Expertise-Leveling Technology and the Division of Creative Labor

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Abstract

How does production adjust when technology lowers the expertise required to perform some tasks? I study digital sampling, which makes recorded performances reusable and reduces the expertise required for music production. I assemble novel data on production credits, sampling, artists' musical training, and content for 70,999 US records released between 1980 and 2000. A difference-in-differences design exploits geographic exposure to a new sampler's 1988 promotional campaign alongside Michael Jackson's tour. Campaign exposure increased sampling, with no detectable change in employment. Teams gained 0.45 musicians working exclusively in writing, composition, arrangement, and production, roughly 13 percent of the pre-period mean, without detectable broadening of individual task bundles. Artists associated with sampling were more likely to be self-taught and less likely to report formal musical training. Records became acoustically more differentiated from the previous year's releases, consistent with greater innovation in recorded sound. Lyrical differentiation showed no detectable change. The findings show that technology can change both the organization of production and innovation in output without a detectable employment response.

JEL: J21, J24, O33, L82, Z11
Keywords: technology and labor, task reallocation, creative industries, sampling, division of labor

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1 Introduction

Much of the debate over new technologies asks how many jobs they will replace. Yet employment is only one margin of adjustment. Technology can also change who can perform a task, how people work together, and what they produce. A long line of research examines how technological change alters the demand for skills, including by substituting for routine tasks and raising the returns to education and expertise (Tinbergen, 1974; Autor et al., 2003; Acemoglu and Autor, 2011). Technology can also lower the knowledge, training, or experience required to perform a task, allowing people to do work that previously required expertise they had not acquired.[1] Lower technical requirements may allow workers to perform more tasks themselves. Whether they actually do so remains an open question: production may instead adjust through changes in who contributes and what they produce. This raises a natural question: How does production adjust when technology lowers the expertise required to perform some tasks?

Recent studies of generative AI find productivity gains in several settings, often with the largest gains among less-experienced or lower-performing workers (Noy and Zhang, 2023; Brynjolfsson et al., 2025). These findings show that technology can improve workers' performance on tasks for which experience previously mattered. Its longer-run effects on employment, the organization of work, and output remain less well understood (Acemoglu et al., 2022; Humlum and Vestergaard, 2026). Studying these outcomes requires observing how production changes as people gain access to the technology and use it over time.

To examine such adjustments, I study digital sampling in US recorded music as an early example of a technology that lowered the expertise required to perform production tasks. Sampling allows musicians to reuse and rearrange recorded performances without acquiring the instrumental expertise required to play those parts themselves. The setting and data offer three advantages for studying this question. First, recording credits identify each contributor and the tasks attributed to them, allowing me to distinguish changes in team composition from changes in individual task bundles. Second, audio and lyrics allow me to measure changes in output alongside changes in the people making it. Third, I can follow these outcomes over a long period before and after the technology's introduction, enabling me to compare prior trends and trace how production adjusts over time.

[1] For example, automatic cameras reduced the technical knowledge required to focus and expose photographs, while desktop publishing software allowed users to prepare publications without mastering traditional typesetting techniques. See the Canon Camera Museum, https://global.canon/en/c-museum/product/film104.html, and the Computer History Museum, https://www.computerhistory.org/revolution/personal-computers/17/306.

I focus on the AKAI MPC60, introduced in 1988, which combined sampling, rhythm programming, sequencing, and arrangement within a single device. Its interface made these functions accessible through large pressure-sensitive pads and a relatively simple workflow, lowering the technical barriers to music production (Vox, 2018). Its promotional campaign included hands-on demonstrations for local producers and musicians alongside Michael Jackson's US *Bad* Tour, creating geographic variation in exposure to the device. I assemble data on 70,999 records produced in 7,229 US studios between 1980 and 2000, linking recording credits to sampling, artists' musical training collected from their biographies, audio features, and lyrics.

I use a difference-in-differences design to estimate the effects of campaign exposure. I compare the eighteen commuting zones reached by the campaign with commuting zones that hosted other major US tours that year, including tours by Bruce Springsteen and Pink Floyd, but were not exposed to the campaign. The pre-campaign period covers 1980–1988 and the post-campaign period covers 1989–2000. Event studies compare outcome trends before the campaign and estimate annual changes in exposed relative to comparison locations afterward.

I first examine whether the campaign increased technology use and whether employment changed as sampling spread. After 1988, the share of records using sampling rises by 2.4 percentage points in exposed relative to comparison commuting zones, against a pre-period mean of roughly 1 percent. The share of studios producing records using sampling also rises. These findings show that campaign exposure changed the use of sampling in local production. Despite this increase, I find no detectable change in the number of people working in music production relative to local population. Employment alone thus reveals little about how production adjusted to greater use of the technology.

Did musicians respond by performing more tasks themselves, or did the composition of teams change? Records in exposed commuting zones include more contributors working exclusively in creative authorship and production, the task category comprising writing, composition, arrangement, and production. After 1988, their number increases by 0.45 per record, roughly 13 percent of the pre-period mean of 3.37. I do not detect an offsetting decline in the other task-category groups, which include contributors working only in execution, such as playing instruments, singing, or technical work; in nonproduction, such as management or visual art; or across task categories. Individual task bundles show no detectable broadening: musicians do not become measurably more likely to work across task categories or to perform multiple tasks within creative authorship and production. The estimates suggest that the increase in creative contributors is more persistent in studios whose pre-campaign genres were

more conducive to sampling, consistent with adjustment continuing where the technology remained especially useful.

To describe the expertise of musicians associated with sampling, I compare their musical training backgrounds with those of other artists. Among artists, 65 percent of those associated with sampled records are self-taught, compared with 37 percent of other artists. They are also less likely to report formal or conservatory training and are younger on average. These differences are consistent with sampling making production accessible to musicians outside traditional training pathways.

The change in who contributes raises a further question: does the output change as well? Following work on differentiation in cultural products (Askin and Mauskapf, 2017), I measure each record's acoustic distance from music released in the preceding year. Campaign exposure increases this distance by 0.17 pre-period standard deviations, consistent with greater innovation in recorded sound. The corresponding measure for lyrics, a dimension the sampler does not directly simplify, shows no detectable change.

The findings offer two broader lessons. First, making some tasks more accessible can coexist with a greater role for specialists in other tasks. Records gain musicians working exclusively in creative authorship and production, while individual task bundles show no detectable broadening. Greater individual technical capability does not necessarily lead people to perform more tasks themselves. Second, technology can change both the organization of production and product differentiation without a detectable employment response. Evidence on individual performance or employment alone would miss these changes in team composition and output.

These findings are particularly relevant for creative production, where the development of ideas is closely connected to the technical expertise required to implement them. Arts and cultural production accounted for $1.17 trillion in value added, 4.2 percent of US GDP, and 5.4 million jobs in 2023 (Bureau of Economic Analysis, 2025). The music evidence shows that lowering technical requirements can change both who contributes and the resulting output.[2]

The paper contributes to three literatures. First, the paper contributes to research on how technological change alters the demand for skills and the allocation of work (Autor et al., 2003; Acemoglu and Autor, 2011; Goos et al., 2014; Acemoglu and Restrepo, 2019).[3]

[2]Creativity also matters outside the arts. The U.S. Department of Labor's O*NET identifies "Thinking Creatively" as an important activity across scientific, technical, managerial, and professional occupations (National Center for O*NET Development, 2026).

[3]Related work examines changes in task content and skill requirements, the emergence of new work, and worker adjustment within firms and occupations. See, among others, Spitz-Oener (2006); Lin (2011); Atalay

Recent work emphasizes how technology changes the expertise required to perform tasks. Autor and Thompson (2025) show that automation can raise or lower occupational expertise requirements depending on which tasks it removes, with different implications for wages and employment. Althoff and Reichardt (2026) examine how task simplification reshapes workers' comparative advantage. I contribute causal evidence on how production teams and their output adjust when technology lowers some expertise requirements. The findings show that making some tasks more accessible can support a greater role for specialists in other tasks, alongside changes in the products they create. The longer observation period also connects the paper to historical evidence on organizational adjustment following technological change (Baily et al., 2026). Demirer et al. (2026) distinguish the initial deployment of technology within existing jobs from subsequent changes in job boundaries and skill requirements. Jointly studying employment, team composition, individual tasks, and output complements evidence on how expertise-leveling technologies affect individual performance and skill acquisition (Autor et al., 2026).[4]

Second, the paper contributes to research on specialization and the division of labor by examining how greater individual technological capability changes the organization of production. The benefits of specialization depend on comparative advantage, knowledge, and the costs of coordinating workers (Becker and Murphy, 1992; Garicano, 2000; Jones, 2009; Dessein and Santos, 2006). Technology can alter these costs: Agrawal and Goldfarb (2008) find that electronic communication increased research collaboration. More directly, Dell'Acqua et al. (2026) show experimentally that individuals using AI can match the performance of teams without AI and produce solutions spanning different areas of expertise. I examine whether making several tasks easier for one person to perform changes the division of labor through broader individual task bundles or through team composition. Observing each musician's tasks on each record allows me to distinguish these responses. The evidence points to adjustment through team composition.[5]

Third, the paper contributes to the economics of creative production by examining how a production technology changes both the division of labor and the characteristics of output. Existing research studies the effects of digitization on the quantity, quality, and

et al. (2020); Deming and Noray (2020); Autor et al. (2024); Feigenbaum and Gross (2024); Bessen et al. (2025); Salomons et al. (2025).

[4]Recent studies separately examine effects of generative AI on productivity, worker performance, labor-market outcomes, and creative output (Noy and Zhang, 2023; Brynjolfsson et al., 2025; Humlum and Vestergaard, 2026; Abbas Nejad et al., 2025; Doshi and Hauser, 2024; Peng et al., 2023; Lin, 2025; Kim et al., 2026; Reimers and Waldfogel, 2026).

[5]Observing tasks within production teams complements evidence on differences in task content among workers in the same occupation (Autor and Handel, 2013).

value of creative products (Waldfogel, 2018; Aguiar and Waldfogel, 2018), differentiation and exploration in music (Askin and Mauskapf, 2017; Kim et al., 2024), and the organization and returns to creative labor (Rosen, 1981; Caves, 2000; Caoui and Galasso, 2025; Borowiecki, 2022). Research on sampling also examines how copyright enforcement changes patterns of creative reuse (Simcoe and Watson, 2019), while historical and institutional accounts describe how recording technologies reshape creative work and access to music production (Katz, 2004; Moorefield, 2010; Askin and Mol, 2018).[6] I show that exposure to a newly emerging production technology changes both team composition and the resulting output. This evidence extends the analysis beyond how technology changes the labor used to make a given product: the products themselves also adjust.

The remainder of the paper proceeds as follows. Section 2 describes recorded-music production, digital sampling, and the promotional campaign. Section 3 introduces the data and empirical strategy. Section 4 examines diffusion and employment, the division of labor, artist backgrounds, and recording characteristics. Section 5 concludes.

2 Background

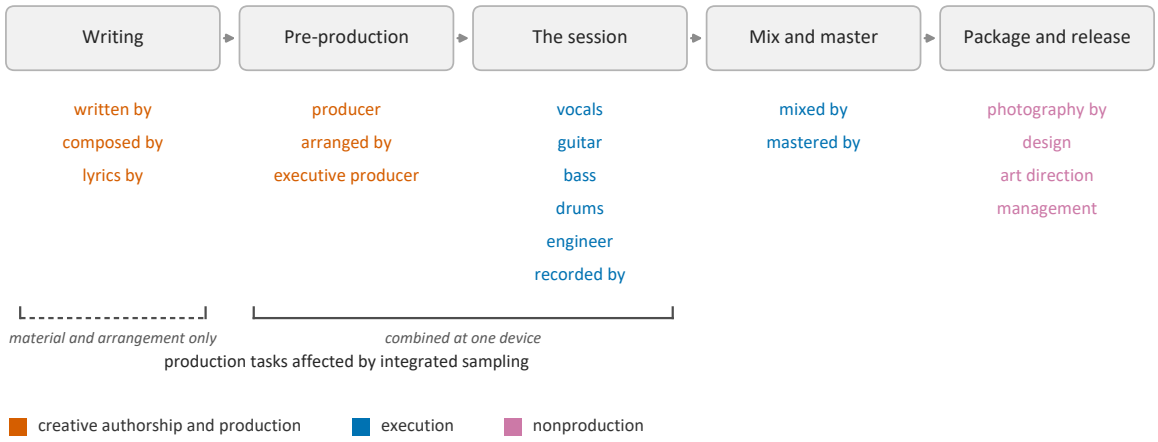
2.1 Teams in recorded-music production

Recorded music is produced by project teams that bring together specialists for individual recordings (Caves, 2000). Their tasks fall into three broad task categories used throughout the paper. *Creative authorship and production* includes writing, composition, arrangement, and production: songwriters, composers, and lyricists create the musical material and words; arrangers adapt this material for particular instruments and voices; and producers coordinate the recording process and shape its sound (Passman, 1994, p. 134). *Execution* includes performance and technical tasks: vocalists and instrumentalists perform the parts, recording engineers capture them, mixing combines the recorded parts, and mastering prepares the recording for release. *Nonproduction* includes activities surrounding the release, such as photography, cover design, management, and the scouting and development of artists. These categories distinguish functions in production; performance and technical work also involve creative judgment.

[6] A broader literature outside economics uses sampling relationships to study musical influence across songs, artists, and genres (Bryan and Wang, 2011; Figueiredo et al., 2024), the transmission of sampling practices through collaboration networks (Youngblood, 2019), and the effects of musical reuse on sales of and interest in the original recordings (Schuster et al., 2019; dos Santos and Figueiredo, 2024).

The division of labor is observable through the credits published with records, which identify the people involved and the tasks attributed to them. These task categories do not imply that each person works in only one category. A musician who writes a song and plays an instrument combines creative authorship and production with execution; someone who only writes or arranges remains within creative authorship and production. These credits allow me to examine both team composition and individual task bundles. Figure 1 places common credit labels along the production sequence and maps them into the three task categories. It also shows where sampling and sequencing brought several tasks into the same device, while mixing, mastering, and activities surrounding the release remained outside the sampler's direct reach. Section 3.1 formalizes the classification used in the empirical analysis.

Figure 1: The recording production process and its credit categories



Note. The figure places common credit labels along the production process and colors them by the three task categories used in the analysis: creative authorship and production, execution, and nonproduction. The annotation beneath identifies tasks affected by integrated sampling. The solid segment marks tasks that could be combined in one device; the dashed segment over writing indicates that sampling also provided recorded material for creating new music, without itself writing or composing. Mixing, mastering, cover design, and business activities remained outside the sampler's direct reach.

