0.187	0.008 (0.42)		-0.001 (0.06)	
War	8	0.317	0.161	0.009 (0.23)		0.011 (0.32)	
Western	3	0.370	0.110	0.015 (0.24)		-0.080 (1.44)	
Indexes							
Violence prone (broad)	184	0.361 †	0.209 †				
Violence prone (narrow)	160	0.368 †	0.210 †				
Benign (broad)	202	0.299 †	0.161				
Benign (narrow)	178	0.286 †	0.150 †				
Intercept				0.242 (11.44)	***	0.116 (5.95)	***
Adj. R square				0.562		0.557	
N				240		240	

Notes:

() indicates t-ratios.

†: indicates a significant difference from the mean at the 5% level.

Coefficient significance levels: *** 1%; ** 5%; * 10%

Table 7

Summary analysis of significant foreign-friendly and technology-friendly results for genre labels with significant time trend coefficients

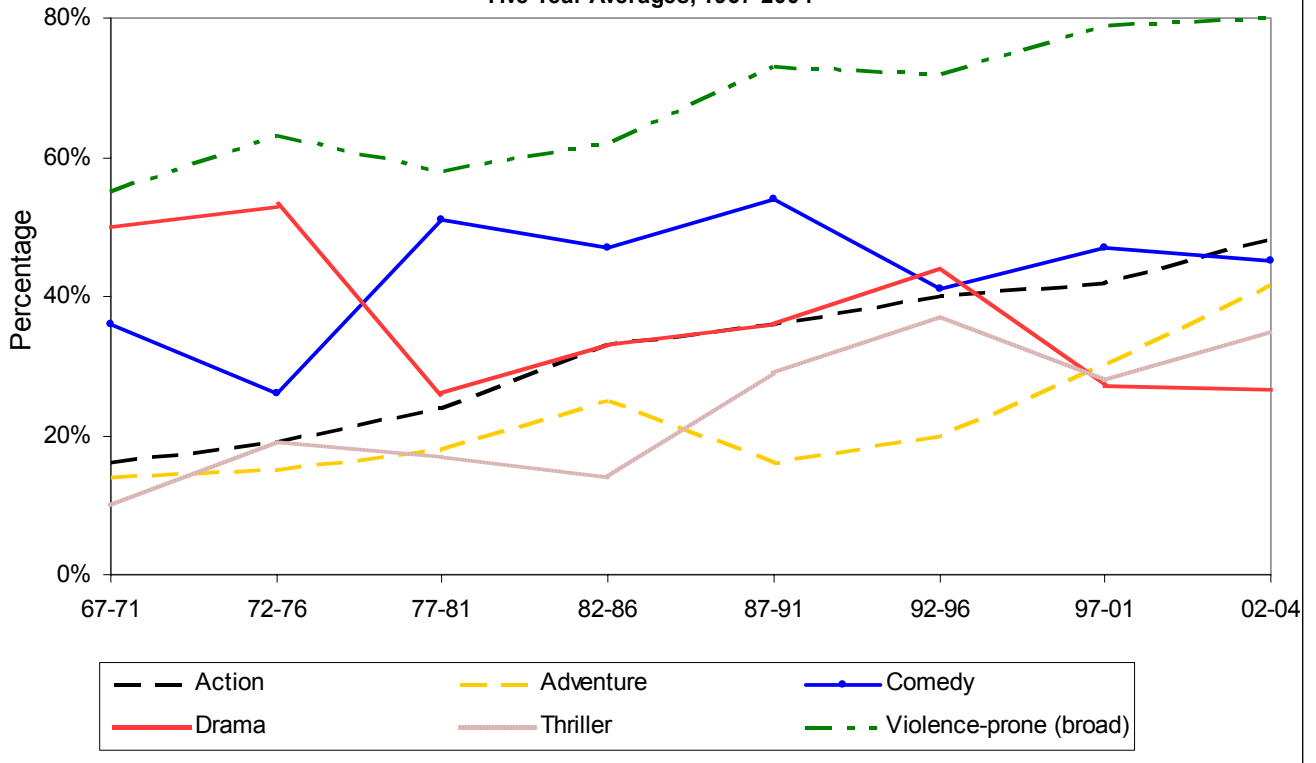
	Total % of movies in which the genre appears, 1967-2004	Estimated direction of change over time	Consistency of foreign-friendly analysis		Consistency of technology-friendly analysis (TECHP-Broad)	
			Difference from mean	Estimated marginal effects	Difference from mean	Estimated marginal effects
Drama	38	-	--	--	Yes	Yes (a)
Action	31	+	Yes	Yes	Yes	Yes
Thriller	23	+	Yes	Yes	Yes	--
Adventure	21	+	Yes	--	Yes	-- (b)
Fantasy	16	+	--	--	Yes	Yes
Musical	6	-	No	No	--	--
Animation	5	+	--	--	--	--
Western	4	-	--	--	--	--

