"Teaching Digital Piracy"

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ABSTRACT

US education policy encourages the use of computers and the Internet at both the college and high school levels. As a consequence, students have had better access to technologies to illicitly share copyrighted music, causing a decline in sales from the traditional music store retail channel. Using a panel of counties over the 1994-2004 period, I find evidence that the number of music stores fell when high schools received subsidies for Internet connections and it fell faster where college enrollment was higher. This intervention in education policy could have contributed greatly to the decline in the music industry.

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"I took and bound this promising boy apprentice to a *pirate*.
A sad mistake it was to make and doom him to a vile lot.
I bound him to a pirate – you – instead of to a pilot."

Act I, *Pirates of Penzance*, Gilbert & Sullivan

I. Introduction

Use of the Internet has altered many economic and social activities (Kraut, Kiesler, Boneva, Cummings, Helgeson, Crawford 1998). Policies that encourage Internet adoption and use could have large effects on these activities. In the US, one such policy subsidizes Internet infrastructure and encourages its use in education, both in higher education and at lower levels. This study examines a likely result of this policy on the music industry and finds evidence consistent with increased Internet usage in schools and colleges in an area leading to fewer music stores serving this area and argues that this is due to increased illicit downloading of music.

Economists' findings on the effects of the Internet, or Information Technology (IT) in general, on educational outcomes have been disappointing. Fuchs and Woessman (2002) and Angrist and Lavy (2002) found no impact, or a negative impact, of computers on educational outcomes after controlling for household characteristics. Puma et al., (2002) and Goolsbee and Guryan (2006) find that federal E-Rate subsidies to schools increased the number of Internet enabled classrooms. However, Goolsbee and Guryan (2006) find no evidence of improvement in

college entrance exam scores after two years of E-Rate experience in California and Ward (2007) finds statistically significant but small improvements in college preparedness and standardized test scores after six years of E-Rate experience in Texas. Agrawal and Goldfarb (2006) find that Internet adoption at universities may have led to changes in academic research productivity, especially at lower tier schools.

In contrast, researchers have found that education is one of the determinants of how the Internet is used. Kiiski and Pohjola (2002) suggest that education may be a factor in determining differences in International adoption levels of the Internet. Goldfarb and Prince (2006) find that higher income Americans are more likely to adopt the Internet, but lower income Americans spend more time online. More closely related to the current paper, Goldfarb (2006) finds that students who attended US universities when the Internet was first diffusing to college campuses were more likely to use the Internet later in life.

A growing literature has emerged studying the effect of the Internet on the music sales volume. Much of this literature discusses the effects of copyright violations and is the result of the Napster legal case. Oberholzer and Strumpf (2007) found no reduction in sales due to Internet related file-sharing. Other studies find evidence consistent with file sharing via the Internet contributing to a decline in music sales. Among the first contributions, Hui and Png (2003) conclude that piracy did decrease compact disc sales (CD), but not by as much as is claimed by the industry. Liebowitz (2003) concluded that other proffered reasons cannot account for the dramatic drop in music sales. Peitz and Waelbroeck (2004) and Blackburn (2004) both find that illegal downloads account for important reductions in music sales. Michel (2004) and Hong (2004) exploit repeated cross sections from the Consumer Expenditure Survey and

find that file sharing may cause a reduction in sales of 5% to 7.6%. Liebowitz (2005) concludes that file sharing induces a decline on sales of a magnitude that is at least of the size of the observed decline. Zentner (2005), Zentner (2006) and Zentner (2007) relate Internet availability to declines in music sales, music stores, and reductions in sales of types of music that are being shared more heavily. Rob and Waldfogel (2006) find evidence that each album download reduces music purchases by at least 0.2 albums.

Additional studies support the negative impact of piracy on music sales by examining related industry dynamics. Bhattacharjee et al. (2005) study the impact of file sharing on albums survival on ranking charts. Bhattacharjee et al. (2006) analyze the effect of the legal actions against individuals on the availability of music files on file sharing networks. Krueger (2005) finds that copying may erode the complementarities between album sales and concert tickets, which might have caused the observed large increase in the price of concert tickets. Mortimer and Sorensen (2005) find that file sharing may have reduced profits from compact disc sales but increased the profitability of live performances.

While this study's findings are also consistent with the diversion of music sales due to Internet file-sharing, this is not its focus. Instead, I examine the role of education in abetting this illicit file-sharing by examining its effect on the diverted retail channel. Illicit file sharing is likely to increase when more teenagers and young adults are exposed to the Internet, and have more intensive exposure, than they would otherwise. For many music consumers, this exposure occurs at their high school or college. Their demand for the substitute retail channel, recordings purchased from a music store, are likely to fall. With a decrease in the demand for purchased recordings, fewer music stores are likely to be viable in any geographic market. I show that

greater Internet access in education at both the high school and the college levels significantly decreases the number of music stores.

The measure of the effect of IT in education on music stores differs for high schools and colleges. For primary and secondary education, I use data from the E-Rate program that provides $2.25 billion per year in subsidies for Internet connections to school districts and libraries. More funds for Internet connections in schools and libraries in a county are associated with a subsequent decline in the number of music stores. A direct measure of Internet expenditures or use in colleges is not available. Instead, I find that the number of music stores in a county declined faster where the college enrollment is higher, even after controlling for the county's population of young adults. This is consistent with colleges contributing to the decline in offline music stores.

II. The Evolution of the Recorded Music Industry and Internet in Education

Not all music acquired online is illegitimate, but most acquired before 2005 probably was. Music piracy has become increasingly easier over the past decade. While technophiles had been converting CD based music to computer files and sharing them with friends before 1999, the volume of file-sharing picked considerably with the introduction that year of Napster, which allowed users to easily find and share music files over the Internet. While Napster was effectively shut down in 2001, other Internet based file-sharing programs had already proliferated. Initially, the downloaded files were played on computers, but as CD burners became more readily available, more music files obtained over the Internet were able to be played on most existing audio equipment. The advent of the MP3 player increased the ease of

using downloaded music. The Apple iPod, introduced in 2002, represents about half of all digital music players and had sales of just 1 million units in 2003, 4.4 million units in 2004, 22 million units in 2005, and 39 million units in 2006. Legitimate downloads of music became meaningful with Apple's iTunes store in 2003 and, while it had sold 2 billion songs by the end of 2006, it had sold just over 200 million by the end of 2004. As late as 2004, most music was listened to via music CDs and not on portable MP3 players and music purchases made online, either downloads or CDs, accounted for less than 2% of all sales (RIAA 2005a).

This study infers changes in the volume of illicit music file sharing from changes in the number of music stores serving the offline market. Changes in the number of music stores is an imperfect measure of diversion toward online acquisition. First, music can be obtained offline through other means besides stores catering specifically to music sales. A non-negligible portion of music CDs are obtained through book stores, discount stores and mail order. It is not clear if these other outlets would face a smaller or larger reduction in sales relative to stand alone music stores. There has been a secular decline in the fraction of music purchased offline at traditional music stores over my sample period (RIAA 2005a). Second, a consumer is likely to obtain more music online than he would have offline. Substitution toward the online channel occurs because the total costs, price plus transactions costs, are lower through this channel. For illicit file sharing, the pecuniary cost was typically zero. Transactions costs include those related to a computer and Internet connection as well as the human capital to find, download, and copy music into a usable format, all of which likely declined over time. However, it is possible that the transactions costs of offline purchases also declined over time. Because of either of these effects, it may be inappropriate to infer that the diversion rate is inversely proportional to the

change in the number of music stores at the aggregate level. Instead, I look for variation in the number of music stores and transactions costs across geographic markets and over time.