2.2 Digital sampling and the sampler

Multitrack recording had already made it possible to construct records from separately recorded parts (Moorefield, 2010; Katz, 2004). Digital sampling turns existing recordings into inputs that can be cut, repeated, rearranged, and combined into new music. Unlike musical notation, a sample preserves a particular recorded performance (Katz, 2004). A producer can reuse that performance without recreating the musical element in a new studio session. Sampling changes both the source of musical material and the expertise required to work with it: a musician can incorporate an instrumental passage without knowing how to play

the instrument. The expertise embodied in the original performance remains an input into production, but the musician reusing it does not have to acquire that expertise.

Digital sampling was available before the 1988 campaign, but early devices were expensive. The Fairlight CMI, introduced in 1979, cost around $25,000, making ownership a substantial investment.[7] Later devices, including the E-mu SP-1200 introduced in 1987, combined sampling with the ability to program drum patterns. The AKAI MPC60, introduced in 1988, combined these functions with sequencing: recording when sounds should play and organizing musical parts into sequences and songs. It could sequence both sounds stored in the device and sounds played by external electronic instruments (Trask, 1988). A contemporary review noted that earlier devices combining sampling and sequencing had seen limited adoption and emphasized how straightforward sampling was on the MPC60 (Trask, 1988). Its interface provided large pressure-sensitive pads for playing recorded sounds, familiar recording and playback controls, and built-in help. Musicians could record a sound, assign it to a pad, and incorporate it into a musical sequence within the same device. They could then rearrange the parts by changing their placement, repetition, and combination, hearing the result as they worked. This made it easier to combine contributions and try different arrangements without requiring a new performance of every part. The device also supported programming drum patterns and sequencing external instruments without reusing an existing recording. Its accessible interface brought these production capabilities to musicians without extensive studio experience (Vox, 2018).

These capabilities changed the requirements of several production tasks. Existing performances could substitute for newly played parts, while programmed repetition and timing correction reduced the instrumental precision needed to construct rhythmic passages. Combining and rearranging those parts within one device could also reduce the coordination required across separate performers and equipment (Arditi, 2014; Moorefield, 2010). Some tasks within execution became easier to perform, while selecting material, arranging musical elements, and shaping the recording remained human decisions within creative authorship and production. The sampler could allow musicians to take on more tasks themselves or make it easier to combine the work of specialists. The analyses in this paper focus on 1980–2000: digital sampling was still in an early stage before 1980, while the spread of digital audio software after 2000 changed the technological setting.

[7] Price documentation at https://www.perfectcircuit.com/signal/fairlight-cmi-history.

2.3 The *Bad* Tour and the AKAI road clinics

In 1988, AKAI organized a series of demonstrations of the sampler alongside the US leg of Michael Jackson's *Bad* World Tour, which played major arenas and stadiums across the country (Halstead and Cadman, 2003; Billboard, 1988). Three members of Jackson's touring band proposed holding demonstrations during their time between concerts. The resulting road clinics followed the tour itinerary, with weekly demonstrations led by the band's drummer and two keyboard players and coordinated by AKAI's US product manager, Mike McRoberts.[8]

The clinics introduced local musicians and recording professionals to the sampler through demonstrations by musicians using it professionally. The setup combined the sampler with other electronic instruments and recording equipment, showing how the devices could be used together. Figure 2 shows the sampler, an AKAI promotional photograph of the touring musicians with the equipment, and a contemporary road-clinic advertisement. Appendix B documents the tour itinerary and the surviving clinic evidence. Appendix Figure B.1 reproduces a photograph of a clinic published in *Music Trades* in October 1988.

A contemporary account describes the clinics as two-hour demonstrations with questions from the audience (Music Trades, 1988, p. 39). To demonstrate the MPC60's ease of use, Greg Phillinganes, a keyboardist in Michael Jackson's touring band, invited a child from the audience to program a drum pattern. He then took the pattern and "turned it into a complete song (Music Trades, 1988, p. 39)." The musicians also showed how to construct a recording of a Stevie Wonder song: Ricky Lawson, the band's drummer, programmed the drums, Phillinganes recorded the keyboard parts, and Lawson acted as recording engineer. The demonstrations connected learning to operate the device with using it to develop songs and combine musical contributions.

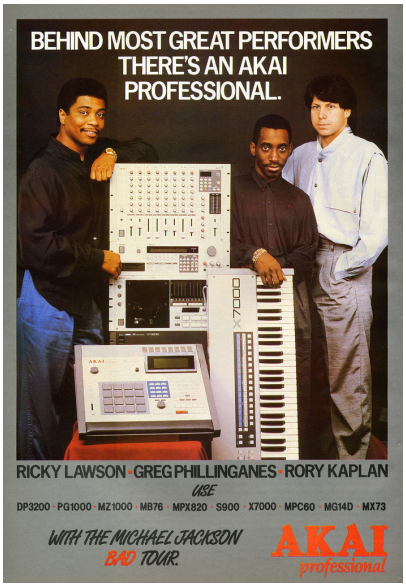
2.4 Copyright clearance and attribution

Sample clearance involves obtaining permission from the relevant rights holders to use sampled material. Before clearance became standard practice, some sampled recordings were released without formal licenses (Demers, 2006). The December 1991 ruling in *Grand Upright Music, Ltd. v. Warner Bros. Records Inc.*, 780 F. Supp. 182 (S.D.N.Y. 1991), found infringement in the unauthorized use of a sampled recording and contributed to clearance becoming standard

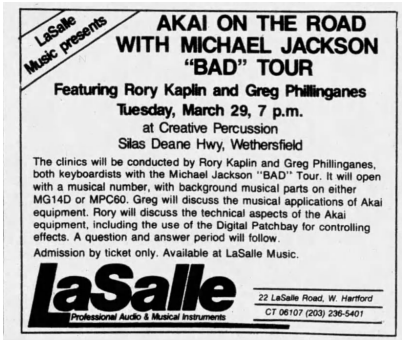
[8]The account of the clinics' organization and weekly format comes from McRoberts's published interview, in which he reports that the musicians held clinics in every city visited by the tour: https://www.bboytechreport.com/2013/01/11/interview-with-mike-mcroberts/.

Figure 2: The AKAI MPC60 and the 1988 road clinics

(a) The AKAI MPC60



(b) Touring musicians with AKAI equipment



(c) A road-clinic advertisement

Note. Panels (a) and (b) are AKAI promotional photographs from the 1988 campaign, kindly shared by Mike McRoberts. Panel (c) is an advertisement published in *The Valley Advocate* (Hatfield, MA) on March 14, 1988, for a clinic scheduled for March 29 at Creative Percussion in Wethersfield, Connecticut; issue image accessed through Newspapers.com.

industry practice. Clearance can generate authorship credits for writers and composers of sampled works who did not participate in producing the new recording. An increase in writing and composition credits after 1991 could thus include additional attribution to earlier work. In the analyses, I use this timing to support the interpretation of the creative-contributor increase: changes before 1991 are less likely to reflect clearance attribution. I also remove writing and composition credits from sampled records released from 1992 onward to assess whether the increase persists.

3 Data and empirical strategy

3.1 Data

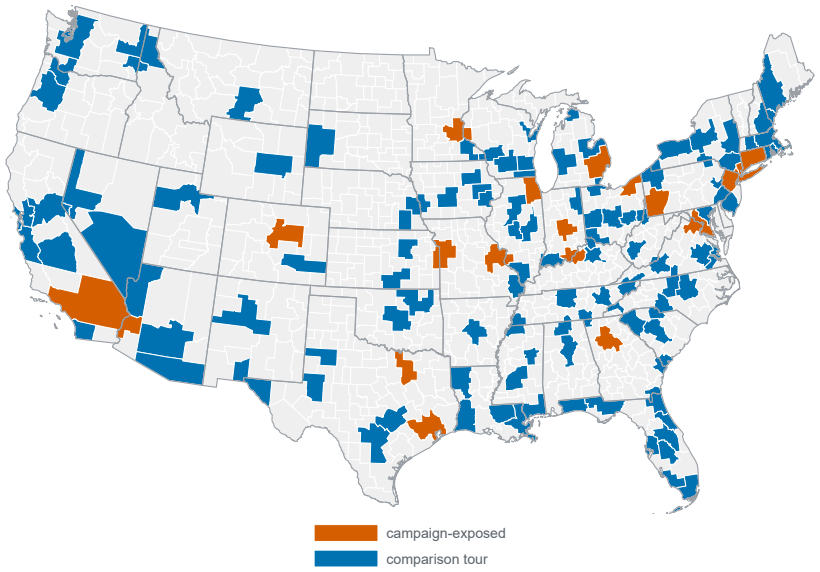
Sample and location. The sample covers commuting zones that hosted Michael Jackson's *Bad* Tour in 1988 and commuting zones that hosted the other top touring acts of 1988 but were not reached by the sampler campaign.[9] I classify a zone as exposed if Michael Jackson

[9]The comparison tours are the ten acts on *Amusement Business*'s year-end list of the top-grossing touring acts of 1988 (Amusement Business, 1988; Harrington, 1989). The list covers box scores reported between

performed there during the US *Bad* Tour in 1988.[10] The analysis follows recorded-music production from 1980 to 2000, covering the years before the campaign and more than a decade afterward.

Commuting zones group counties linked by commuting flows and approximate local labor markets (Tolbert and Sizer, 1996). I assign tour venues and recording studios to 1990 commuting zones, using concert dates and venues assembled principally from *Billboard*'s Boxscore reports. The sample contains 18 exposed and 107 comparison commuting zones, with 70,999 records produced in 7,229 studios. Figure 3 shows their geographic distribution.

Figure 3: Exposed and comparison commuting zones in the estimation sample



Note. Michael Jackson performed in the exposed commuting zones during the US *Bad* Tour in 1988. Comparison commuting zones hosted one of the other top touring acts of 1988 without the sampler campaign. Commuting zones outside the estimation sample are shown in the background.

Records and credits. The primary source for recording credits is Discogs, a user-maintained database containing release dates, track lists, recording studios, genres, and the credits published with records. The unit of observation is a record, dated by its release year. I retain records whose recording studio can be located in the continental United

December 1987 and November 1988, and its attendance figures are tour totals that include late-1987 and concerts held in Canada. Jackson's tour did not report to that list. In order of reported attendance, they are Aerosmith's *Permanent Vacation*, Pink Floyd's *A Momentary Lapse of Reason*, Def Leppard's *Hysteria*, the Grateful Dead's 1988 US dates, AC/DC's *Blow Up Your Video*, Bruce Springsteen's *Tunnel of Love*, the *Monsters of Rock* festival tour, Whitesnake's 1987–1988 tour, John Cougar Mellencamp's *Lonesome Jubilee*, and George Michael's *Faith*. Only US concerts that took place in 1988 define comparison zones.

[10] Appendix Table B.1 lists the concerts that took place, with their venues and dates, alongside destinations the tour announced or considered but never visited. The concerts took place in eighteen commuting zones.

States. For each record, I observe the people named in its credits and the tasks attributed to them, allowing me to measure how work is distributed within the team. Appendix A.1 describes record construction and studio matching; Appendix A.8 examines credit coverage across release formats. The organizational sample contains 70,994 records with classified tasks. Appendix Table A.1 reports the observation count at each stage of the construction, from Discogs releases to the estimation sample of records, and Appendix Table C.1 reports summary statistics for records and commuting zones in exposed and comparison locations.

Sampling and employment. I use the website WhoSampled to identify links between recordings and the earlier recordings they sample. I classify a record as using sampling if at least one of its tracks is linked to a sampled recording. At the commuting-zone-year level, I calculate the share of records using sampling and the share of active studios producing at least one such record. WhoSampled may miss uses of sampling, so a record without a listed sample does not necessarily contain none. Appendix A.2 describes the matching procedure and measurement checks.[11]

Employment in music production is measured as the number of distinct people appearing in record credits within a commuting zone and year, per 100,000 residents aged 20–64. The measure is an extensive-margin one: a person counts once in a commuting-zone-year if they appear in any credit, regardless of the number of records or tasks associated with them. Production credits carry no hours, earnings, or contract terms, so I cannot observe changes in how much each person works, or in what they are paid. Throughout the paper, employment refers to this extensive margin. The population denominator comes from annual SEER county population estimates, aggregated to commuting zones. Appendix A.4 documents its construction.

Division of labor. I classify record credits into the three task categories introduced in Section 2.1: creative authorship and production, execution, and nonproduction. From these assignments, I construct measures of task allocation, team composition, and individual breadth.[12]

To measure team composition, I classify each person on a record into one of four mutually exclusive groups: those working only in creative authorship and production, only in execution, only in nonproduction, or across two or more task categories. The number of people in each

[11] Appendix Figure A.1 shows how the linked sources nest, from records to studios to commuting zones, and the coverage of each measure across them.

[12] Appendix Table A.2 reports pre-campaign team size and task composition by genre.

group measures its contribution to team size; dividing by the total number of people on the record gives its share of the team. The share working across task categories also measures individual breadth. I additionally measure the share of people holding multiple distinct tasks within creative authorship and production, whether or not they also hold tasks in another task category.

To measure task allocation, I calculate each task category's share of all listed contributions, counting a person separately for each task they perform. I refer to these as task shares in the results. These shares give more weight to people who hold multiple credits, whereas the team-composition measures count each person once. For example, a musician listed as both writer and producer contributes two credit lines to creative authorship and production but counts as one person in the corresponding team-composition group. I further separate creative authorship and production into two components: writing and composition; and production, arrangement, and conducting. Appendix A.6 reports the credit labels and classification rules.

Recording characteristics. I link records to Spotify Echo Nest acoustic characteristics, MusicFlamingo audio embeddings, and lyrics from Genius. The acoustic characteristics measure properties of recorded sound and have been used to study differentiation in popular music (Askin and Mauskapf, 2017), while the audio embeddings provide an alternative way to compare how recordings sound. Lyrics allow a separate comparison of verbal content. I use these sources to measure how records differ from earlier recordings, following the broader idea of characterizing creative output relative to prior musical styles (Borowiecki and Mauri, 2024), with construction details and coverage checks reported in Appendix H.

Artist backgrounds. I link the main artists associated with records to Wikidata and Wikipedia biographies to collect information on musical training, education, birthplace, and birth year. For musical training, I distinguish descriptions of self-teaching and formal instruction. When a biography provides no information on a characteristic, I leave it unclassified. I use documented training characteristics to compare main artists associated with records using sampling with those associated with other records. Appendix A.7 describes collection and coverage.