Notes:

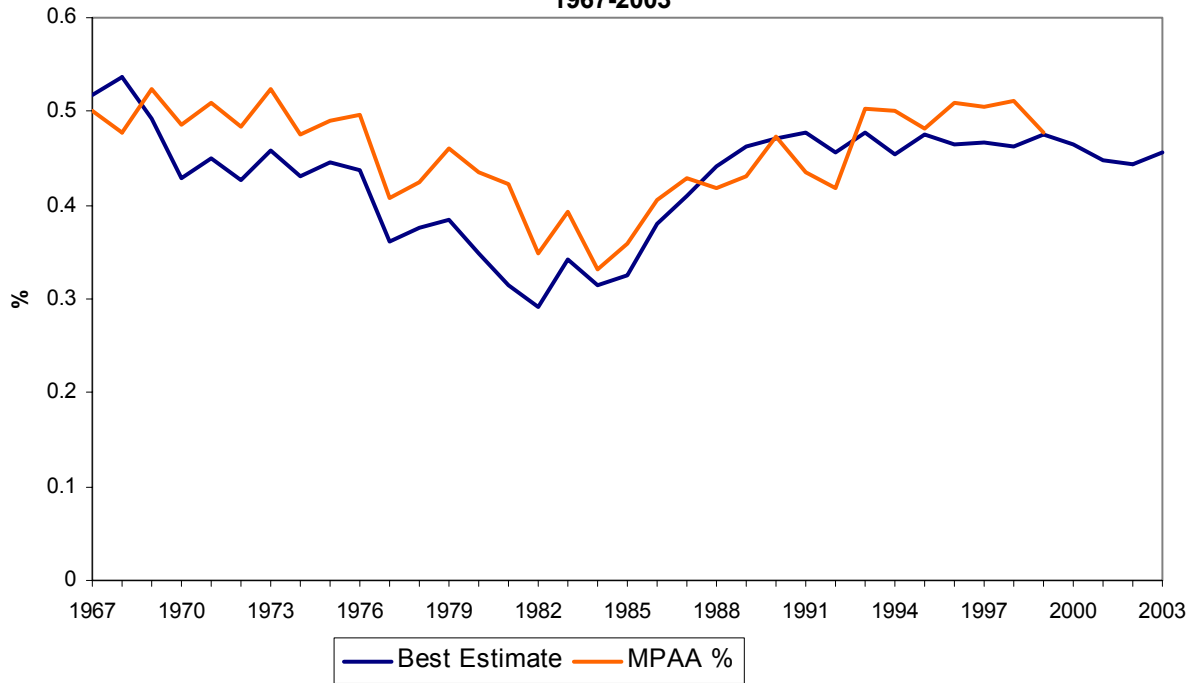
a. insignificant for TECHP-Narrow

b. significance for TECHP-Narrow

Figure 1
Trends in Genres of Top 20 Box Office Movies in the U.S.
Five Year Averages, 1967-2004



**Figure 2. Trends over Time in Foreign Revenue Percentage
by 2 Alternative Definitions
1967-2003**



Appendix Table B-1
Foreign Revenue % by Year

Year	N	Mean	Std Dev
1993	48	0.423	0.204
1994	49	0.439	0.185
1995	50	0.471	0.189
1996	49	0.442	0.195
1997	46	0.467	0.170
1998	48	0.453	0.140
1999	50	0.438	0.157
2000	48	0.422	0.145
2001	49	0.436	0.130
2002	50	0.402	0.167
Total	487	0.439	0.170

**Appendix Table C-1
Technology Intensiveness by Year**

Year	TECHP-Narrow			TECHP-Broad		
	N	Mean	Std Dev	N	Mean	Std Dev
1993	20	0.079	0.098	20	0.229	0.119
1994	20	0.117	0.088	20	0.262	0.114
1995	20	0.159	0.124	20	0.326	0.165
1996	20	0.163	0.123	20	0.303	0.129
1997	20	0.183	0.127	20	0.337	0.132
1998	20	0.171	0.120	20	0.310	0.114
1999	20	0.153	0.143	20	0.290	0.168
2000	20	0.179	0.114	20	0.327	0.136
2001	20	0.194	0.127	20	0.343	0.139
2002	20	0.224	0.144	20	0.337	0.143
2003	20	0.236	0.157	20	0.391	0.161
2004	20	0.245	0.178	20	0.386	0.192
Total	240	0.175	0.135	240	0.320	0.148