Since 1998, the E-Rate subsidy program has provided up to $2.25 billion annually to schools and libraries to make access to modern telecommunications and information services more affordable. Schools and libraries approved for the E-Rate Program receive discounts, thereby subsidizing market prices for telecommunication equipment and services. While nearly all schools are eligible, schools serving more low income students receive subsidy amounts that cover a larger percentage of the costs. The subsidy can be used for spending on "all commercially available telecommunications services, Internet access, and internal connections" (Department of Education, 1997). The E-Rate Program supports the acquisition of digital technology infrastructure, including telephone services (basic, long-distance, and wireless); Internet and web site services; and the acquisition and installation of network equipment and services, including wiring in school and library buildings. The subsidies do not cover computers, software, or databases because they are not directly related to Internet connections (FCC, 2001).

The E-Rate program was designed to help schools and libraries obtain access to the Internet and other digital technology, especially those serving poorer populations. The program subsidizes a portion of an eligible bid for Internet and telecommunications connections and services solicited by school districts. Puma et al., (2002) and Goolsbee and Guryan (2006) find that the E-Rate program increased school district investment in Internet enabled classrooms. Table 1 suggests that, while schools serving lower income students lagged behind, Internet enabled classrooms become nearly universally available across all classrooms in the US between 1994 and 2003.

Colleges and universities tend to geographically concentrate people who tend to be both intense music demanders and technologically savvy. Colleges have long been thought to be sources of musical movements that eventually spread to other areas. Market research indicates that about a quarter of all music purchased in the US is purchased by 15-24 year olds (RIAA 2005b). Those attending college will typically relocate to, and purchase their music in, a college town. Consequently, college towns have traditionally supported substantially more music stores than similarly sized areas without colleges. If these students were more likely to download music than the rest of the population, their demand for offline music will decline faster than non-students, causing the equilibrium number of music stores in college towns to fall faster than in other areas.

III. A Model of Music Store Demand and the Costs of File Sharing

I propose a simple economic model to motivate the empirical investigation. Let the per person demand for music be given by;

$$q_i = q_i\left(P\ , I_i, X_i\right) \quad \textbf{(1)}$$

where P is price, I_i represents the consumer's income and X_i may be other demand shifters. While demand is subscripted for each individual, the empirical analysis aggregates individuals into geographic markets. Within these markets, I focus on those aged 15-25, labeled the "young," who represent the demographic group with the highest average consumption level. For purposes of this study, the "young" differ from the "old" in that they are thought to consume more music, they are thought to have been responsible for a disproportionate share of music file-sharing, and they have been subject to IT interventions in their education that may have

facilitated even more file-sharing.

The analysis will not directly consider price and income effects or the determinants of overall music demand. Instead, we will concentrate on the distribution channel from which this music demand is satisfied. In particular, we consider the probability that, given a piece of music will be obtained, it will be purchased legitimately as:

$$\begin{aligned} \Pr(Purchase|Obtain) &= \phi(P, TC) \\ \phi_P < 0, &\qquad \phi_{TC} > 0 \end{aligned} \tag{2}$$

where P is the price of the item purchased legitimately and TC reflects transactions costs of obtaining music over the Internet. Offline purchasing and online downloading can be considered substitute channels with P and TC reflecting the prices for each channel. We assume the demand for the legitimate channel is decreasing in product price and increasing downloading transactions costs. For what follows, we focus on the transactions costs of downloading.

Transactions costs of downloading and using digital music are modeled as:

$$\begin{aligned} &TC = TC(ERate, year, college) \\ &TC_{ERate} < 0, TC_{year} < 0,\ TC_{college} < 0,\ \ TC_{year,college} < 0. \end{aligned} \tag{3}$$

E-Rate subsidies provide high speed Internet access to poorer high school students that tends to lower the cost of downloading music files. The availability of music online and the ease of obtaining it is assumed to have increased over time. Likewise, because colleges have tended to provide high speed Internet access before most other institutions, students attending college are assumed to have lower downloading transactions costs over time as the high speed access combines with general increase in ease of use and availability of music on the Internet.

Combining equations (1), (2) and (3) and distinguishing between the young and the old in

overall music demand yields the demand for music purchased in stores as:

$$Q^S = Pop\left[Frc_y q_y \phi\left(P, TC\left(ERate, year, college\right)\right) + \left(1 - Frc_y\right) q_o \phi\left(P, TC\left(year\right)\right)\right] \quad \textbf{(4)}$$

where *Pop* is the total population and Frc_y is the fraction of the population that is young. While both the young and the old face the same function, $\phi(.)$, the old's transactions costs are assumed to not be directly affected to the E-Rate or college. Finally, it is assumed that the equilibrium number of stores serving a geographic area is proportional to the demand for purchased music[1]. Thus, change in Q^S will be identified with changes in the number of music stores.

The first hypothesis is that falling transactions costs of downloading over time have led to increased downloading. By differentiating (4) with respect to year, we obtain:

$$\frac{\partial Q^S}{\partial year} = Pop\left(Frc_y q_y + \left(1 - Frc_y\right) q_o\right) \phi_{TC} TC_{year} < 0. \quad \textbf{(5)}$$

Increased transactions costs increase the probability of a music purchase, $\phi_{TC} > 0$, but, over time, these transactions costs have fallen, $TC_{year} < 0$. Because of this, all else equal, we expect fewer purchases to occur over time and the number of music stores serving a population to decline.

We develop our E-Rate funding related test by differentiating (4) with respect to *E-Rate*:

$$\frac{\partial Q^S}{\partial ERate} = Pop_y q_y \phi_{TC} TC_{ERate} < 0. \quad \textbf{(6)}$$

E-Rate subsidies are hypothesized to reduce downloading transactions costs, $TC_{ERate} < 0$, which in turn leads to decreased purchased since young consumers substitute toward downloading, ϕ_{TC}

[1]This condition may not strictly hold if the equilibrium size distribution of stores changes with total demand. This possibility will be investigated in the empirics below.

> 0. Combined, this implies that, if the hypothesized effect were true, increased E-Rate subsidies would lead to fewer music purchases. The proposed test for this is that areas that receive more E-Rate funding will see a decline in the number of music stores.

The college related hypothesis is that, as colleges have invested in Internet infrastructure, they have tended to reduce transactions costs of downloading music over time. The effect on music store demand is seen by the second derivative of (4) with respect to college and year:

$$\frac{\partial\left(Q^S\right)^2}{\partial college\,\partial year} = Pop\,Frc_y q_y \phi_{TC} TC_{college,year} < 0. \qquad \textbf{(7)}$$

That is, not only are music sales expected to be falling over time, they are expected to fall faster where more music consumers are "exposed" to enhanced Internet access in the traditional college experience. A potential problem with this hypothesis is that the people exposed to colleges tend to be the young and the young could be associated with more rapid declines in music purchases even absent exposure to college. To see this, we take the second derivative of (4) with respect to the fraction who are young and year:

$$\frac{\partial\left(Q^S\right)^2}{\partial Frc_y\,\partial year} = \left(q_y - q_o\right)\phi_{TC} TC_{year}. \qquad \textbf{(8)}$$

Since the demand for music is assumed to be higher for the young relative to the old, $q_y > q_o$ and $TC_{year} < 0$, equation (8) is negative. Empirically, it is possible that a test for college effect from equation (7) could simply capture the young effect of equation (8) if being exposed to college and being young are positively related. To account for this, the empirical specification will include separate measures in the variation in college exposure and the size of the young population at different points in time.