Local characteristics. Predetermined commuting-zone characteristics, including population, density, urban share, education, and income, come from the 1980 Census. Employment data come from County Business Patterns as imputed by Eckert et al. (2021), and annual local personal income comes from the BEA. In robustness checks, I interact predetermined charac-

teristics with year indicators and examine employment and income as additional outcomes to assess broader local economic changes. Appendix A.4 documents their construction.

3.2 Empirical strategy

I estimate the effects of local campaign exposure using a difference-in-differences design, comparing changes in production in exposed and comparison commuting zones. Exposure is assigned by recording location, which can differ from where contributors live.

I use locations hosting other major tours as comparisons because Jackson's tour visited major concert destinations: Both groups hosted major concerts in 1988, but only Jackson's tour was accompanied by the sampler campaign. Appendix Table C.1 reports pre-campaign characteristics of the two groups.

Event studies are the main specification, tracing pre-campaign trends and the timing of subsequent adjustment. The analysis takes place at two levels: diffusion and employment are measured for each commuting zone and year, while the division of labor and recording characteristics are measured for each record.[13] I estimate

$$Y_{mt} = \sum_{\tau \neq 1988} \beta_\tau \left(\text{Exposed}_m \times \mathbf{1}\{t = \tau\}\right) + \mu_m + \rho_{d(m),t} + \varepsilon_{mt}, \tag{1}$$

$$Y_a = \sum_{\tau \neq 1988} \beta_\tau \Big(\text{Exposed}_{m(a)} \times \mathbf{1}\{t(a) = \tau\}\Big) + \mu_{g(a)} + \rho_{d(a),t(a)} + \varepsilon_a. \tag{2}$$

In Equation (1), Y_{mt} is an outcome in commuting zone m and year t. In Equation (2), Y_a is an outcome for record a, with $m(a)$, $d(a)$, and $t(a)$ denoting its recording commuting zone, census division, and release year. Exposed indicates a commuting zone that hosted the tour. Each β_τ measures the difference between exposed and comparison locations in year τ relative to their difference in 1988.

Equation (1) includes commuting-zone fixed effects μ_m to account for persistent differences between locations. In Equation (2), $g(a)$ denotes the recording studio for the preferred organizational specification, so the estimates compare records produced within the same studios over time. In an alternative organizational specification, I use commuting-zone fixed effects to allow entry and exit of studios. When studying output, instead of organizational outcomes, I employ commuting-zone fixed effects. Both equations include census-division-by-

[13] The commuting-zone panel contains 125 zones. Eight comparison zones have no records, so the sampling-adoption and organizational samples cover 117 zones, 99 of them comparison zones.

year fixed effects ρ, so identification uses variation across commuting zones within the same census division.

The identifying assumption is that, absent the sampler campaign, outcomes in exposed and comparison locations would have followed parallel trends conditional on the respective fixed effects. Different pre-campaign levels do not violate this assumption, but different trends would. For example, changes in the genres produced in large recording centers could affect both sampling and creative contributions independently of the campaign. The pre-campaign event-study coefficients show whether outcome trends differed before exposure. I also interact initial local characteristics with year indicators, allowing outcome paths to vary with pre-campaign density, urban share, and income.

Pooled difference-in-differences estimates summarize the average effect over 1989–2000. Records released in 1988 may have been recorded before the local demonstration, so the post-campaign period starts in 1989.[14] For both commuting-zone-year and record-level analyses, standard errors are clustered by commuting zone. With 18 exposed zones, the main confidence intervals use the bias-reduced cluster-robust CR2 estimator with coefficient-specific Satterthwaite degrees of freedom (Imbens and Kolesár, 2016).

4 Results

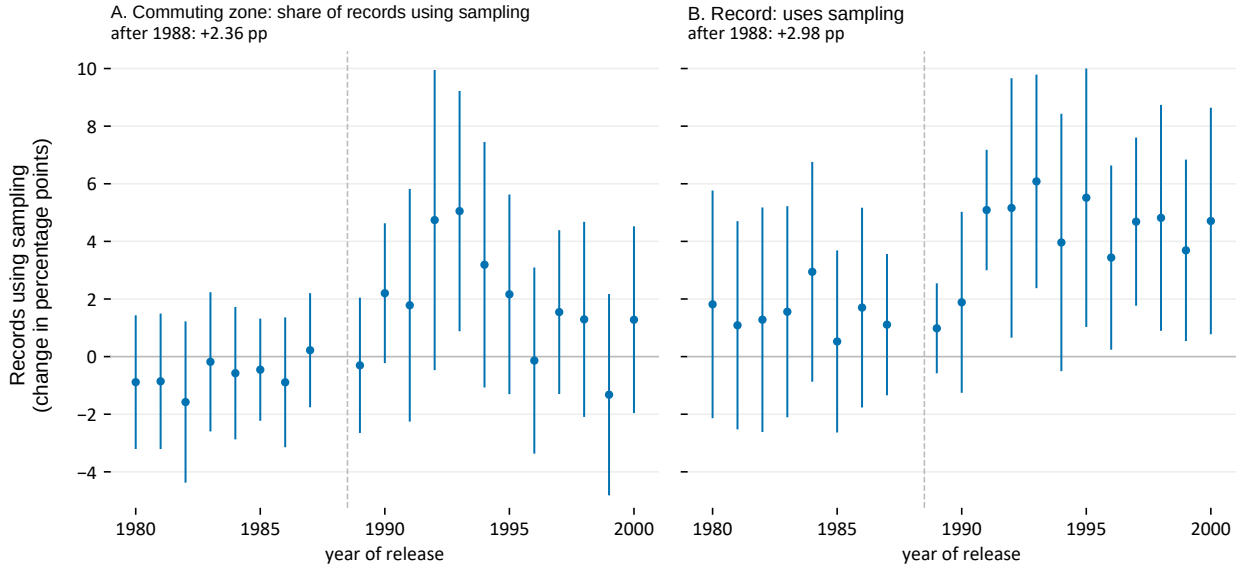
4.1 Diffusion

Did the campaign increase the use of sampling? I compare records produced in locations reached by the demonstrations with records produced in locations that hosted other major tours in 1988. Figure 4 presents two ways of making this comparison. Panel A follows the share of records using sampling in each commuting zone and year, giving each active zone-year one observation. Panel B follows individual records, with an outcome equal to one if the record uses sampling. Both specifications include commuting-zone and census-division-by-year fixed effects. Panel A describes the change across local recording sectors; Panel B describes the change across individual records.

The two event studies show little differential movement before the campaign. Sampling rises in exposed relative to comparison locations soon afterward, reaches its largest difference around 1993, and then declines later in the decade. The pooled estimate in Panel A is an increase of 2.36 percentage points after 1988, against a pre-campaign mean of 1.00 percent.

[14] Appendix Table C.3 reports estimates after excluding 1988 and after treating 1988 as post-campaign.

Figure 4: The effect of campaign exposure on sampling adoption



Note. Both panels report annual estimates of campaign exposure relative to 1988. Panel A uses one observation per active commuting-zone-year, with the share of records using sampling as the outcome. Panel B uses one observation per record, with an indicator for sampling as the outcome. Both include commuting-zone and census-division-by-year fixed effects. Bars are 95% CR2 confidence intervals with coefficient-specific Satterthwaite degrees of freedom, clustered by commuting zone. The post-campaign period is 1989–2000.

Panel B gives an increase of 2.98 percentage points, or about three additional records using sampling per hundred records.[15] The share of active studios producing at least one record using sampling also rises (Appendix Table D.1). The increase thus appears both across local recording sectors and among the records and studios within them.

Robustness checks

To account for potential differences between tour venues, I conduct horse-race regressions in which I add pre-campaign population density, urban share, and income interacted with year effects. The corresponding event studies retain the early-1990s rise and the peak around 1993 (Appendix Figure D.2). I also examine broader local employment, working-age population, and income to assess whether the sampling increase coincided with a general expansion of the exposed locations. These outcomes show no clear common expansion beginning with the campaign (Appendix Table D.4 and Figure D.3).

To examine whether the comparison tours also led to increased sampling, I compare the 99 comparison-tour zones with records against 226 zones outside those tours, excluding locations

[15] Appendix Figure D.1 reports the raw annual sampling shares. Like Panel B, these series give each record equal weight. Appendix Table D.1 reports the pooled commuting-zone estimates.

reached by the sampler campaign. I find no sampling response to these tours (Appendix Table D.3). I also restrict the main comparison group to the first five or eight tours in reported attendance order and obtain nearly identical estimates (Appendix Table C.4).[16] These comparisons link the sampling increase to the tour carrying the demonstrations and show that it persists across choices of comparison locations.

I also use studio equipment listings to descriptively document sampler availability. The *Mix* directories cover a small, changing set of studios[17]. In their detailed equipment lists, I identify the MPC60 and its successor, the MPC3000. Listing rates for both products are similar in exposed and comparison zones through 1990, followed by a higher exposed share in 1991–1993 (Appendix Figure D.4). The equipment evidence therefore documents greater sampler availability in exposed locations in the same early-1990s period during which I observe the increase in sampling.

4.2 Employment

Does greater use of sampling reduce employment in music production? Reusing recorded performances can replace some newly performed parts, while lower technical requirements can also allow for the execution of a larger number of projects. I measure employment as the number of distinct people appearing in record credits in each commuting zone and year, relative to its working-age population. Each person counts once, regardless of how many records they contribute to. This measure captures participation in music production along the extensive margin; hours worked and earnings are not observed. Figure 5 compares its path in exposed and comparison locations. The figure displays no decline in employment in the post-period. If anything, employment rises throughout the mid-1990s, but effects are almost all statistically insignificant. The rise in sampling therefore was not accompanied by a reduction in the number of people working in music production relative to local population.

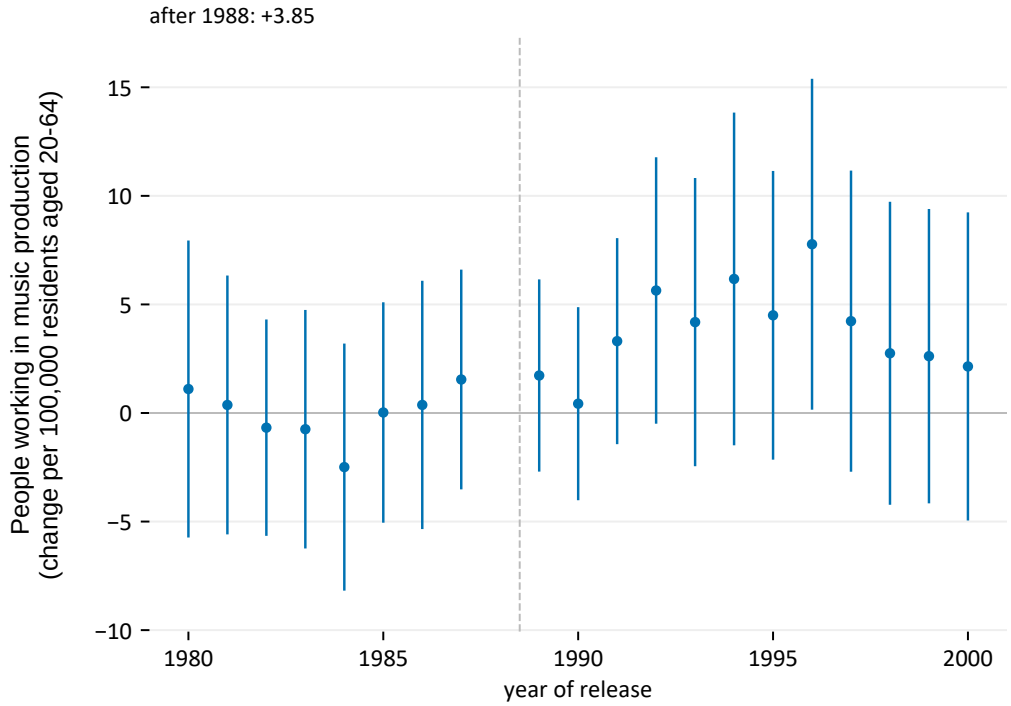
Robustness checks

To check whether the result depends on expressing employment relative to population, I examine contributor counts and working-age population separately, and estimate Poisson

[16] Appendix D.4 also compares the sampling estimate with estimates under alternative assignments of eighteen exposed zones. The reassignment p-values are 0.010 without restrictions, 0.021 within census divisions, and 0.006 within divisions and groups defined by pre-campaign recording activity.

[17] *Mix*, a professional recording-industry magazine, publishes a directory of recording studios and other audio facilities. See https://www.mixonline.com/recording/about-mix-magazine-375708.

Figure 5: The effect of campaign exposure on employment in music production



Note. Event-study estimates for the number of distinct people appearing in record credits per 100,000 residents aged 20–64, with 1988 as the omitted reference year. The specification includes commuting-zone and census-division-by-year fixed effects. Bars are 95% confidence intervals using CR2 with coefficient-specific Satterthwaite degrees of freedom, clustered by commuting zone.

models with a population offset (Appendix Table D.2). The rate and Poisson specifications detect no employment response, and working-age population shows little differential movement. Accounting for predetermined local characteristics (density, urban share and median income) also leaves no detectable response in the employment rate. The evidence reinforces the argument that music production adjusted without a detectable employment decline. The next question is how musicians' contributions to individual records changed as sampling spread.

4.3 Organization of production

Did musicians use the sampler to perform more tasks themselves, or did records bring together different contributions? To answer this, I examine both the composition of teams and the tasks their members perform. Recall that creative authorship and production comprises writing, composition, arrangement, and production; execution comprises performance and technical work; and nonproduction comprises activities surrounding the release, such as cover design and management. I count each contributor on a record to isolate those working only

in one category from those working across categories. Table 1 reports the changes after 1988 within recording studios in exposed relative to comparison locations.

Table 1: The effect of campaign exposure on team composition

	Contributors working only in				
	Creative authorship and production	Execution	Nonproduction	Across categories	Total team
Exposure × *Post*	0.449**	0.217	0.023	-0.132	0.556
	(0.160)	(0.196)	(0.071)	(0.145)	(0.406)
Studio FE	Yes	Yes	Yes	Yes	Yes
Division-by-Year FE	Yes	Yes	Yes	Yes	Yes
Observations	70,994	70,994	70,994	70,994	70,994
Mean of Dep. Var., 1980–1988	3.37	8.00	1.62	2.25	15.24

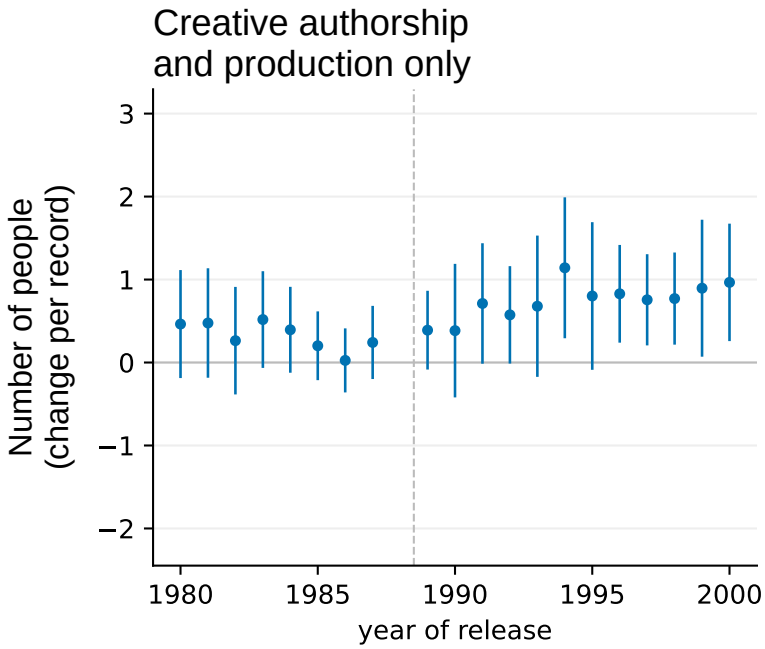
Note. Each column reports a pooled difference-in-differences estimate for the number of contributors per record, comparing 1989–2000 with 1980–1988. Exposure is assigned by the recording commuting zone. The first three columns count contributors working only in the stated category; the fourth counts contributors working across two or more categories. These four groups partition the team. Creative authorship and production includes writing, composition, arrangement, and production; execution includes performance and technical work; nonproduction includes activities surrounding the release. Parentheses report CR2 standard errors, clustered by commuting zone. Significance stars use two-sided t-tests with the reported Satterthwaite degrees of freedom ($\nu = 8.13$): *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. The sample contains 117 commuting zones, 18 exposed. Pre-campaign means use 1980–1988 records in the estimation sample. Figure 6 reports the creative-only contributor-count event study. Appendix Figure E.1 reports the other contributor counts and contributor shares, and Appendix Table E.1 reports the alternative fixed-effect specification and period comparisons.

Records gain 0.45 contributors working only in creative authorship and production, about 13 percent of the pre-campaign mean of 3.37. Writing and composition account for most of this increase (Appendix Table E.4). Figure 6 shows the event study estimates for the number of contributors working only in creative authorship and production. The execution and nonproduction event studies are reported in Appendix Figure E.1, Panels E and F, showing no significant change.

The organizational response for creative authorship and production develops over several years. Sampling rises soon after the campaign, while the number of musicians working only in creative authorship and production increases over the early 1990s (Figure 6). Their share of the team follows a similar path (Appendix Figure E.1, Panel A), and the shift in task shares becomes clearer around 1993 (Appendix Figure E.3). The increase in technology use thus precedes the more pronounced changes in the division of labor, showing that organizational adjustment continues beyond the initial adoption response.

This increase in creative contributors per record can coexist with the earlier finding of no detectable employment change. A musician contributing to several records counts once in local employment but appears on each record's team. Existing musicians could therefore contribute to more projects without the number of distinct people working locally increasing. The two results describe different margins of production: employment captures how many

Figure 6: The effect of campaign exposure on creative-only contributors



Note. Annual estimates of campaign exposure for the number of contributors per record working only in creative authorship and production. The reference year is 1988. Each contributor counts once if all their classified credits on the record fall within creative authorship and production. Regressions include studio and census-division-by-year fixed effects, following Equation (2). Bars are 95% CR2 confidence intervals with coefficient-specific Satterthwaite degrees of freedom, clustered by commuting zone. The sample contains 70,994 records in 117 commuting zones, 18 exposed. Appendix Figure E.1 retains the full figure, including execution and nonproduction counts and contributor shares. Table 1 also reports contributors working across categories and total team size.

people contribute in a location, while team composition captures how their contributions are combined on individual records.

Did the increase in creative contributors coincide with individual musicians taking on a broader range of work? I examine the share of musicians working across task categories and the share performing multiple tasks within creative authorship and production. For example, a writer who also acts as a performer works across categories, while a writer who also produces holds several creative tasks. Neither measure shows a detectable increase after the campaign (Appendix Figure E.2 and Table E.3, Panel A). The technology combined several functions in one device, but individual task bundles did not measurably broaden. Together with the increase in creative contributors, this points to adjustment through team composition.

The increase in creative contributors also appears in the allocation of tasks. In later years, creative authorship and production account for a larger share of tasks relative to execution (Appendix Figure E.3). Note that task shares count credits instead of people: a musician credited for both writing and production contributes two creative credits but counts once in

the contributor measures.[18] Additional credits involving creative tasks can therefore reduce execution's share of the total even when the number of execution credits does not fall. Indeed, the absolute execution-credit count shows no detectable decline (Appendix Table E.2). Records using sampling also have a larger creative-authorship-and-production share and a smaller execution share than other records in the descriptive comparison (Appendix Table G.1).

These findings connect changes in expertise requirements to the division of labor within production teams. Autor and Thompson (2025) emphasize that the consequences of automation depend on the expertise required by the tasks that remain. Sampling allows musicians to use recorded performances without acquiring the instrumental expertise needed to play them. Here, this greater technical capability is accompanied by more musicians working exclusively in creative authorship and production, without detectable broadening of individual task bundles. The findings show that making some tasks more accessible can support a greater role for specialists in other parts of production.

Robustness checks

One concern is that some additional authorship credits could belong to creators of earlier music rather than people working on the new recording. As discussed in Section 2.4, sample clearance obtains permission to reuse material and can generate credits for the writers and composers of that material. This became more common after the December 1991 *Grand Upright* ruling. In a robustness check, I remove writing and composition credits from sampled records released from 1992 onward. The exclusion removes new writing as well as attribution to earlier work, so it covers a broader set of contributions than clearance alone. Appendix Table E.6 reports the exercise, and Appendix Table E.7 provides complementary descriptive evidence separating sampled-work authorship. The creative-contributor estimate remains 0.35, compared with 0.45 in the baseline: the increase persists after removing these writing and composition credits, demonstrating that the effects are indeed driven by genuine changes to team composition.

To account for potential differences between tour venues, I restrict comparisons to larger or more active locations and include pre-campaign density, urban share, and income interacted with year fixed effects (Appendix Table E.5). The creative-contributor increase remains significant in these specifications. Comparisons only within the same primary genre also yield a positive estimate (Appendix Table E.9). Finally, a record made in several commuting zones

[18] Appendix Figure E.5 expresses the annual estimates relative to the pre-campaign average. Appendix Figure E.4 separates authorship from production and arrangement. Appendix Table C.2 explains the relation between pooled estimates and annual coefficients.

can be difficult to assign to one exposure group. Restricting the sample to records whose studios all lie in one zone retains the increase (Appendix Table E.5).[19] These checks show that the creative-contributor result also appears among more comparable recording locations and records with an unambiguous geographic assignment.

To describe where the organizational response persists, I separate studios by how conducive their pre-campaign production was to sampling. A studio's propensity is the average 1980–1987 sampling rate of its genres, weighted by its records; the split is at the record-weighted median.[20] The share of contributors working only in creative authorship and production rises in both groups during the mid-1990s. It subsequently falls back in lower-propensity studios and remains elevated in higher-propensity studios (Appendix Figure F.1). Sampling may remain useful across successive projects where reused sounds and programmed rhythms are common, while experience working with recorded material can make its use easier. The pattern places the more persistent creative-contributor response in studios whose earlier production offered greater scope for sampling.

4.4 Artist backgrounds

If recorded performances reduce the instrumental skills required to realize musical ideas, formal musical training may become less central to production. Therefore, I compare the training and prior experience of artists associated with sampling with those of artists on other records. The comparison is descriptive: sampling is endogenous, so it does not identify entry caused by the campaign.[21]

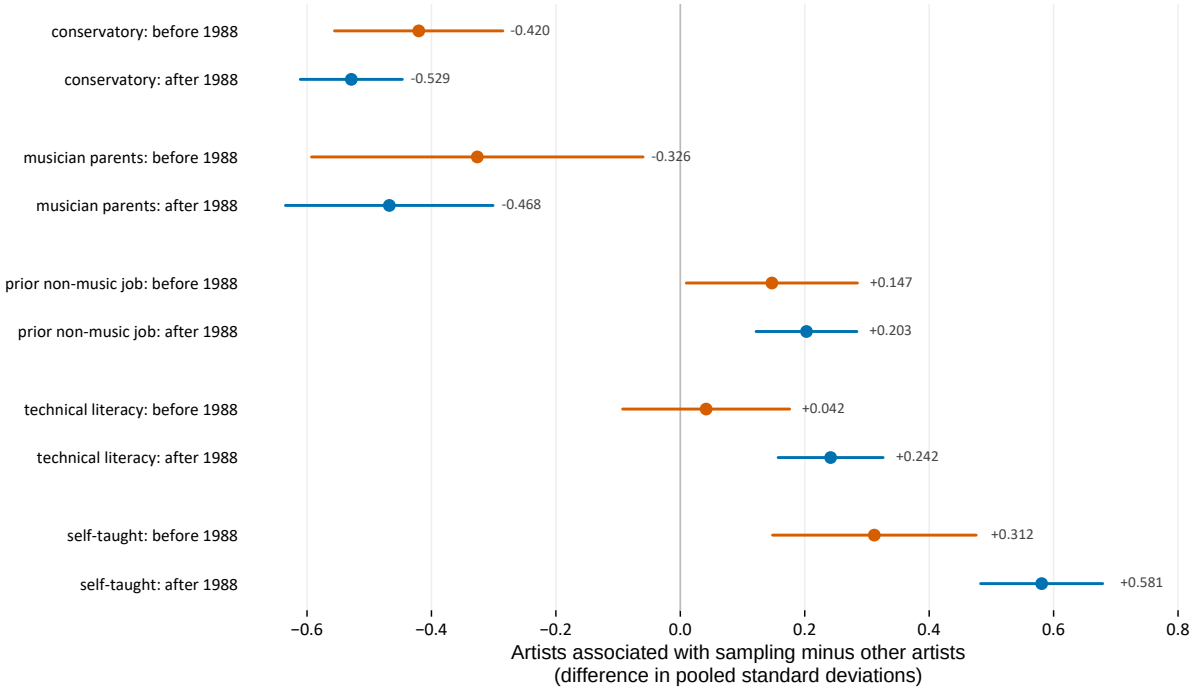
The largest differences concern musical training (Figure 7). Among artists with documented backgrounds after 1988, 65 percent of those associated with sampled records are self-taught, compared with 37 percent of other artists. This difference of 28 percentage points, equivalent to 0.58 standard deviations, is statistically significant at the 5 percent level. They are also less likely to have formal or conservatory training. Artists associated with sampling were born 12.7 years later on average (Appendix Table F.7, Panel B).

[19] Appendix Table E.9 compares release formats, and Figure E.6 reports their annual paths. Appendix Table E.8 compares alternative exposure assignments. Table F.1 reports heterogeneity by pre-campaign production practices.

[20] Appendix F.2 reports the group comparisons and alternative specifications, including the imprecisely estimated differences between groups.

[21] Artists move across locations over their careers, and I cannot reliably establish where each artist lived or worked in 1988. Assigning campaign exposure using the locations of their later recordings could therefore misclassify exposure and reflect subsequent location choices. I consequently compare artists associated with sampling with those on other records, rather than estimate campaign effects on artists' training backgrounds.

Figure 7: Training and background of artists associated with sampling



Note. Differences between main artists associated with records using sampling and other records, standardized by the pooled dispersion of each characteristic and reported separately for 1980–1988 and 1989–2000. Positive values indicate a higher mean among artists associated with records using sampling. These are descriptive comparisons. Coverage varies across characteristics; Appendix F.3 discusses the biographical comparisons.

These patterns are consistent with lower instrumental requirements, making production accessible to artists with different strengths, including skills developed outside formal musical training. Familiarity with technology could help artists manipulate and combine performances they could not execute themselves.

The comparison cannot determine whether artists bring existing technical skills to sampling or acquire them to use them. The latter possibility connects to Salomons et al. (2025), who show how technological change reshapes vocational training and how updated skills improve workers' labor market outcomes. Artists can differ in training even when they perform similar tasks: the background comparison concerns main artists, while the organizational analysis covers everyone working on a record.

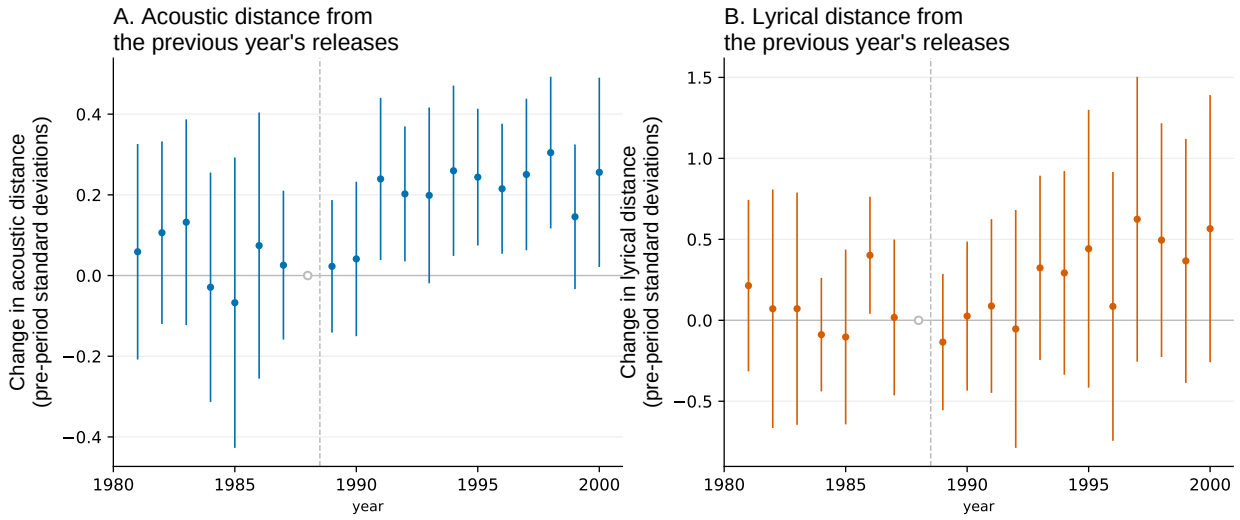
4.5 Output

Did access to sampling also change the music produced? Following Askin and Mauskapf (2017), I measure a record's acoustic distance from the previous year's releases as one minus its

average similarity to those releases across eleven acoustic characteristics, weighting comparison records by genre proximity. Higher values indicate greater acoustic differentiation from earlier releases.[22] I construct a corresponding lyrical measure from lyric embeddings using the same prior-year comparison.[23]

Figure 8 compares acoustic and lyrical distance in exposed and comparison locations, using commuting-zone and census-division-by-year fixed effects. Panel A shows little differential acoustic movement before the campaign or in 1989 and 1990. The coefficients become positive in 1991 and remain positive through 2000. The pooled increase after 1988 is 0.169 pre-period standard deviations. Panel B shows positive but imprecise estimates for lyrical differentiation. The changes in organization are accompanied by greater acoustic differentiation, consistent with greater innovation in recorded sound.