IV. An Econometric Model of Music Store Determination

The above considerations suggest that the number of viable music stores in an area is a function of over all demand, E-Rate funding and interactions of college, the size of the young population and time. The basic regression equation estimated below is given by:

$$\begin{aligned} \ln(MusicStores_{it}) &= \sum_{i=1}^{I}\delta_i dum_i + \sum_{t=1}^{T}\phi_t dum_t + \gamma_0 FrcYouth_{it} + \sum_{\tau=1}^{T}\gamma_t FrcYouth_{it}\times dum_t \\ &+ \delta_0 \ln(Popl_{it}) + \lambda_0 FrcCollege_{it} + \sum_{\tau=1}^{T}\lambda_t FrcCollege_{it}\times dum_t \\ &+ \sum_{\tau=1}^{3}\beta_\tau \ln(Erate_{it-\tau}) + \varepsilon_{it}. \end{aligned} \quad \textbf{(9)}$$

To control for factors not related to the hypotheses under investigation, the logarithm of the number of music stores in a county and a year are related to fixed county and year effects, the fraction of the population aged 15-24, labeled *FrcYouth*, this fraction interacted with year dummies, and the log of the population of the county. County fixed effect estimates will capture non-time varying differences county demographic effects and non-time varying idiosyncratic differences in the availability of substitute and complementary entertainment goods. Year fixed effects will tend to capture the secular change in the number of music stores, all else equal. Traditionally, the "youth" population has been the target audience for most music sales suggesting that more stores will be demanded when this fraction is higher. However, if this fraction is mostly time invariant, the county dummy variable will likely include much of the differences in demand across areas due to differences in the youth population. The *FrcYouth* and year interaction is meant to capture the effect of changes in demand due to variation in the "youth" population over time within counties. All else equal, we would expect that a growth in the youth population would be associated with more music stores.

The variables of interest for increased downloading related to high schools are the *ERate*

variables. These are calculated as the per capita dollar subsidy for Internet connections in the county for the previous three years. Because a county is often an aggregation of different school districts and city jurisdictions, E-Rate subsidies are likely not evenly distributed across schools and libraries in a county. Therefore, a larger dollar amount per person often indicates that the populations of more school districts where affected as well as the same population affected more intensively. Previous research suggests that E-Rate subsidies can affect IT investment in schools and educational outcomes up to three years after receipt (Puma 2005, Guryan and Goolsbee 2006, Ward 2007).

The variables of interest for increased downloading related to colleges and universities are those involving the fraction of the county's population enrolled in college, labeled *FrcCollege*, interacted with year dummies. Colleges tend to both have high music demand consumers, the "youths," and provide higher speed Internet access to these youths than they would otherwise enjoy. While the *FrcYouth* interaction variables measures the effect of the former, the *FrcCollege* interaction variables are meant to measure the effect of the latter. It is likely that illicit file-sharing increased over the sample period and it is possible that areas with many youths experienced even more file-sharing. But controlling for these effects, we wish to uncover whether areas with larger relative college and university populations experienced even greater illicit file-sharing as indicated by a greater decline in the number of music stores. A negative trend in the coefficient estimates for λ_t would be consistent with colleges contributing to illicit file-sharing.

Because it is the youth population that is the population directly "exposed" to these high school and college "treatments," this correlation suggests a robustness check of the specification.

The fraction of youths measure is positively related to the demand for music when the costs of file-sharing are controlled for but should be negatively related to purchased music demand when they are not. When variables meant to capture ease file-sharing, the E-Rate subsidies and college enrollment interactions, are omitted, the youth fraction-year interactions should become increasingly negative over time. To the extent that the E-Rate and college enrollment interactions succeed in measuring the ease of file sharing, the youth fraction-year interactions should remain non-negative.

The tests of IT policies in education leading to a decrease in the number of music stores should be free of endogeneity concerns. A common problem that studies relating to online behaviors must overcome is finding exogenous variation in Internet access or Internet traffic to relate to music downloading. That is, the desire to share music files may be driving the demand for individual consumers to obtain Internet access and use the Internet more extensively. If so, causality could possibly flow from an increased file sharing propensity to Internet adoption. In the present case, however, it is unlikely that school districts sought E-Rate subsidies and colleges invested in digital infrastructure so that their students could download and share music files. Still, I cannot rule out that some omitted variable is simultaneously affecting both Internet adoption and the number of music stores.

V. Music Store, E-Rate and College Enrollment Data

The hypotheses described above are tested using a panel of data comprising the counties of the US for the years 1994-2004. The amount of music downloading is measured indirectly from the number of music stores in the county as measured by the US Census Bureau's County

Business Patterns data. The US Census Bureau also makes annual population estimates available for each county by age category[2]. Annual E-Rate funding data for the various school districts in the US were collected from the Universal Service Administrative Company (USAC). Finally, college enrollment data were collected from the US Department of Education's Integrated Postsecondary Education Data System (IPEDS). Each source is described in turn.

County Business Patterns (CBP) data are annual data for each county in the US and include establishment, employment and payroll information for various industry classifications. Until 1997, industries were classified based on the Standard Industrial Classification (SIC) System and from 1998 based on the North American Industry Classification System (NAICS). While many industry definitions often differ between the two, the definition of what is generally considered a music store did not change. The NAICS code 45122 is described as "Prerecorded tape, compact disc, and record stores" which completely bridges to the SIC code 5735 description of "Record & prerecorded tape stores." For industry categories and locations with few establishments, such as music stores in less populated counties, the Census Bureau suppresses employment and payroll information for privacy reasons. The analysis below examines the effects on the number of stores in all categories as well as the number of stores in each of these size categories. Data on the number of establishments by establishment size are catagorized by the number of employees as 1-4, 5-9, 10-19, 20-49, 50-249, 250-499, 500-999, 100+ with each successive group having fewer music stores.. Nationwide, only about 100 music stores ever had more than 49 employees. For the size of store analyses, all stores with 10 or more employees were aggregated into a single size category.

[2]See US Census Bureau. www.census.gov/popest/datasets.html.

E-Rate data are available via download from USAC[3]. These data include, among other variables, the funding commitment for each public school district in the US since the program began in 1998. Not all districts receive E-Rate subsidies each year and, because subsidy rates are tied to the number of low income students in schools being served, per capita amounts received may vary across areas. Districts were matched to counties based on the zip code of the district offices. The analysis below uses the per capita amounts and, as with Goolsbee and Guryan (2006) and Ward (2007), includes lag values of E-Rate funding to capture the possibility of learning to share files in previous years.