Figure 8: The effect of campaign exposure on acoustic and lyrical distinctiveness



Note. Event-study estimates with 1988 as the omitted reference year. Panel A reports one minus a record's genre-weighted mean acoustic similarity to the previous year's releases; Panel B reports the corresponding lyrical-distance measure. Outcomes are standardized by their pre-period dispersion, and panels use independent vertical scales. Both specifications include commuting-zone and census-division-by-year fixed effects. Bars are 95% confidence intervals using CR2 with coefficient-specific Satterthwaite degrees of freedom, clustered by commuting zone.

[22]The backward-looking comparison is related to Borowiecki and Mauri (2024). The measure correlates 0.96 with an unweighted comparison to all previous-year releases. Appendix H.4 reports a separate within-genre measure.

[23]Lyrical distance is adjusted for the relationship between lyric length and measured similarity using within-song truncation experiments; see Appendix H.2. Appendix Figure H.1 compares corrected and uncorrected lyrical-distance estimates. Neither detects a response. Appendix Figure H.5 shows no detectable change in lyrical coverage.

Robustness checks

I check whether the acoustic result depends on the way sound is represented or on the fixed-effect specification. Studio fixed effects give a similar response (Appendix H.3). MusicFlamingo, a large audio-language model, supplies an alternative representation of the recordings. Its estimate is positive and of similar magnitude on the same records, with less precision; matching the comparison set and genre weights also gives a similar estimate (Appendix Figure H.4). The positive acoustic response appears under both representations of sound and when following production within studios.

The musical reference set helps interpret this innovation. The main measure compares each record with the broader set of recent releases. Restricting the reference set to releases within the same genre produces no detectable increase, and a direct comparison shows a larger response under the broad measure (Appendix Table H.1). Holding primary genre fixed reduces the estimated increase on the same records from 0.17 to 0.05 pre-period standard deviations. Appendix Figure H.2 reports the three annual paths.[24] The acoustic change concerns how records relate to the wider range of recent music.

Commercial performance provides another dimension of output. I examine entry into the *Billboard* 200, weeks on the chart, and rank-weighted chart performance. During the study period the chart ranked albums by sales, so these outcomes describe relative market success when sales quantities are unavailable (Askin and Mauskapf, 2017; Billboard, 2014).[25] Appendix Table H.3 and Figure H.6 report the estimates. None detects a campaign response. The increase in acoustic innovation is accompanied by no detectable change in chart performance.

Creativity can involve combining existing elements in new ways (Charness and Grieco, 2019). Sampling makes recorded performances available for this process: musicians can select, transform, and combine musical parts without performing those parts themselves. Sequencing and rearrangement also make it easier to experiment with different combinations. By making musical ideas easier to realize, these capabilities can expand the possibilities for innovation. The increase in acoustic differentiation is consistent with musicians using these possibilities to develop recordings that differ from recent releases.

[24] Appendix Table H.2 and Figure H.3 report genre shares. These exercises describe changes in genre composition and the acoustic comparison without decomposing the response into their separate contributions.

[25] Askin and Mauskapf (2017) study the Hot 100 singles chart. The Billboard 200 outcomes used here reflect relative album sales and are not converted into dollar revenues.

5 Conclusion

Digital sampling made recorded performances reusable, allowing musicians to work with instrumental parts they could not play themselves. I show that exposure to the AKAI MPC60 sampler's 1988 promotional campaign increased sampling without a detectable employment response in music production. Furthermore, records gained musicians working only in creative authorship and production, while individual task bundles showed no detectable broadening. I demonstrate that artists associated with sampling were more often self-taught and less often formally trained. Finally, records became more acoustically differentiated from recent releases, consistent with greater innovation in recorded sound.

These findings show that technologies that expand individual capabilities can also deepen the division of labor. Autor and Thompson (2025) emphasize that the consequences of automation depend on the expertise required by the tasks that remain. This paper shows how changing expertise requirements can reshape both production teams and their output. When technology makes some tasks more accessible, production can adjust through a different composition of specialized contributions, without workers taking on broader individual roles. Greater individual technical capability does not necessarily translate into greater self-sufficiency in production; it can instead support a greater role for collaboration among specialists. A second lesson is that employment alone can miss substantial adjustments to technological change. Following production over more than a decade reveals changes in who contributes, how people divide tasks, and what they produce, even without a detectable employment response.

The reuse of human work also raises questions about ownership and returns. A recorded performance can become an input into later production without its creator participating again. Ownership and access terms can shape both the incentive to supply that work and who benefits from its subsequent use (Cullen et al., 2026). Debates over licensing music for generative AI illustrate the relevance of consent and compensation when existing work becomes material for further production (The Economist, 2026). This could provide useful input for future work: Linking contributions to ownership shares, licensing agreements, and payments would connect these organizational changes to economic returns. Measures of rhythm, harmony, and arrangement would also help identify which musical characteristics account for the acoustic response.

The findings suggest that lower execution requirements can support a greater role for creating and developing ideas, alongside greater product innovation. Execution and idea development can both require expertise, but these capabilities can reside in different peo-

ple. Making execution more accessible can therefore change whose strengths contribute to production. Here, production adjusts through more contributions concentrated in creative authorship and production, without broader individual task bundles, alongside more differentiated output. Together, these results show how technology can reshape the division of creative labor and expand what people produce.

References

Abbas Nejad, Kian, Giuseppe Musillo, Till Wicker, and Niccolò Zaccaria, "Labor Market Signals: The Role of Large Language Models," *Available at SSRN 5185035*, 2025.

Acemoglu, Daron and David Autor, "Skills, tasks and technologies: Implications for employment and earnings," in "Handbook of labor economics," Vol. 4, Elsevier, 2011, pp. 1043–1171.

_ **and Pascual Restrepo**, "Automation and New Tasks: How Technology Displaces and Reinstates Labor," *Journal of Economic Perspectives*, 2019, *33* (2), 3–30.

_ **, David Autor, Jonathon Hazell, and Pascual Restrepo**, "Artificial Intelligence and Jobs: Evidence from Online Vacancies," *Journal of Labor Economics*, 2022, *40* (S1), S293–S340.

Agrawal, Ajay and Avi Goldfarb, "Restructuring Research: Communication Costs and the Democratization of University Innovation," *American Economic Review*, 2008, *98* (4), 1578–1590.

Aguiar, Luis and Joel Waldfogel, "Quality predictability and the welfare benefits from new products: Evidence from the digitization of recorded music," *Journal of Political Economy*, 2018, *126* (2), 492–524.

Althoff, Lukas and Hugo Reichardt, "Task-Specific Technical Change and Comparative Advantage," NBER Working Paper 35353, National Bureau of Economic Research 2026.

Amusement Business, "Year-End Report: Top 10 Touring Acts of 1988," *Amusement Business*, December 1988, *100* (52). Issue of 24 December 1988. Compiled from Amusement Business Boxscores in issues dated 5 December 1987 through 26 November 1988; reports total gross, attendance and capacity for each act.

Arditi, David, "Digital downsizing: The effects of digital music production on labor," *Journal of Popular Music Studies*, 2014, *26* (4), 503.

Askin, Noah and Joeri Mol, "Institutionalizing Authenticity in the Digitized World of Music," *Research in the Sociology of Organizations*, 2018, *55*, 159–202.

_ **and Michael Mauskapf**, "What makes popular culture popular? Product features and optimal differentiation in music," *American Sociological Review*, 2017, *82* (5), 910–944.

Atalay, Enghin, Phai Phongthiengtham, Sebastian Sotelo, and Daniel Tannenbaum, "The Evolution of Work in the United States," *American Economic Journal: Applied Economics*, 2020, *12* (2), 1–34.

Autor, David and Neil Thompson, "Expertise," *Journal of the European Economic Association*, 2025, *23* (4), 1203–1271.

_ **, Caroline Chin, Anna Salomons, and Bryan Seegmiller**, "New frontiers: The origins and content of new work, 1940–2018," *The Quarterly Journal of Economics*, 2024, *139* (3), 1399–1465.

Autor, David H. and Michael J. Handel, "Putting Tasks to the Test: Human Capital, Job Tasks, and Wages," *Journal of Labor Economics*, 2013, *31* (S1), S59–S96.

Autor, David H, Frank Levy, and Richard J Murnane, "The skill content of recent technological change: An empirical exploration," *The Quarterly journal of economics*, 2003, *118* (4), 1279–1333.

Autor, David, Tanya Rodchenko, Josh Martin, Zanna Iscenko, Scott Strand, David Pearl, and Melissa Ferere, "Does AI Assistance Enhance or Erode Expertise? Evidence from a Three-Month Field Experiment in Patent Drafting," NBER Working Paper 35720, National Bureau of Economic Research September 2026.

Baily, Martin Neil, David M. Byrne, Aidan T. Kane, and Paul E. Soto, "Generative AI: What Type of Technology?," *AEA Papers and Proceedings*, May 2026, *116*, 26–30.

Barnes, Brooks, "Michael Jackson: A Thrilling Pop Icon, a Troubled Soul," *The Seattle Times*, June 2009. Reports that the Tacoma Dome Bad Tour dates were cancelled before opening night.

Becker, Gary S. and Kevin M. Murphy, "The Division of Labor, Coordination Costs, and Knowledge," *Quarterly Journal of Economics*, November 1992, *107* (4), 1137–1160.

Bessen, James, Maarten Goos, Anna Salomons, and Wiljan van den Berge, "What Happens to Workers at Firms that Automate?," *The Review of Economics and Statistics*, 2025, *107* (1), 125–141.

Billboard, "Billboard Boxscore," *Billboard*, 1988, *100* (11, 12, 15, 17, 22, 42, 43, 45). Boxscore listings for Michael Jackson Bad Tour dates, March 12–November 5, 1988.

_ , "Billboard Boxscore," *Billboard*, 1989, *101* (6), 32. Boxscore listing for Michael Jackson Los Angeles Sports Arena dates.

_ , "Billboard 200 Makeover: Album Chart to Incorporate Streams & Track Sales," November 2014. Accessed September 24, 2026.

Borowiecki, Karol Jan, "Good Reverberations? Teacher Influence in Music Composition since 1450," *Journal of Political Economy*, April 2022, *130* (4), 991–1090.

_ **and Caterina Adelaide Mauri**, "Originality, Influence, and Success: A Model of Creative Style," *Journal of Cultural Economics*, 2024, *48*, 221–258.

Bryan, Nicholas J. and Ge Wang, "Musical Influence Network Analysis and Rank of Sample-Based Music," in "Proceedings of the 12th International Society for Music Information Retrieval Conference (ISMIR 2011)" 2011, pp. 329–334.

Brynjolfsson, Erik, Danielle Li, and Lindsey R. Raymond, "Generative AI at Work," *The Quarterly Journal of Economics*, 2025, *140* (2), 889–942.

Bureau of Economic Analysis, "Arts and Cultural Production Satellite Account, U.S. and States, 2023," Statistical Release, U.S. Department of Commerce April 2025.

Caoui, El Hadi and Alberto Galasso, "Fractional Ownership and Copyright Licensing: Evidence from the Music Industry," NBER Working Paper 34336, National Bureau of Economic Research October 2025. Also CEPR Discussion Paper DP19686.

Caves, Richard E., *Creative Industries: Contracts Between Art and Commerce*, Harvard University Press, 2000.

Charness, Gary and Daniela Grieco, "Creativity and Incentives," *Journal of the European Economic Association*, 2019, *17* (2), 454–496.

Cullen, Zoë, Danielle Li, and Shengwu Li, "Labor as Capital: AI and the Ownership of Expertise," Working Paper, Harvard University and MIT 2026.

Dalla Riva, Chris, *Uncharted Territory: What Numbers Tell Us about the Biggest Hit Songs and Ourselves*, Bloomsbury, 2025.

Dell'Acqua, Fabrizio, Charles Ayoubi, Hila Lifshitz, Raffaella Sadun, Ethan Mollick, Lilach Mollick, Yi Han, Jeff Goldman, Hari Nair, Stew Taub, and Karim R. Lakhani, "The Cybernetic Teammate: A Field Experiment on Generative AI and Teamwork," *Organization Science*, 2026, *37* (4), 1217–1242. Earlier version circulated as NBER Working Paper 33641, April 2025, under the title The Cybernetic Teammate: A Field Experiment on Generative AI Reshaping Teamwork and Expertise.

Demers, Joanna, *Steal This Music: How Intellectual Property Law Affects Musical Creativity*, University of Georgia Press, 2006.

Deming, David J. and Kadeem Noray, "Earnings Dynamics, Changing Job Skills, and STEM Careers," *The Quarterly Journal of Economics*, 2020, *135* (4), 1965–2005.

Demirer, Mert, John J. Horton, Nicole Immorlica, Brendan Lucier, and Peyman Shahidi, "Chaining Tasks, Redefining Work: A Theory of AI Automation," Working Paper 34859, National Bureau of Economic Research 2026.

Dessein, Wouter and Tano Santos, "Adaptive Organizations," *Journal of Political Economy*, 2006, *114* (5), 956–995.

dos Santos, Guilherme Soares S. and Flavio Figueiredo, "Assessing the Impact of Sampling, Remixes, and Covers on Original Song Popularity," 2024. arXiv:2411.01242. Announced on arXiv as to appear in the 1st Latin American Music Information Retrieval Workshop (LAMIR), Rio de Janeiro, December 2024.

Doshi, Anil R. and Oliver P. Hauser, "Generative AI Enhances Individual Creativity but Reduces the Collective Diversity of Novel Content," *Science Advances*, 2024, *10* (28), eadn5290.

Eckert, Fabian, Teresa C. Fort, Peter K. Schott, and Natalie J. Yang, "Imputing Missing Values in the US Census Bureau's County Business Patterns," Working Paper 26632, National Bureau of Economic Research 2021.

Feigenbaum, James and Daniel P Gross, "Answering the call of automation: How the labor market adjusted to mechanizing telephone operation," *The Quarterly Journal of Economics*, 2024, *139* (3), 1879–1939.

Figueiredo, Flavio, Tales Panoutsos, and Nazareno Andrade, "Surprising Patterns in Musical Influence Networks," 2024. arXiv:2410.15996. Announced on arXiv as to appear in the Latin American Music Information Retrieval Workshop (LAMIR), Rio de Janeiro, December 2024.

Garicano, Luis, "Hierarchies and the Organization of Knowledge in Production," *Journal of political economy*, 2000, *108* (5), 874–904.

Goos, Maarten, Alan Manning, and Anna Salomons, "Explaining Job Polarization: Routine-Biased Technological Change and Offshoring," *American Economic Review*, 2014, *104* (8), 2509–2526.

Halstead, Craig and Chris Cadman, *Michael Jackson: The Solo Years*, Authors OnLine, 2003.

Harrington, Richard, "On the Beat: Top 10 on the Road to Riches," *The Washington Post*, January 1989. 4 January 1989. Reports the Amusement Business year-end touring list with show counts, and Michael Jackson's 1988 US attendance as provided by his management.

Humlum, Anders and Emilie Vestergaard, "Still Waters, Rapid Currents: Early Labor Market Transformation under Generative AI," NBER Working Paper 33777, National Bureau of Economic Research March 2026. Originally issued May 2025; revised March 2026.

Imbens, Guido W. and Michal Kolesár, "Robust Standard Errors in Small Samples: Some Practical Advice," *Review of Economics and Statistics*, 2016, *98* (4), 701–712.

Jones, Benjamin F., "The Burden of Knowledge and the "Death of the Renaissance Man": Is Innovation Getting Harder?," *The Review of Economic Studies*, 2009, *76* (1), 283–317.

Katz, Mark, *Capturing Sound: How Technology Has Changed Music*, University of California Press, 2004.

Kim, Khwan, Noah Askin, and James A Evans, "Disrupted routines anticipate musical exploration," *Proceedings of the National Academy of Sciences*, 2024, *121* (6), e2306549121.

Kim, Sueyoul, Ginger Zhe Jin, and Eungik Lee, "Does Generative AI Crowd Out Human Creators? Evidence from Pixiv," NBER Working Paper, National Bureau of Economic Research 2026.

Lin, Jeffrey, "Technological Adaptation, Cities, and New Work," *The Review of Economics and Statistics*, 2011, *93* (2), 554–574.

Lin, Sijie, "Learning to Prompt: Human Adaptation in Production with Generative AI," 2025. Job market paper, Rotman School of Management, University of Toronto. Version December 2025. SSRN 5788402.

Moorefield, Virgil, *The producer as composer: Shaping the sounds of popular music*, Mit Press, 2010.

Music Trades, "Michael Jackson Group Stages Akai Clinics," *Music Trades*, October 1988, p. 39.

National Center for O*NET Development, "4.A.2.b.2 – Thinking Creatively," 2026. Version 30.x. Accessed 2026-09-07.

Noy, Shakked and Whitney Zhang, "Experimental Evidence on the Productivity Effects of Generative Artificial Intelligence," *Science*, 2023, *381* (6654), 187–192.

Passman, Donald S., *All You Need to Know About the Music Business*, revised, updated, and expanded ed., New York: Simon & Schuster, 1994.

Peng, Sida, Eirini Kalliamvakou, Peter Cihon, and Mert Demirer, "The Impact of AI on Developer Productivity: Evidence from GitHub Copilot," Working Paper, arXiv preprint 2023. arXiv:2302.06590.

Reimers, Imke and Joel Waldfogel, "AI and the Quantity and Quality of Creative Products: Have LLMs Boosted Creation of Valuable Books?," NBER Working Paper 34777, National Bureau of Economic Research January 2026. Revised May 2026.

Rosen, Sherwin, "The Economics of Superstars," *The American Economic Review*, 1981, *71* (5), 845–858.

Salomons, Anna, Cäcilia vom Baur, and Ulrich Zierahn-Weilage, "Expertise at Work: New Technologies, New Skills, and Worker Impacts," 2025. Working paper.

Schuster, Mike, David Mitchell, and Kenneth Brown, "Sampling Increases Music Sales: An Empirical Copyright Study," *American Business Law Journal*, 2019, *56* (1), 177–229.

Simcoe, Timothy and Jeremy Watson, "Digital Sampling, Copyright Assertion and Creative Reuse," April 2019. Working paper dated 20 April 2019, Boston University Questrom School of Business and University of Minnesota Carlson School of Management; posted with the 2019 SERCI Annual Congress documents.

Spitz-Oener, Alexandra, "Technical Change, Job Tasks, and Rising Educational Demands: Looking Outside the Wage Structure," *Journal of Labor Economics*, 2006, *24* (2), 235–270.

The Economist, "Record labels are in a spin over AI music," 2026.

The New York Times, "Michael Jackson Silent on Ending His Tours," *The New York Times*, December 1988.

The Vindicator, "Jackson Cancels Cincinnati Shows," *The Vindicator*, February 1988. Contemporaneous notice of cancelled Riverfront Coliseum dates.

Tinbergen, Jan, "Substitution of graduate by other labour," *Kyklos*, 1974, *27* (2), 217–226.

Tolbert, Charles M. and Molly Sizer, "U.S. Commuting Zones and Labor Market Areas: A 1990 Update," Technical Report, U.S. Department of Agriculture, Economic Research Service 1996. Staff Paper AGES-9614.

Trask, Simon, "Akai MPC60 MIDI Production Center," *Music Technology*, April 1988, pp. 40–44. Contemporary review of the Akai MPC60, including its launch price.

Vox, "Meet the unassuming drum machine that changed music forever," *Vox*, April 2018. Published 16 April 2018.

Waldfogel, Joel, *Digital Renaissance: What Data and Economics Tell Us about the Future of the Creative Industries*, Princeton University Press, 2018.

Youngblood, Mason, "Cultural transmission modes of music sampling traditions remain stable despite delocalization in the digital age," *PLOS ONE*, 2019, *14* (2), e0211860.

A Data construction

This appendix describes the record sample, the linked data sources, and the construction of the measures used to study the division of labor.

A.1 From Discogs releases to the record sample

Discogs lists releases, including different pressings, countries, and formats of the same record. I consolidate releases sharing a master identifier and retain releases without one as separate records. Of the 77,077 records formed at this stage, 28,648 have no master identifier and 22,991 combine multiple releases. Within each group, I select the earliest eligible release, breaking ties by the number of contributors, track count, and finally release identifier in ascending text order. Selection follows the period, recording-location, and information requirements and precedes the genre and continental-US restrictions. All record measures, including sampling links, come from this representative release.

The baseline includes all release formats and retains compilations, reissues, remasters, and remixes. Album, LP, or mini-album descriptors appear on 69.3 percent of records; compilation or reissue descriptors appear on 10.9 percent. Appendix E.8 compares formats. A separate dating check flags 3,548 records whose earliest listed release predates the assigned year by more than five years or predates 1980; Table E.5 reports estimates excluding them. The baseline excludes 1,284 records with Stage & Screen, Children's, Non-Music, or Brass & Military as their primary genre. Secondary tags do not trigger exclusion, which leaves 1,268 estimation records carrying at least one of these tags.

The estimation sample contains 70,999 records released in 1980–2000 and assigned to a continental-US commuting zone in the exposure design (Section 3.2). The organizational analysis uses the 70,994 records with at least one classified credit. The remaining five have no defined task share. Table A.1 reports the construction steps in order.

Figure A.1 shows how the units of the estimation sample nest and the coverage of the main measures.

A.2 Matching to WhoSampled

WhoSampled identifies relationships between recordings and the earlier recordings they sample. I link these relationships to Discogs tracks on track title and billed main artist.

Table A.1: From Discogs releases to the record sample

Restriction	Unit	Observations
Discogs releases in the extract	release	1,924,986
released 1980–2000	release	1,035,410
names a recording or mixing studio	release	208,126
main studio located to a US county	release	127,864
credit and sampling information present	release	124,300
Consolidated to records	record	77,077
primary genre inside recorded music	record	75,793
continental United States	record	75,594
commuting zone in the exposure design	record	70,999
at least one classified credit	record	70,994

Note. The first block counts Discogs releases, distinguished by pressing, country, and format. The second counts records, defined by a shared Discogs master identifier or a separate release when no master identifier is available. Differences across blocks reflect consolidation as well as sample restrictions. The representative release is selected before the genre and continental-US restrictions. Of the records, 22,991 combine multiple releases and 28,648 have no master identifier; the largest group contains 31 releases. The estimation sample covers 117 commuting zones, including 18 exposed zones. Five records have no classified credit and are excluded from the organizational sample.

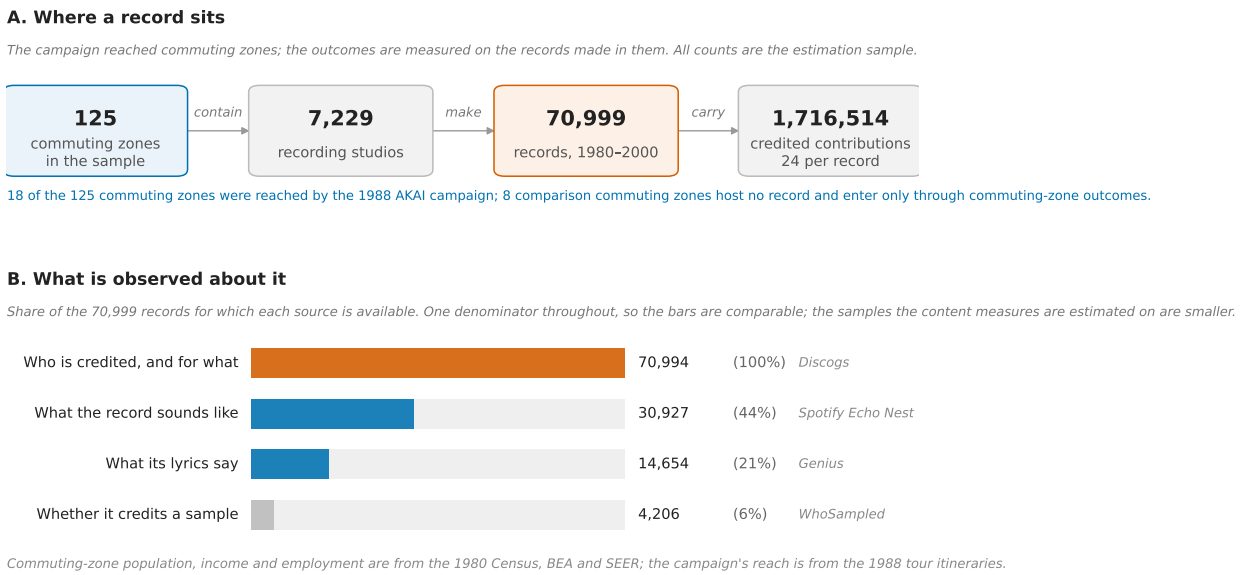


Figure A.1: Where a record sits, and what is observed about it

Note. Panel A relates records and recording studios to the commuting zones where campaign exposure is assigned. The sample contains 70,999 records, of which 70,994 have at least one classified credit. Eight of the 125 commuting zones have no record and enter only the commuting-zone analysis; all eight are comparison zones, and all 18 exposed zones host records. Panel B reports source availability, which can exceed the number of records with a defined regression outcome. Lyrics are available for 14,654 records, while the lyrical-distance regression uses the 14,125 of them in 94 commuting zones that have a defined prior-year comparison. Appendix H describes content-measure construction and coverage.

Both fields are normalized before matching: text is lowercased, a trailing featuring clause is removed, parenthesized and bracketed material such as a version or remix tag is deleted, ampersands are spelled out, remaining punctuation becomes whitespace, and whitespace is collapsed. I first match exactly on the normalized title and artist together. Remaining tracks are blocked on the leading consonants of title and artist, and each candidate pair within a block receives the average of two Jaro–Winkler scores, one on title and one on artist, with a threshold of 0.90; the highest-scoring candidate is kept and one link is retained per track. Release year does not enter this match. The matched relationships are restricted to sampling: the WhoSampled extract carries sampling and remix relations only, covers are excluded upstream of it, and the aggregated file used here retains only recordings with at least one sampling relation. Interpolations are not separately identified in the source and cannot be separated here.

A record uses sampling when at least one track on its representative release links to an earlier sampled recording. I also measure the share of its tracks with a link. The estimation sample contains 11,723 exact and 2,801 fuzzy track links. A review of thirty fuzzy links drawn at a fixed seed, without reference to exposure or period, found twenty-eight matching recordings or named mixes, one later remix of the same song, and one pairing of different acts. These measures capture sampling identified by WhoSampled, rather than all uses of the device.

A.3 Studios and geography

I extract recording-studio names from Discogs, standardize their spelling, and locate them through manual lookup and the Google Maps Geocoding API. Coordinates are assigned to counties by point-in-polygon and then to 1990 commuting zones using the Autor–Dorn crosswalk. The location measure identifies where a record was produced. Alaska, Hawaii, and US territories are excluded.

The location assignment uses recording and mixing studios listed by Discogs and excludes mastering locations. Multiple studios appear on 32.3 percent of records. I assign each record to the studio with the most credit slots, preferring a recording studio over a mixing-only studio when counts tie. Remaining ties are resolved by a deterministic hash of record and studio identifiers, affecting 18.5 percent of records. Credited studios span multiple commuting zones on 12.8 percent of records.

To assess sensitivity to this assignment, I restrict to the 87.2 percent of records whose studios all lie in one commuting zone. The estimation sample retains 61,920 records in all 117 zones, including all 18 exposed zones. The creative-contributor estimate falls from 0.45 to 0.25 per record (Table E.5).

Of the 13,149 tie-broken records, 8,399 choose among studios within one commuting zone. Their assigned studio can change, but their zone and campaign exposure cannot. The remaining 4,750 involve studios in different zones, so the choice can affect exposure. Excluding cross-zone ties gives a creative-contributor estimate of 0.29, as does excluding all tie-broken records (Table E.5).

A.4 Population and economic series

The employment denominator is the number of residents aged 20–64 in each commuting zone and year. I construct it by aggregating the SEER annual county population estimates, available by single year of age from 1969 onward. I reconcile county codes with the commuting-zone crosswalk before aggregation, because SEER holds county geography fixed across its whole span and carries its own modified codes for counties whose boundaries moved.[26]

The population series exceeds the 1980 continental-US Census total by 0.3 percent and the existing commuting-zone population aggregate by 1.0 percent. Six of the 722 zone totals differ by more than three percent; none is exposed to the campaign. Predetermined characteristics come from the 1980 Census: population, urban share, college attainment, unemployment, and logged median household income in 1979. County employment comes from the County Business Patterns series imputed by Eckert et al. (2021), and personal income from BEA local-area accounts. I aggregate these series to commuting zones. The linear employment rate and Poisson specification use the same annual working-age population, respectively as denominator and log offset.