The college related hypothesis discussed above is that the traditional college experience leads to more music file sharing. This could be because students have access to high speed networks and to technically sophisticated classmates. To test this, I collected enrollment from the US Department of Education's Integrated Postsecondary Education Data System (IPEDS)[4]. From the universe of all schools, I selected the nearly 2,300 baccalaureate degree granting institutions. Excluded were nearly 4,000 community colleges and trade schools because they tend to cater to non-residential and part-time students who do not have a similar exposure to high speed Internet service on campus. The schools included in the sample had total enrollments totaling 9.0 million in 1992 and 10.7 million students in 2004. The school's city was mapped into its county and the enrollments of multiple schools in a county were aggregated to a county total. Out of more than 3,200 counties, about 900 had any college enrollment. Table 2 lists counties with the highest enrollment to population ratios in 2004.

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[3]Universal Service Administrative Company. www.sl.universalservice.org/

[4]Integrated Postsecondary Education Data System. nces.ed.gov/ipeds/.

A number of more rural counties were too small to support music stores, colleges, or even traditional schools. The hypotheses outlined above would not apply to these counties. Therefore, the sample is constrained to counties with average population from 1994 to 2004 above 25,000 eliminating 1,674 counties from the analysis. Another 64 counties were eliminated because they were missing music store data for more than six years. The remaining 1,403 counties represented about 90% of the US population and 95% of music stores in 2004. Tables 3 and 4 relate the number of music stores and the percentage of counties with a music store by size over time for the sample counties used. These tables indicate that there has been a secular decline in the number of music stores over time but that the decline might be confined to smaller stores. The number and distribution of stores with 10 or more employees is relatively constant. This pattern is consistent with RIAA (2005a) which reports a shift away from traditional music stores toward larger department stores (including Target and Walmart) and hardware or audiovisual stores (including Best Buy and Circuit City). In the methodology described above, year dummy variable estimates will include these overall secular trends. Data are not available on the extent to which one county had a larger shift toward department stores, hardware, or audiovisual stores than others. However, to the extent that the correlation between this shift and E-Rate and college presence is uncorrelated, my estimates of interest will be unbiased.

VI. Estimation Results

The main estimation results are presented in Table 5. Regressors of interest are added incrementally from left to right. The first model excludes the variables of interest and indicates that, after controlling for county and year fixed effects, un-interacted changes in the population

of the young, in college or in total have no significant direct relationship with the number of music stores. While county fixed effects are not reported, the year fixed dummy variable estimates, and these dummies interacted with the fraction of the population that is aged 15-24 are reported. These indicate a near monotonic downward trend in the number of music stores that is proportional to the fraction of the youth population, although these are only statistically significant in the last three years. Controlling for the youth-year interaction, the un-interacted dummy variable results suggest that the number of stores per capita peaked in 1999 and steadily fell since then, although none of the reported individual estimates are statistically significant.[5] Calculated at the sample mean for the fraction of population aged 15-24, the interacted and un-interacted year dummy variable estimates indicate about a 20% decline in the number of music stores between 1999 and 2004. These estimates track the general trend in music sales which also rise and then fall over this period with a peak in 1999 and about a 20-25% decline afterward (Liebowitz, 2006).

The second model adds the E-Rate variables and suggests that the E-Rate led to a reduction in the number of music stores. Specifically, it indicates that E-Rate subsidies from the previous two years decrease the number of music stores in the current year. In both models two and three in this table the sum of the lagged effects is about -0.0072 and is always significantly different from zero at the one percent level. This effect is significant, of the hypothesized sign, and is relatively sizable. Since the E-Rate was instituted in 1998, the average subsidy came to about $8 per person for the counties in the sample, but the funds were concentrated toward those

[5]However, the coefficients for the 2004 and 2003 dummy variables are significantly different from that for 1999, the peak year, at the 5% level.

who were poorer and younger. The parameter estimates suggest that this program reduced the number of music stores by an average 8.5% or about two-fifths of the total decline. When one considers that the effect of these subsidies on the intended educational outcomes was small (Guryan and Goolsbee, 2006 and Ward, 2007), a finding consistent with unintended illicit behavior is even more remarkable.

The third model indicates that areas with relatively more college students experienced faster declines in the number of music stores. In fact, as a robustness check, the youth effects found in the previous two columns virtually vanish after controlling for these college effects. The un-interacted fraction enrolled in college indicates that areas with a larger fraction of its population enrolled in college had significantly more music stores in 1994, the omitted year dummy variable. This likely reflects greater music demand among college students. However, the interaction of the fraction enrolled in college with the year dummies indicates a significant negative trend in music stores in college-towns that eventually nearly reaches the magnitude of the 1994 but with the opposite sign. This is consistent with college-towns having significantly more stores in 1994 but being not significantly different from non-college towns by 2004, at least in terms of the number of music stores.

It is possible to calculate how much colleges contributed to the decline in music stores from these estimates. Counties with college enrollment averaged 6.6% of their population enrolled implying that, by 2004, these counties averaged 8.2% fewer music stores than in 1994. The effect of colleges on the overall number of music stores throughout the sample is smaller because counties without colleges were unaffected. While only about half of the sample counties had colleges, counties with colleges had considerably more music stores. Consequently, these

estimates indicate that colleges led to an overall 7.1% reduction in the number of music stores, about one-third of the total decline. Note that in model three, the estimated trend in the un-interacted year dummies is negative, suggesting some unmeasured cause for the decline in the number of music stores. It is possible that this includes increased file-sharing outside of high schools and colleges sources identified here.

Table 6 applies the specification to music stores of different sizes. The County Business Pattern data allow one to classify size by the number of employees at the establishment. Music stores tend to be small with about 37% employing four or fewer employees, 37% employing 5-10 employees and 26% employing more than 10 employees. However, when stores are dis-aggregated by size, a distinct pattern emerges across these size categories. First, the un-interacted year dummy estimates indicate a general trend away from small and medium stores to larger stores. In this case, the decline in the overall number of music stores from table 5 likely overestimates the decline in music sales. Second, the year dummies interacted with the youth fraction do not affect the number of stores in any systematic way. They might suggest a slight trend toward larger stores. Third, E-Rate subsidies appear to have contributed to the decline in the number of medium sized and larger stores, but not smaller stores. In contrast, college enrollment appears to have contributed to the decline in the number of small and, perhaps, medium stores, but not larger stores. These results are consistent with the Emre, Hortacsu and Syverson (2005) claim that, by lowering consumer search costs, Internet searching is likely to shift demand toward relatively larger, more efficient retailers. Overall, these results tend to confirm the main results in table 5 that the E-Rate and colleges are generally associated with declines in the number of music stores, but they paint a bit more subtle picture of where the

decline in stores occurred.

The estimated effects on total music stores may be biased because the effects differ by store size. As a robustness check, I attempt to overcome this problem by estimating the number of employees in all music stores by weighting stores in a size category at the midpoint number of employees in that category. While precision may be lost by the assumptions inherent in this calculation, the number of employees so calculated is likely to be more free of the aggregation biases in the number of stores variable. Table 7 replicates Table 5 but uses this estimate of the number of employees instead of the number of stores. Not surprisingly, all of the qualitative findings from Table 5 are also present in Table 7. However, the total population, youth population and youth population interactions all significantly affect music store employment. These estimates indicate that the E-Rate is associated with an 8.0% reduction in the number of music store employees and that colleges are associated with a 7.0% reduction.

As a further robustness check, the same methodology was applied to other activities associated with the high school and college aged population that do not benefit from Internet usage. In particular, I am aware of no claims that the Internet has greatly affected the markets for video game sales or for sporting goods. I examined the number of video game stores and sporting goods stores in these counties according to equation (9). The results in table 8, indicate that these two types of stores were unaffected by the E-Rate and that only video game stores appear to be related to college enrollment over time. In general, these results bolster the claim that the results in tables 5, 6 and 7 are not mere spurious correlations.

VI. Conclusions

The analysis above indicates that the US education policy of encouraging Internet in education has also encouraged illicit file-sharing of copyrighted music. This is true at both the high school and college levels. Between 1994 and 2004, the number of music stores in the average county in the sample fell by about 20-30%. My estimates account for about half to two-thirds of the reduction in the number of music stores. The remaining decline could simply reflect consumer preferences for other legitimate retail outlets for music or could include the effects of unmeasured illicit file-sharing. While the number of music stores may have declined due to the Internet in education, the percent decline in music sales is likely smaller because it appears that smaller stores were affected more. Indeed, my attempt to estimate the effect on music store employees results in smaller estimated effects. Still, the effects on the music industry represent relatively large unintended consequences of this policy. Furthermore, they may soon have negative consequences for the movie and video entertainment industry. One irony is that there is scant evidence that the intended consequence, enhanced educational attainment, has been achieved.

For the US, this effect of the Internet in education on music piracy may largely be of historical interest. Nearly all classrooms and dorm rooms already have Internet access. Still, to some extent, Internet access will continue to improve such that the transactions costs of sharing files illicitly should continue to fall. If these results extend to video downloading and the transactions costs for sharing these larger files continue to fall, we could see education policy affecting the film industry. Similarly, if these result can be extended to other countries that are just beginning to enhance Internet access in schools, they suggest that this form of piracy is

likely to flourish.

This analysis suggests that there could be other unintended consequences of these policies. For example, young people have increasingly used the Internet for social networking via instant messenger services and social network sites (e.g., MySpace and Facebook). These are likely to have changed the depth and breadth of their social networks. In particular, young people in physically or economically remote areas, in, say, rural or ghetto areas, may have more first-person knowledge of the outside opportunities available to them. Also, young people have greater exposure to information that had previously been denied them. Specifically, just as these young people are becoming sexually aware, they now have greater access to sexually explicit material. Does this encourage promiscuity or does it substitute for it?

References

Angrist, Joshua and Victor Levy, "New Evidence on Classroom Computers and Pupil Learning," *The Economic Journal*, 112 (2002), 735-65.

Bhattacharjee, S., Gopal, R. D., Marsden, J., and Telang, R., "The Effect of Digital Sharing Technologies on Music Markets: A Survival Analysis of Albums on Ranking Charts," Working Paper, University of Connecticut.

Bhattacharjee, S., Gopal, R. D., Lertchwara, K., and Marsden, J., "Impact of Legal Threats on Individual Behavior: An Analysis of Music Industry Actions and Online Music Sharing," *Journal of Law and Economics*, pp. 91-114, April 2006.

Blackburn, David, "Online Piracy And Recorded Music Salesö, 2004, Working Paper, Department of Economics, Harvard University.

Bresnahan and Reiss, "Entry And Competition In Concentrated Markets," *Journal of Political Economy*, vol. 95 (5), (October), pp. 977-1009, 1991.

British Phonographic Industry, "Market Information", June 2003.

Brown, Jeffrey and Austan Goolsbee (2002) "Does The Internet Make Markets More Competitive? Evidence From The Life Insurance Industry," *Journal of Political Economy* 110(3), pp. 481-507.

Brynjolfsson, Erik and Michael Smith, "Frictionless Commerce? A Comparison Of Internet And Conventional Retailers," *Management Science*, 46(4), 2000, 563¡ 585.

Emre, Onsel, Hortacsu, Ali and Syverson, Chad, "E-Commerce and the Market Structure of Retail Industries" (October 2005). NET Institute Working Paper No. 05-24 <http://ssrn.com/abstract=851267>.

Fader, Peter. Expert Report, A&M Records, Inc v. Napster, Inc. 114 F Supp. 2d 896, 2000.

Fine, Michael, "Soundscan Study On Napster Use And Loss of Sales," June 2000, available at www.riaa.com.

Fuchs, Thomas and Ludger Woessmann, "Computers and Student Learning: Bivariate and Multivariate Evidence on the Availability and Use of Computers at Home and at School," (November 2004). CESifo Working Paper Series No. 1321.

Goldfarb, Avi, and Jeffrey Prince, "Internet Adoption and Usage Patterns are Different: Implications for the Digital Divide," 2006.

Goldfarb, Avi. 2006. The (Teaching) Role of Universities in the Diffusion of the Internet. *International Journal of Industrial Organization* 24(2), 203-225.

Goolsbee, Austan and Jonathan Guryan,"The Impact of Internet Subsidies in Public Schools," *Review of Economics and Statistics*, 88 (2006), 336-47.

Hong, Seung-Hyun, "The Effect Of Digital Technology On The Sales Of Copyrighted Goods: Evidence From Napster," 2004, Working Paper, Department of Economics, Stanford University.

Hui, Kai-Lung and Ivan Png (2003) "Piracy and the Legitimate Demand for Recorded Music," *Contributions to Economic Analysis & Policy*: 2(1), Article 11 <http://www.bepress.com/bejeap/contributions/vol2/iss1/art11>.

International Federation of the Phonographic Industry (IFPI), "The Recording Industry In

Numbers," April 2004.

Kiiski S,.Pohjola M., "Cross-country diffusion of the Internet" Information Economics and Policy, Volume 14, Number 2, June 2002, pp. 297-310(14).

Kraut, Robert; Kiesler, Sara; Boneva, Bonka; Cummings, Jonathon; Helgeson, Vicki; Crawford, Anne, (1998) "Internet Paradox Revisited," *Journal of Social Issues*, Volume 58, Number 1, Spring.

Krueger, Alan, "The Economics of Real Superstars: The Market for Rock Concerts in the Material World," *Journal of Labor Economics*, Volume 23, Number 1, January 2005.

Liebowitz, Stan, "Will MP3 Downloads Annihilate the Record Industry? The Evidence So Far," *Advances in the Study of Entrepreneurship, Innovation, and Economic Growth*, V. 15, 2004, pp. 229-260.

Liebowitz, Stan, "Pitfalls In Measuring The Impact Of File-sharing." CESifo Economic Studies, July 2005.

Liebowitz, Stan, "File-Sharing: Creative Destruction or just Plain Destruction?," *Journal of Law and Economics*, April, 2006, pp. 1-28.

Liebowitz, Stan, "Testing File-Sharing's Impact by Examining Record Sales in Cities," Working Paper, School of Management, University of Texas, 2005.

Michel, Robert, "The Impact Of The Digital Age On The Music Industry: An Empirical Analysis," Working Paper, 2004.

Mortimer, Julie and Sorensen, Alan, "Supply Responses to Digital Distribution: Recorded Music and Live Performances," Working Paper, 2005.

Oberholzer, Felix and Strumpf, Koleman, "The Effect Of File Sharing On Record Sales. An Empirical Analysis," Working Paper, 2004.

Peitz, Martin and Waelbroeck, Patrick, "The Effect Of Internet Piracy On Music Sales: Cross Section Evidence," *Review of Economic Research on Copyright Issues*, 1 (2), 71-79, 2004.

Puma, Michael E., Duncan Chaplin, Kristin Olson, Amy Pandjiris, "The Integrated Studies of Educational Technology: A Formative Evaluation of the E-Rate Program," *Washington (D.C.) Urban Journal* (2002). <http://www.urban.org/UploadedPDF/410579_ERateFinalReport.pdf>.