A.5 The *Mix* directories

Mix magazine published regional recording-studio directories reporting names, addresses, contact information, owners, and managers. Detailed listings also describe consoles, recorders,

[26] One modified code does not resolve to a single commuting zone: the combined Yuma–La Paz code, which SEER reports from 1980 through 1993, spans two zones. I allocate it using the 1994 population shares, the first year the two pieces are reported separately, separately by age band, and flag the affected observations. The 1994 shares are 10.7 percent to La Paz and 89.3 percent to Yuma.

monitoring equipment, and instruments. These listings provide direct information on reported studio equipment.

Studio directories appear in 80 of the 246 scanned *Mix* issues from 1980–1993; 77 yield parsed listings. I link listings using telephone numbers, studio names with city and state, or addresses with postal codes. I exclude linked entities spanning multiple commuting zones or holding more listings than the directory schedule allows. After location and linkage restrictions, the data contain 16,697 listings from 7,283 studios; 1,267 studios appear both before and after 1988.

Equipment is reported only in the detailed listing format, whose prevalence changes differentially with campaign exposure. The equipment series in Appendix D.6 describes the 3,876 full-format listings that resolve to a studio inside the design's commuting zones, 2,210 in exposed and 1,666 in comparison zones; 53 of them name an MPC60 or MPC3000. The series does not date acquisition and does not follow a fixed set of equipment-reporting studios. Linking the directory to the record sample runs in the other direction, from Discogs: a Discogs studio is linked to a directory studio on an exact name match with agreeing location, which links 501 of the 8,119 main studios of the continental record frame, or 6.2 percent, and 448 of the studios in the estimation sample.

A.6 Classifying credits into function families

The unit of classification is a contributor-function pair within a record. A person listed as both writer and guitarist contributes one credit to writing and one to instrumental performance. Credit labels are normalized for case, punctuation, and aliases, and a contributor holding the same normalized label twice on one record contributes one credit; the 814 distinct functions so formed cover 1,808,567 contributor-function observations over 1,147,717 distinct contributor-record pairs.

The baseline maps each Discogs credit category to a function family. The categories *Instruments*, *Vocals*, *Acting, Literary & Spoken* and *Featuring & Presenting* become performance; *Technical* becomes technical work; *Writer*, *Production*, *Arrangement*, *Conducting & Leading*, *Remix* and *DJ Mix* become creative authorship and production; *Visual* and *Management* become nonproduction. Where the Discogs category is missing, 881 observations are recovered from the function label itself, and 5,592 observations carry no usable category, remain unclassified, and enter no share. An alternative classification uses a review of the 241 functions accounting for 99 percent of observations. Reviewers observed function labels and

frequencies but no information on year, exposure, or outcomes. The resulting assignments change the classification of about two percent of observations. The main analysis combines performance and technical work into execution, as defined in Section 3.1.

Writing, composition, arrangement, and production belong to creative authorship and production. These functions develop musical material and shape its realization as a recording. Performance and engineering belong to execution, while design, photography, and management belong to nonproduction. The categories describe the attributed function: creative judgment can enter performance and technical work as well as writing and production.

Several labels warrant particular attention. Discogs places executive producer and featuring under Production and Writer, respectively, so both enter creative authorship and production. Conducting enters the same family. Programmed by belongs to Arrangement, while drum programming belongs to Instruments and enters execution. Engineering, mixing, recording, and mastering enter the technical component of execution. These assignments follow the source categories; alternative classifications and exclusions assess their influence on the results.

Among contributors working exclusively in creative authorship and production, 8.9 percent have no creative credit other than executive producer or featuring. Removing those labels reduces the mean creative-contributor count from 3.48 to 3.17 over 1980–2000. Rebuilding contributor categories after removal lowers the campaign estimate by about an eighth, with positive estimates in each release-format group (Table E.9).

For team composition, I count each person once per record and distinguish those working only in creative authorship and production, only in execution, only in nonproduction, and across categories. For individual breadth, I also distinguish multiple functions within creative authorship and production. These measures distinguish the number of contributors from the range of tasks attributed to each person.

A.7 Biographical characteristics

I link billed main artists to Wikidata and Wikipedia through Discogs identifiers. A language model extracts musical training, education, prior occupations, and technical literacy from their biographies. Artists lacking an identifier link remain uncovered.

Training is recorded as a single category, with conservatory education identified within formal training. The coding distinguishes self-teaching, structured individual instruction, and formal training. Individual instruction accounts for 21.4 percent of classified artists

and is scored zero on both headline training indicators. When biographies describe several training routes, the retained category does not record their order or relative importance. Missing characteristics remain unclassified. Technical literacy and prior non-music work instead record whether a biography mentions them, so zero means no mention.

Each artist contributes once to each period in which they appear, regardless of record output. An artist is associated with sampling if any record in that period is identified as using sampling. Records with several billed artists contribute each artist; artists active in both periods enter both comparisons. Groups remain in the data, with zero on the mention-based indicators when no relevant information is recorded. Linked biographies cover 3,428 of 15,326 main artists active in 1980–1988 and 5,583 of 33,807 active in 1989–2000. The background comparisons concern these main artists; the organizational analysis includes all contributors.

A.8 Credit coverage and descriptive patterns

Credit lists differ in length and in how they represent individual and collective contributions. This subsection describes those differences and their implications for measuring task shares and team composition.

Credit-list length and release format. Credit lists differ systematically in length across release formats. A record is long-form when its Discogs format descriptors name an album, an LP, or a mini-album, and short-form otherwise; singles and twelve-inch releases are therefore in the sample and are short-form. Over 1980–2000 short-form records carry an average of 15.6 classified credits against 29.3 for long-form records, and short-form records rise from 30.3 to 40.7 percent of the sample between 1980–1987 and 1993–2000. Because a task share is a ratio over a record's own classified credits, a given change in a few credits moves the share of a thinly credited record much further than that of a long one. Appendix E.8 estimates the organizational specifications separately by release format. Counting contributors complements the share measures by asking whether more people work in a category, although counts also depend on which contributions are recorded.

Thin credit lists become less common in both groups. Between 1980–1987 and 1993–2000, the share with three or fewer classified credits falls from 5.3 to 4.4 percent in exposed locations and from 9.9 to 5.3 percent in comparison locations. The short-form share rises by 11.3 and 8.9 percentage points, respectively. The baseline retains all credit-list lengths because a restriction based on post-campaign coverage could itself change sample composition.

Genre profiles. Table A.2 describes credit patterns by genre before the campaign. Hip hop has the largest creative-authorship-and-production share, while jazz has the largest execution share. Classical records contain a comparatively large composition component. These patterns illustrate differences in production and crediting across genres; the classification rules are reported separately in Appendix A.6.

Table A.2: Composition of credited work by genre, 1980–1987

			Function-family share (%)			Excl.	Function share (%)		
Genre	Records	Team	Auth.	Exec.	Nonpr.	(%)	Writ.	Comp.	Prod.
Hip Hop	513	7.4	59.4	36.9	3.7	85.8	26.1	1.1	26.8
Funk/Soul	3,230	19.0	42.8	51.6	5.6	87.3	18.6	1.1	15.1
Latin	392	13.4	42.0	49.4	8.6	89.4	21.3	1.4	10.6
Reggae	332	10.7	41.8	52.5	5.7	87.3	12.7	1.5	18.8
Electronic	2,677	14.4	39.9	52.8	7.2	81.6	15.7	1.6	17.0
Classical	824	12.4	36.8	51.8	11.4	92.0	3.9	14.9	10.2
Folk/World/Country	3,899	15.2	36.4	56.5	7.1	89.7	18.8	1.2	12.7
Blues	764	17.6	34.6	56.2	9.2	86.9	19.8	0.8	10.7
Pop	1,050	17.3	34.0	57.5	8.5	84.6	15.8	1.5	11.5
Rock	5,946	12.5	31.8	57.5	10.7	73.9	14.5	1.2	14.0
Jazz	2,829	17.5	30.5	59.0	10.5	87.5	16.2	3.1	8.4

Notes. The table covers 22,456 records released in 1980–1987 with a located continental-US studio and at least one classified credit, across 3,186 studios and 274 commuting zones. Each record appears once, under its primary genre. The sample extends beyond the 125 commuting zones in the exposure design. *Team* is the number of credited contributors per record. Auth., Exec., and Nonpr. denote creative authorship and production, execution, and nonproduction. Writ., Comp., and Prod. denote writing, composition, and production. Entries are equally weighted record means. The three function-family shares partition classified credits and sum to 100 percent. *Excl.* is the share of contributors whose credits all fall within a single function family. The three individual-function shares are shares of classified credits and do not sum to the creative-authorship-and-production family because that family also contains arrangement and conducting.

Collective performance credits. Some performance credits name an orchestra, choir, horn section, or other ensemble rather than its individual members. A single credited entity can then represent several performers. I identify potential collective credits using both the function label and the entity name. Entity-name matching is restricted to execution credits outside the billed main artist, and labels referring to an individual who directs or writes for an ensemble are excluded.

The rule flags 34,300 of the 1,798,606 classified credits in the continental record data: 1.9 percent overall and 3.2 percent of execution credits. Before the campaign, the mean record-level share of collective execution credits is 12.1 percent in classical music, 1.1 percent in rock, and 0.4 percent in hip hop. These credits identify an ensemble contribution without revealing the number of performers.

Between 1980–1987 and 1993–2000, the share of records with a collective credit falls from 11.3 to 9.9 percent in exposed locations and from 12.7 to 10.8 percent in comparison locations. Excluding flagged credits and rebuilding contributor categories leaves the organizational estimates close to the baseline (Appendix E.6).

B The sampler campaign and exposure coding

This appendix documents the organization of the road clinics and the historical evidence used to assign campaign exposure.

Organization of the clinics. Mike McRoberts, then AKAI's US product manager, traces the campaign to the January 1988 NAMM trade show, where members of Michael Jackson's touring band proposed holding demonstrations during the US tour. The clinics followed the tour itinerary and demonstrated an integrated production setup centered on the sampler alongside other AKAI equipment. McRoberts reports that the musicians held clinics in every city visited by the tour.[27] Figure 2 presents a promotional photograph and a contemporary clinic advertisement. The advertisement provides contemporaneous evidence of one planned clinic; the itinerary-wide account comes from McRoberts's retrospective interview.

Tour itinerary and exposure. Concert dates and venues are assembled from the tour documentation and *Billboard* Boxscore reports (Halstead and Cadman, 2003; Billboard, 1988, 1989). These sources establish which concerts took place, while the organizer's account links that itinerary to the clinics. I classify a commuting zone as exposed if Michael Jackson performed there during the US *Bad* Tour in 1988. The resulting comparison concerns local campaign exposure; individual attendance is not observed.

Table B.1 maps 49 concerts that took place in nineteen cities to the eighteen exposed commuting zones; Irvine and Los Angeles share a zone. The register documents the concert itinerary, which McRoberts's account links to the clinics.

Cancelled and considered destinations. Cincinnati and Tacoma had announced tour dates that were subsequently cancelled, for tour restructuring and illness respectively (The Vindicator, 1988; Barnes, 2009). Jackson did not perform in either commuting zone, so I

[27] McRoberts's account describes the origin, weekly format, and equipment used in the clinics: https://www.bboytechreport.com/2013/01/11/interview-with-mike-mcroberts/.

Figure B.1: An AKAI road clinic during the 1988 *Bad* Tour

Note. Photograph published in "Michael Jackson Group Stages Akai Clinics (Music Trades, 1988, p. 39)." The original caption identifies, from left, keyboardist Greg Phillinganes, drummer Ricky Lawson, and keyboardist Rory Kaplan.

Table B.1: The 1988 concerts and the exposure coding

City	Venue	1988 dates	Dates	Zone
Concerts held				
Kansas City	Kemper Arena	23–24 Feb	2	29,502
New York City	Madison Square Garden	3, 5–6 Mar	3	19,400
St. Louis	St. Louis Arena	13 Mar	1	24,701
Indianapolis	Market Square Arena	18–19 Mar	2	14,200
Louisville	Freedom Hall	20 Mar	1	13,101
Denver	McNichols Sports Arena	24–26 Mar	3	28,900
Hartford	Hartford Civic Center	30–31 Mar; 1 Apr	3	20,901
Houston	The Summit	8–10 Apr	3	32,000
Atlanta	Omni Coliseum	13–15 Apr	3	9,100
Rosemont	Rosemont Horizon	19–21 Apr	3	24,300
Dallas	Reunion Arena	25–27 Apr	3	33,100
Bloomington	Met Center	4–6 May	3	21,501
Pittsburgh	Civic Arena	26–28 Sep	3	16,300
East Rutherford	Brendan Byrne Arena	3–5 Oct	3	19,600
Richfield	Richfield Coliseum	10–11 Oct	2	15,200
Landover	Capital Centre	13, 17–19 Oct	4	11,304
Auburn Hills	The Palace of Auburn Hills	24–26 Oct	3	11,600
Irvine	Irvine Meadows Amphitheatre	7–9 Nov	3	38,300
Los Angeles	Los Angeles Memorial Sports Arena	13 Nov	1	38,300
Announced, cancelled				
St. Louis (laryngitis)	St. Louis Arena	14 Mar	1	24,701
Cincinnati (tour restructuring)	Riverfront Coliseum	1–2 Apr	2	—
Tacoma (laryngitis)	Tacoma Dome	31 Oct; 1–2 Nov	3	—
Considered only				
Birmingham	—	—	—	—
Chapel Hill	—	—	—	—

Note. US tour destinations in 1988, distinguishing concerts held from dates cancelled and destinations only considered, compiled from tour documentation and *Billboard* Boxscore reports. The 49 concerts that took place in 19 cities map to the 18 exposed commuting zones. Dates count played or cancelled shows; considered destinations have no announced date. Zone is the 1990 commuting-zone identifier. The register documents concerts; McRoberts's retrospective account links the itinerary to the clinics. St. Louis remains exposed because the March 13 show occurred despite cancellation of March 14. I classify cancelled and considered destinations as unexposed if Jackson did not perform there.

classify both as unexposed. St. Louis remains exposed because Jackson performed there on March 13, 1988, even though a subsequent performance was cancelled (The New York Times, 1988).