Puma, Michael E., Duncan Chaplin, Andreas D. Pape, *E-Rate Program and the Digital Divide: A Preliminary Analysis from the Integrated Studies of Educational Technology*, The Urban Institute, Washington, D.C. Sept., 2000. <http://www.urban.org/UploadedPDF/410385_Standards.pdf>.

Rob, Rafael and Waldfogel, Joel, "Piracy On The High C's: Music Downloading, Sales Displacement, And Social Welfare In A Sample Of College Students," *Journal of Law and Economics*, April 2006, pp. 29-62.

RIAA, 2005a, http://www.riaa.com/news/newsletter/pdf/2005yrEndStats.pdf.

RIAA, 2005b, http://www.riaa.com/news/marketingdata/pdf/2005consumerprofile.pdf

Scott Morton, Fiona, Florian Zettlemeyer, and Jorge Silva-Russo (2001), "Internet Car Retailing," *Journal of Industrial Economics* 49, December 2001, pp. 501-519.

Sinai, Todd and Waldfogel Joel, "Geography and The Internet: Is The Internet A Substitute Or A Complement For Cities?," *Journal of Urban Economics*, vol. 56, number 1 (July 2004), pp. 1-24.

Sorensen, Alan, 2000, "Equilibrium Price Dispersion In Retail Markets for Prescription

Drugs," *Journal of Political Economy* 108, pp. 833-850.

Wan Minhua, "Demand Uncertainty, Search Cost And Price Dispersion: Evidence From The Online Book Industry," Working Paper, University of Chicago, 2005.

Ward, Michael R., "The Effects of the E-Rate Internet Subsidies in Education" (March 2006). Available at SSRN: http://ssrn.com/abstract=940092

Zentner, Alejandro, "File Sharing And International Sales Of Copyrighted Music: An Empirical Analysis With A Panel Of Countries," *Berkeley Electronic Press, Topics in Economic Analysis & Policy*: Vol. 5: No. 1, Article 21, 2005.

Zentner, Alejandro, "Measuring The Effect Of File Sharing On Music Purchases," *Journal of Law and Economics*, April 2006, pp. 63-90.

Zentner, Alejandro, "Online Sales, File Sharing, and the Decline of Retail Music Specialty," 2007.

Table 1
Percent of all Classrooms, Computer Labs, and
Library/Media Centers with Internet access

	Fraction of Low Income Students			
Year	Less than 35%	35%-49%	50%-74%	75% or more
1994	3%	2%	4%	2%
1995	9%	6%	6%	3%
1996	17%	12%	11%	5%
1997	33%	33%	20%	14%
1998	57%	60%	41%	38%
1999	73%	69%	61%	38%
2000	82%	81%	77%	60%
2001	90%	89%	87%	79%
2002	93%	90%	91%	89%
2003	95%	93%	94%	90%

source: US Department of Education
<http://nces.ed.gov/programs/digest/d05/tables/dt05_416.asp>

Table 2
Counties with Highest Percent Population Aged 15-25 and Associated Universities

State	County	County Popl.	Popl. Aged 15-25	Percent Aged 15-25	Major Institution	2004 Enroll.	Enroll. as Percent of Popl.
VA	Harrisonburg City	37,974	15,891	41.8%	James Madison U.	16,108	42.4%
ID	Madison	27,450	11,483	41.8%	BYU Idaho	11,555	42.1%
KS	Riley	64,615	23,086	35.7%	Kansas State U.	23,151	35.8%
WA	Whitman	40,164	14,298	35.6%	Wash State U.	23,241	57.9%
TX	Brazos	146,353	50,373	34.4%	Texas A&M	44,435	30.4%
VA	Montgomery	81,225	27,169	33.4%	Virginia Tech	27,619	34.0%
OH	Athens	61,588	20,503	33.3%	Ohio U.	20,143	32.7%
MS	Oktibbeha	41,245	13,551	32.9%	Miss. State U.	15,934	38.6%
GA	Clarke	98,961	32,395	32.7%	U. of Georgia	33,405	33.8%
MI	Isabella	61,812	19,958	32.3%	Mich State U.	44,836	72.5%
IA	Story	78,315	24,593	31.4%	Iowa State U.	26,380	33.7%
WY	Albany	31,976	9,964	31.2%	U. of Wyoming	13,207	41.3%
IL	McDonough	33,360	10,298	30.9%	Western IL U.	13,558	40.6%
NC	Watauga	41,497	12,774	30.8%	Appalachian St. U.	14,653	35.3%
PA	Centre	135,028	41,325	30.6%	Penn. State U.	41,289	30.6%
MS	Lafayette	37,366	11,401	30.5%	U. of Mississippi	14,497	38.8%
IN	Monroe	118,199	35,889	30.4%	Indiana U.	37,821	32.0%
SD	Brookings	27,631	8,263	29.9%	S. Dakota State U.	10,884	39.4%
LA	Lincoln Parish	42,641	12,701	29.8%	Grambling State U.	5,039	11.8%
NY	Tompkins	97,296	28,730	29.5%	Cornell U.	19,518	20.1%
IL	Jackson	59,873	17,609	29.4%	Southern IL U. - Carbondale	21,589	36.1%
OK	Payne	66,897	19,549	29.2%	OK State U.	23,819	35.6%
VA	Charlottesville City	41,950	12,199	29.1%	U. of Virginia	23,341	55.6%
KS	Douglas	96,464	27,973	29.0%	U. of Kansas	26,980	28.0%
GA	Bulloch	54,250	15,504	28.6%	GA Southern U.	16,100	29.7%
IN	Tippecanoe	145,981	41,121	28.2%	Purdue U.	40,108	27.5%
ID	Latah	34,442	9,443	27.4%	U. of Idaho	12,824	37.2%
WV	Monongalia	81,533	21,757	26.7%	West Virginia U.	25,255	31.0%

Enrollment figures from IPEDS data. The table excludes counties with fewer than 25,000 residents.

Table 3
Average number of Music Stores per County

Year	All Stores	Stores with 1-4 Empl.	Stores with 5-9 Empl.	Stores with 10+ Empl.
1994	5.72	2.12	2.24	1.36
1995	5.79	2.10	2.22	1.46
1996	5.79	2.10	2.31	1.38
1997	5.34	2.46	1.72	1.15
1998	5.17	1.91	1.96	1.29
1999	5.05	1.80	1.83	1.43
2000	5.00	1.70	1.58	1.72
2001	5.00	1.71	1.86	1.42
2002	4.81	1.78	1.65	1.37
2003	4.16	1.55	1.41	1.20
2004	3.81	1.62	1.01	1.19

Table 4
Percent of Counties with a Music Store

Year	All Stores	Stores with 1-4 Empl.	Stores with 5-9 Empl.	Stores with 10+ Empl.
1994	69.3%	54.6%	50.3%	33.7%
1995	71.6%	54.6%	51.5%	36.1%
1996	73.2%	53.4%	54.8%	35.1%
1997	72.1%	60.4%	48.1%	34.7%
1998	72.6%	51.4%	54.4%	37.7%
1999	72.9%	50.0%	53.6%	41.1%
2000	72.7%	49.2%	49.0%	47.9%
2001	74.0%	48.5%	56.4%	40.2%
2002	73.4%	49.5%	51.2%	40.4%
2003	70.4%	43.3%	47.3%	41.1%
2004	68.2%	45.1%	39.4%	41.7%

Table 5
The Determinants of the Ln(Number of Music Stores)

	Model 1		Model 2		Model 3	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Year 1995 Dummy	0.045	(0.055)	0.041	(0.057)	-0.030	(0.073)
Year 1996 Dummy	0.095	(0.055)	0.091	(0.057)	0.034	(0.073)
Year 1997 Dummy	0.043	(0.056)	0.040	(0.057)	-0.102	(0.073)
Year 1998 Dummy	0.063	(0.055)	0.059	(0.057)	-0.042	(0.073)
Year 1999 Dummy	0.079	(0.055)	0.097	(0.058)	-0.069	(0.073)
Year 2000 Dummy	0.047	(0.054)	0.109	(0.059)	-0.062	(0.073)
Year 2001 Dummy	0.064	(0.054)	0.147*	(0.058)	-0.017	(0.073)
Year 2002 Dummy	0.069	(0.055)	0.154**	(0.058)	-0.031	(0.072)
Year 2003 Dummy	-0.041	(0.055)	0.044	(0.058)	-0.175*	(0.073)
Year 2004 Dummy	-0.038	(0.055)	0.048	(0.059)	-0.156*	(0.073)
Fraction Youth	0.488	(0.677)	0.516	(0.677)	-0.377	(0.717)
FrcYouth x 1995	-0.032	(0.378)	-0.033	(0.378)	0.554	(0.540)
FrcYouth x 1996	-0.345	(0.378)	-0.346	(0.377)	0.125	(0.538)
FrcYouth x 1997	-0.315	(0.380)	-0.317	(0.380)	0.884	(0.538)
FrcYouth x 1998	-0.490	(0.374)	-0.492	(0.373)	0.359	(0.534)
FrcYouth x 1999	-0.628	(0.371)	-0.635	(0.371)	0.766	(0.531)
FrcYouth x 2000	-0.457	(0.363)	-0.477	(0.363)	0.980	(0.511)
FrcYouth x 2001	-0.521	(0.364)	-0.547	(0.363)	0.829	(0.514)
FrcYouth x 2002	-0.829*	(0.365)	-0.853*	(0.365)	0.687	(0.515)
FrcYouth x 2003	-0.794*	(0.367)	-0.811*	(0.367)	1.007	(0.517)
FrcYouth x 2004	-1.222**	(0.369)	-1.238**	(0.369)	0.458	(0.521)
Ln(population)	-0.024	(0.071)	-0.028	(0.071)	-0.050	(0.071)
Ln(E-Rate) 1 year lag			-0.003*	(0.001)	-0.003*	(0.001)
Ln(E-Rate) 2 year lag			-0.004**	(0.001)	-0.004**	(0.001)
Ln(E-Rate) 3 year lag			0.000	(0.001)	0.000	(0.001)
Fraction College	0.072	(0.427)	0.045	(0.427)	1.528**	(0.496)
FrcColl x 1995					-0.393	(0.271)
FrcColl x 1996					-0.298	(0.271)
FrcColl x 1997					-0.822**	(0.274)
FrcColl x 1998					-0.568*	(0.273)
FrcColl x 1999					-0.978**	(0.273)
FrcColl x 2000					-1.068**	(0.272)
FrcColl x 2001					-1.009**	(0.271)
FrcColl x 2002					-1.140**	(0.267)
FrcColl x 2003					-1.351**	(0.266)
FrcColl x 2004					-1.252**	(0.266)
R-squared	0.05		0.05		0.05	

Standard errors in parentheses; * significant at 5%; **significant at 1%;
15,401 total observations; 1,403 county fixed effects not reported.

Table 6
The Determinants of the Ln(Number of Music Stores) by Store Size

	Ln(Stores w/ 1-4 Empl)		Ln(Stores w/ 5-9 Empl)		Ln(Stores w/ 10+	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Year 1995 Dummy	-0.139	(0.086)	0.187*	(0.075)	-0.064	(0.059)
Year 1996 Dummy	-0.014	(0.086)	0.141	(0.074)	-0.024	(0.058)
Year 1997 Dummy	-0.044	(0.086)	0.042	(0.074)	-0.105	(0.058)
Year 1998 Dummy	0.034	(0.086)	-0.062	(0.074)	0.082	(0.058)
Year 1999 Dummy	-0.085	(0.086)	0.070	(0.074)	-0.002	(0.058)
Year 2000 Dummy	-0.166	(0.085)	0.120	(0.074)	0.070	(0.058)
Year 2001 Dummy	-0.094	(0.086)	0.101	(0.074)	0.081	(0.058)
Year 2002 Dummy	-0.015	(0.085)	0.005	(0.074)	0.124*	(0.058)
Year 2003 Dummy	-0.195*	(0.086)	-0.042	(0.074)	0.118*	(0.058)
Year 2004 Dummy	-0.156	(0.086)	-0.008	(0.075)	0.034	(0.059)
Fraction Youth	0.320	(0.609)	-0.199	(0.527)	0.120	(0.414)
FrcYouth x 1995	0.009	(0.084)	0.152*	(0.073)	-0.282**	(0.057)
FrcYouth x 1996	1.214	(0.845)	0.290	(0.732)	-0.632	(0.574)
FrcYouth x 1997	0.284	(0.584)	1.232*	(0.506)	-0.046	(0.397)
FrcYouth x 1998	1.062	(0.636)	-1.126*	(0.550)	0.692	(0.432)
FrcYouth x 1999	-0.108	(0.634)	-0.529	(0.548)	0.322	(0.431)
FrcYouth x 2000	0.973	(0.634)	-0.865	(0.548)	0.789	(0.431)
FrcYouth x 2001	-0.775	(0.629)	0.648	(0.544)	-0.269	(0.427)
FrcYouth x 2002	0.088	(0.625)	-0.262	(0.541)	0.594	(0.425)
FrcYouth x 2003	0.613	(0.602)	-1.027*	(0.521)	1.084**	(0.409)
FrcYouth x 2004	0.010	(0.606)	-0.136	(0.524)	0.362	(0.412)
Ln(population)	-0.368	(0.606)	-0.056	(0.525)	0.060	(0.412)
Ln(E-Rate) 1 year lag	-0.001	(0.001)	-0.003*	(0.001)	0.000	(0.001)
Ln(E-Rate) 2 year lag	0.000	(0.002)	-0.003*	(0.001)	-0.004**	(0.001)
Ln(E-Rate) 3 year lag	-0.001	(0.002)	0.002	(0.001)	0.000	(0.001)
Fraction College	0.185	(0.614)	-1.263*	(0.531)	0.815	(0.417)
FrcColl x 1995	-0.681	(0.319)	0.321	(0.276)	0.044	(0.217)
FrcColl x 1996	-0.264	(0.320)	0.249	(0.277)	-0.028	(0.217)
FrcColl x 1997	-0.836**	(0.323)	0.108	(0.279)	-0.293	(0.219)
FrcColl x 1998	-0.475	(0.322)	-0.236	(0.279)	-0.011	(0.219)
FrcColl x 1999	-0.826**	(0.322)	-0.411	(0.279)	0.047	(0.219)
FrcColl x 2000	-1.146**	(0.321)	-0.088	(0.278)	-0.114	(0.218)
FrcColl x 2001	-0.923**	(0.319)	-0.071	(0.276)	-0.010	(0.217)
FrcColl x 2002	-1.057**	(0.315)	-0.449	(0.273)	0.168	(0.214)
FrcColl x 2003	-1.152**	(0.314)	-0.682*	(0.272)	0.111	(0.213)
FrcColl x 2004	-1.042**	(0.314)	-0.479	(0.271)	-0.171	(0.213)
R-squared	0.04		0.07		0.04	

Standard errors in parentheses; * significant at 5%; **significant at 1%;
15,401 total observations; 1,403 county fixed effects not reported.

Table 7
The Determinants of the Ln(Employment in Music Stores)

	Model 1		Model 2		Model 3	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Year 1995 Dummy	0.058	(0.089)	0.065	(0.092)	0.025	(0.118)
Year 1996 Dummy	0.116	(0.089)	0.123	(0.092)	0.074	(0.117)
Year 1997 Dummy	-0.112	(0.089)	-0.105	(0.092)	-0.272*	(0.117)
Year 1998 Dummy	-0.008	(0.088)	-0.001	(0.092)	-0.107	(0.117)
Year 1999 Dummy	0.030	(0.088)	0.055	(0.093)	-0.115	(0.118)
Year 2000 Dummy	0.013	(0.087)	0.096	(0.095)	-0.080	(0.117)
Year 2001 Dummy	0.022	(0.087)	0.132	(0.094)	-0.036	(0.117)
Year 2002 Dummy	-0.045	(0.088)	0.060	(0.093)	-0.109	(0.116)
Year 2003 Dummy	-0.220*	(0.089)	-0.115	(0.094)	-0.329**	(0.117)
Year 2004 Dummy	-0.239**	(0.089)	-0.132	(0.094)	-0.337**	(0.118)
Fraction Youth	-3.097**	(1.089)	-3.067**	(1.089)	-3.940**	(1.156)
FrcYouth x 1995	0.304	(0.609)	0.302	(0.609)	0.630	(0.869)
FrcYouth x 1996	-0.033	(0.608)	-0.035	(0.607)	0.370	(0.866)
FrcYouth x 1997	0.702	(0.611)	0.700	(0.611)	2.121*	(0.866)
FrcYouth x 1998	0.558	(0.601)	0.555	(0.601)	1.443	(0.860)
FrcYouth x 1999	0.529	(0.598)	0.522	(0.597)	1.957*	(0.855)
FrcYouth x 2000	1.164*	(0.585)	1.140	(0.584)	2.635**	(0.824)
FrcYouth x 2001	0.833	(0.585)	0.803	(0.585)	2.212**	(0.828)
FrcYouth x 2002	0.864	(0.587)	0.836	(0.587)	2.246**	(0.829)
FrcYouth x 2003	1.255*	(0.590)	1.236	(0.590)	3.018**	(0.833)
FrcYouth x 2004	0.927	(0.594)	0.910	(0.594)	2.616**	(0.839)
Ln(population)	0.670**	(0.115)	0.665**	(0.115)	0.643**	(0.115)
Ln(E-Rate) 1 year lag			-0.003	(0.002)	-0.002	(0.002)
Ln(E-Rate) 2 year lag			-0.006**	(0.002)	-0.006**	(0.002)
Ln(E-Rate) 3 year lag			0.001	(0.002)	0.001	(0.002)
Fraction College	-0.197	(0.687)	-0.231	(0.687)	1.203	(0.799)
FrcColl x 1995					-0.210	(0.436)
FrcColl x 1996					-0.253	(0.437)
FrcColl x 1997					-0.986	(0.441)
FrcColl x 1998					-0.596	(0.440)
FrcColl x 1999					-1.004*	(0.440)
FrcColl x 2000					-1.102*	(0.439)
FrcColl x 2001					-1.036*	(0.436)
FrcColl x 2002					-1.042*	(0.430)
FrcColl x 2003					-1.323**	(0.429)
FrcColl x 2004					-1.257**	(0.429)
R-squared	0.03		0.03		0.03	

Standard errors in parentheses; * significant at 5%; **significant at 1%;
15,401 total observations; 1,403 county fixed effects not reported.

Table 8
The Determinants of the Ln(Stores)

	Video Games		Sporting Goods	
	Coef.	Std. Err.	Coef.	Std. Err.
Year 1995 Dummy	0.009	(0.085)	-0.008	(0.072)
Year 1996 Dummy	0.058	(0.084)	-0.013	(0.072)
Year 1997 Dummy	-0.109	(0.084)	-0.089	(0.072)
Year 1998 Dummy	-0.133	(0.084)	-0.106	(0.072)
Year 1999 Dummy	-0.156	(0.084)	-0.121	(0.072)
Year 2000 Dummy	-0.223**	(0.084)	-0.240**	(0.072)
Year 2001 Dummy	-0.192*	(0.084)	-0.244**	(0.072)
Year 2002 Dummy	-0.154	(0.083)	-0.245**	(0.071)
Year 2003 Dummy	-0.349*	(0.084)	-0.188**	(0.072)
Year 2004 Dummy	-0.437*	(0.085)	-0.182	(0.072)
Fraction Youth	-0.278	(0.827)	-3.540**	(0.708)
FrcYouth x 1995	-0.333	(0.623)	0.107	(0.533)
FrcYouth x 1996	-0.652	(0.620)	0.217	(0.531)
FrcYouth x 1997	-0.040	(0.620)	0.225	(0.531)
FrcYouth x 1998	-0.014	(0.616)	0.277	(0.527)
FrcYouth x 1999	-0.145	(0.612)	0.112	(0.524)
FrcYouth x 2000	0.222	(0.590)	0.859	(0.505)
FrcYouth x 2001	-0.096	(0.593)	0.899	(0.507)
FrcYouth x 2002	-0.210	(0.593)	1.128	(0.508)
FrcYouth x 2003	0.840	(0.596)	0.403	(0.510)
FrcYouth x 2004	1.507**	(0.601)	0.371	(0.514)
Ln(population)	0.430**	(0.082)	0.061	(0.070)
Ln(E-Rate) 1 year lag	0.001	(0.001)	0.000	(0.001)
Ln(E-Rate) 2 year lag	0.001	(0.001)	0.000	(0.001)
Ln(E-Rate) 3 year lag	-0.001	(0.001)	0.001	(0.001)
Fraction college	-0.694	(0.572)	0.237	(0.489)
FrcColl x 1995	0.189	(0.312)	-0.032	(0.267)
FrcColl x 1996	0.423	(0.313)	-0.082	(0.268)
FrcColl x 1997	0.452	(0.316)	0.020	(0.270)
FrcColl x 1998	0.396	(0.315)	0.046	(0.270)
FrcColl x 1999	0.334	(0.315)	0.020	(0.270)
FrcColl x 2000	0.396	(0.314)	-0.180	(0.269)
FrcColl x 2001	0.595	(0.312)	-0.251	(0.267)
FrcColl x 2002	0.453	(0.308)	-0.238	(0.264)
FrcColl x 2003	0.306	(0.307)	0.070	(0.263)
FrcColl x 2004	0.184	(0.307)	0.136	(0.263)
R-squared	0.02		0.03	

Standard errors in parentheses; * significant at 5%; **significant at 1%;
15,401 total observations; 1,403 county fixed effects not reported.