Birmingham and Chapel Hill appear as possible destinations in historical accounts, with less documentation than the announced dates in Cincinnati and Tacoma. Jackson did not perform in either destination, so I classify both commuting zones as unexposed.

C The sample, specification choices, and inference

This appendix describes the estimation sample and examines inference, treatment of the campaign year, and choice of comparison tours.

C.1 The estimation sample

Table C.1 describes the 125 commuting zones in the design, including 18 exposed locations, and the 70,994 records with classified tasks produced in 117 of them. Panels A and B summarize records and commuting-zone-years over 1980–1988. Panel C reports predetermined local characteristics at the dates indicated. Each measure uses the observations on which it is defined; record statistics weight records equally, and commuting-zone-year statistics weight active zone-years equally.

C.2 Inference and multiple hypotheses

The main estimates use CR2 confidence intervals with coefficient-specific Satterthwaite degrees of freedom, clustered by commuting zone. With eighteen exposed zones, the effective degrees of freedom can be substantially below the cluster count. Table D.1 compares CR2 with conventional cluster-robust inference on the same diffusion regressions. Reported intervals and p-values are not adjusted for multiple testing.

C.3 Pooled coefficients and annual estimates

The pooled coefficient summarizes the average change after 1988 relative to the pre-campaign period. Each event-study coefficient instead measures a year-specific difference relative to

Table C.1: Summary statistics for the estimation sample

	campaign-exposed				comparison			
	N	coverage	mean	s.d.	*N*	coverage	mean	s.d.
Panel A. Records released 1980–1988								
Record uses sampling	15,726	1.000	0.037	0.188	8,418	1.000	0.019	0.136
Contributors working only in creative authorship and production	15,726	1.000	3.402	4.377	8,418	1.000	3.311	4.513
Total credited contributors	15,726	1.000	15.9	14.3	8,418	1.000	14.0	13.1
Share of contributors working only in creative authorship and production	15,726	1.000	0.256	0.263	8,418	1.000	0.275	0.295
Task breadth: share credited in two or more task categories	15,726	1.000	0.167	0.179	8,418	1.000	0.166	0.196
Task breadth: share with two or more tasks within creative authorship and production	15,726	1.000	0.107	0.155	8,418	1.000	0.098	0.164
Acoustic distance from the previous year's releases	6,128	0.390	0.263	0.055	2,642	0.314	0.257	0.060
Lyrical distance from the previous year's releases	2,682	0.171	0.097	0.015	1,117	0.133	0.095	0.014

	campaign-exposed				comparison			
	N	coverage	mean	s.d.	*N*	coverage	mean	s.d.
Panel B. Commuting-zone-years, 1980–1988								
Share of records using sampling	162	1.000	0.017	0.026	615	0.639	0.008	0.048
Share of active studios producing a record using sampling	162	1.000	0.037	0.051	615	0.639	0.018	0.080
Credited people per 100,000 working-age residents	162	1.000	26.4	26.9	963	1.000	12.5	38.3
Records released	162	1.000	97.1	176.0	963	1.000	8.741	24.4
Active studios	162	1.000	32.9	54.0	963	1.000	3.586	8.292
Credited people	162	1.000	1,070	2,065	963	1.000	95.3	287.5
Panel C. Commuting zones, predetermined characteristics								
Population, 1980	18	1.000	3,792,387	3,081,396	107	1.000	779,670	808,309
Working-age residents aged 20–64, 1980	18	1.000	2,224,829	1,809,090	107	1.000	456,347	484,576
Employment, 1980	18	1.000	1,446,617	1,181,723	107	1.000	261,422	300,940
Log population density, 1980	18	1.000	5.320	0.819	107	1.000	3.818	0.955
Urban share, 1980	18	1.000	0.877	0.069	107	1.000	0.695	0.161
College share, 1980	18	1.000	0.191	0.044	107	1.000	0.161	0.039
Log median income, 1979	18	1.000	9.021	0.127	107	1.000	8.719	0.219
Records released before 1988	18	1.000	3,675	7,571	107	1.000	285.2	942.9
Studios active before 1988	18	1.000	131.1	193.9	107	1.000	16.1	30.7
People credited before 1988	18	1.000	5,377	9,428	107	1.000	552.1	1,458

Note. The sample comprises 125 commuting zones, including 18 exposed and 107 comparison zones, over 1980–2000. Panels A and B report 1980–1988 statistics for records and commuting-zone-years, respectively; Panel C reports predetermined commuting-zone characteristics at the dates indicated. Observations receive equal weight within each panel. Each statistic uses observations for which the measure is defined. Coverage is the proportion of eligible units observed: the exposed and comparison groups contain 15,727 and 8,418 pre-campaign records, 162 and 963 zone-years, and 18 and 107 zones, respectively. Sampling shares exclude zone-years without records; contributor counts include them as zeros. Records are produced in 117 zones; the other eight enter the commuting-zone statistics. Employment is the number of credited people relative to the annual population aged 20–64. Organizational statistics use records with classified credits, excluding one exposed record from the pre-campaign sample. Contributors count once per record. Task shares use classified credit lines, while breadth measures count contributors working across task categories or holding multiple tasks within creative authorship and production. Acoustic and lyrical distance compare measured records with the previous year's releases, weighted by genre proximity; Appendix H describes construction and coverage.

1988. Averaging the annual coefficients over 1989–2000 and subtracting their 1980–1987 average gives a comparison of the same two periods that weights every year equally.

Table C.2 reports both summaries. They are close throughout. For the main organizational count, the pooled estimate is +0.449 musicians and the difference in annual averages is +0.42, [+0.10, +0.74]; for sampling adoption, they are 2.36 and 2.44 percentage points, [+0.52, +4.36]. The main text uses the pooled estimate to describe the average response and the annual estimates to describe its timing.

Table C.2: Pooled coefficients and averages of annual estimates

	Pooled Post × Exposed	Post-period average minus pre-period average
Panel A. Records, studio and division-year effects		
Creative authorship and production, share of credits	+1.59 [-0.80, 3.98]	+1.79 [-1.13, 4.71]
Execution, share of credits	−1.35 [-3.43, 0.72]	−1.51 [-4.12, 1.11]
Contributors exclusive to creative authorship, share	+2.18 [-0.22, 4.58]	+2.08 [-0.99, 5.15]
Contributors exclusive to creative authorship, count	+0.45 [0.08, 0.82]	+0.42 [0.10, 0.74]
Credited team size	+0.56 [-0.38, 1.49]	+0.37 [-0.58, 1.32]
Panel B. Records, commuting-zone and year effects		
Creative authorship and production, share of credits	+4.13 [-0.06, 8.32]	+4.20 [-0.08, 8.48]
Execution, share of credits	−4.12 [-7.80, -0.44]	−4.09 [-7.86, -0.32]
Contributors exclusive to creative authorship, share	+4.60 [-0.19, 9.38]	+4.53 [-0.41, 9.46]
Contributors exclusive to creative authorship, count	+0.69 [0.13, 1.24]	+0.60 [0.05, 1.14]
Credited team size	−0.22 [-2.49, 2.05]	−0.54 [-2.87, 1.79]
Panel C. Commuting zones		
Records crediting a sample, share	+2.36 [0.52, 4.19]	+2.44 [0.52, 4.36]
Credited contributors per 100,000 aged 20–64	+3.85 [-1.49, 9.18]	+3.85 [-1.72, 9.43]

The pooled column reports the coefficient on exposure interacted with the post-campaign indicator. The other columns average annual coefficients measured relative to 1988 over the indicated periods. Shares are in percentage points and counts in people. Brackets report 95% CR2 confidence intervals clustered by commuting zone. The columns should not be interpreted as an exact arithmetic decomposition.

C.4 Treatment of the campaign year

The campaign took place during 1988, but release dates do not establish whether a record was produced before or after the local demonstration. The baseline retains 1988 in the pre-period, and the event studies use it as the reference year. Table C.3 examines the alternatives of excluding 1988 or assigning it to the post-period.

The creative-contributor estimates are +0.449 under the baseline coding, +0.396 when 1988 is excluded, and +0.304 when it is assigned to the post-period. Each interval lies above zero, so the estimated increase remains under all three codings.

Table C.3: Pooled estimates under alternative codings of 1988

	1988 kept as pre-period	1988 rows dropped	1988 coded post-period
Panel A. Records, studio and division-year effects			
Creative authorship and production, share of credits	+1.59	+1.58	+1.23
	[−0.80, +3.98]	[−1.06, +4.21]	[−1.34, +3.81]
Execution, share of credits	−1.35	−1.33	−1.00
	[−3.43, +0.72]	[−3.60, +0.94]	[−3.27, +1.26]
Contributors exclusive to creative authorship, share	+2.18	+1.98	+1.47
	[−0.22, +4.58]	[−0.76, +4.72]	[−1.28, +4.22]
Contributors exclusive to creative authorship, count	+0.45	+0.40	+0.30
	[+0.08, +0.82]	[+0.05, +0.74]	[+0.02, +0.59]
Credited team size	+0.56	+0.33	+0.13
	[−0.38, +1.49]	[−0.62, +1.28]	[−0.85, +1.11]
Panel B. Records, commuting-zone and year effects			
Creative authorship and production, share of credits	+4.13	+4.40	+4.16
	[−0.06, +8.32]	[−0.01, +8.81]	[−0.09, +8.42]
Execution, share of credits	−4.12	−4.31	−4.06
	[−7.80, −0.44]	[−8.18, −0.44]	[−7.79, −0.32]
Contributors exclusive to creative authorship, share	+4.60	+4.75	+4.45
	[−0.19, +9.38]	[−0.31, +9.82]	[−0.45, +9.34]
Contributors exclusive to creative authorship, count	+0.69	+0.63	+0.57
	[+0.13, +1.24]	[+0.07, +1.20]	[+0.02, +1.11]
Credited team size	−0.22	−0.53	−0.64
	[−2.49, +2.05]	[−2.95, +1.88]	[−2.98, +1.70]
Panel C. Commuting zones			
Records crediting a sample, share	+2.36	+2.42	+2.29
	[+0.52, +4.19]	[+0.51, +4.34]	[+0.46, +4.13]
Credited contributors per 100,000 aged 20–64	+3.85	+3.85	+3.56
	[−1.49, +9.18]	[−1.72, +9.43]	[−1.77, +8.89]

Note. Pooled coefficients on Exposed × Post under three treatments of 1988: included in the pre-period, excluded, or included in the post-period. These alternatives reflect uncertainty about when records released during the campaign year were produced. Shares are in percentage points and counts in contributors. The creative-contributor estimates are +0.449, +0.396, and +0.304, respectively; excluding 1988 reduces the estimate by 12%, while assigning it to the post-period reduces it by 32%. The first and third specifications use 70,994 records and 1,852 zone-years for sampling. Excluding 1988 leaves 67,785 records and 1,768 zone-years. Brackets are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone.

C.5 The number of comparison tours

The baseline comparison group uses the ten tours described in Section 3.2. Table C.4 restricts that list to its first eight or five acts in reported attendance order, keeping the eighteen exposed zones fixed. The comparison group changes from 107 zones to 106 and 103. Eight tours exclude Milwaukee; five also exclude Daytona Beach, Starkville, and Erie.

The reported sampling, organizational, and acoustic estimates are similar across these cutoffs, while the employment estimate remains imprecise. Because the alternative lists cover nearly the same zones, this is a check on the tour-count cutoff within the existing design.

Table C.4: Main estimates with the comparison group built from ten, eight, and five tours

	Estimate	95% interval (CR2)	N	Zones (comparison)	Pre-years resolving
Records crediting a sample, share of a zone-year's records (pp)					
Ten tours (baseline)	+2.357	[+0.520, +4.194]	1,852	117 (99)	0 of 8
Eight tours	+2.367	[+0.515, +4.219]	1,831	116 (98)	0 of 8
Five tours	+2.347	[+0.493, +4.202]	1,810	113 (95)	0 of 8
Credited people per 100,000 residents aged 20–64					
Ten tours (baseline)	+3.85	[−1.49, +9.18]	2,625	125 (107)	0 of 8
Eight tours	+3.87	[−1.48, +9.23]	2,604	124 (106)	0 of 8
Five tours	+3.69	[−1.62, +9.00]	2,541	121 (103)	0 of 8
Contributors exclusively in creative authorship and production, per record					
Ten tours (baseline)	+0.449	[+0.081, +0.818]	70,994	117 (99)	0 of 8
Eight tours	+0.441	[+0.060, +0.822]	70,707	116 (98)	0 of 8
Five tours	+0.441	[+0.060, +0.823]	70,652	113 (95)	0 of 8
Acoustic distance from the previous year's releases (pre-period SD)					
Ten tours (baseline)	+0.169	[+0.066, +0.272]	30,924	106 (88)	0 of 7
Eight tours	+0.167	[+0.062, +0.273]	30,865	105 (87)	0 of 7
Five tours	+0.168	[+0.063, +0.274]	30,850	103 (85)	0 of 7

Note. Pooled 1989–2000 campaign-exposure estimates using ten, eight, or five comparison tours. The source is *Amusement Business*'s year-end list of ten top-grossing touring acts (24 December 1988); Jackson did not report to that list. The five- and eight-tour samples select acts by reported attendance, which covers boxscores from December 1987 through November 1988, including late-1987 and Canadian dates. Only US concerts that took place in 1988 determine comparison zones, and all 18 exposed zones remain fixed. The ten-, eight-, and five-tour designs contain 107, 106, and 103 comparison zones and 26,568, 26,281, and 26,226 comparison records. The eight-tour sample excludes Milwaukee; the five-tour sample also excludes Daytona Beach, Starkville, and Erie. Zone counts refer to each outcome's estimation sample, with comparison counts in parentheses. Employment uses all zones; sampling and record-level outcomes require observed records. Units are percentage points for sampling, people per 100,000 residents aged 20–64 for employment, contributors per record for organization, and pre-period standard deviations of the ten-tour sample for acoustic distance. The first, second, and fourth blocks include commuting-zone and census-division-by-year effects; the third includes studio and division-by-year effects. Brackets are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone. The final column counts pre-campaign annual coefficients whose intervals exclude zero.

D Diffusion and employment

This appendix examines sampling and employment in local music production. It presents the underlying series, sensitivity to local characteristics and comparison locations, and equipment listings that provide a separate description of device availability.

D.1 Sampling across commuting zones

Table D.1 reports the pooled commuting-zone estimates. Figure D.1 shows the raw annual sampling shares. These series give each record equal weight, so commuting zones producing more records contribute more to them than to the baseline regression, which gives each active commuting-zone-year one observation.

Table D.1: Commuting-zone-level estimates

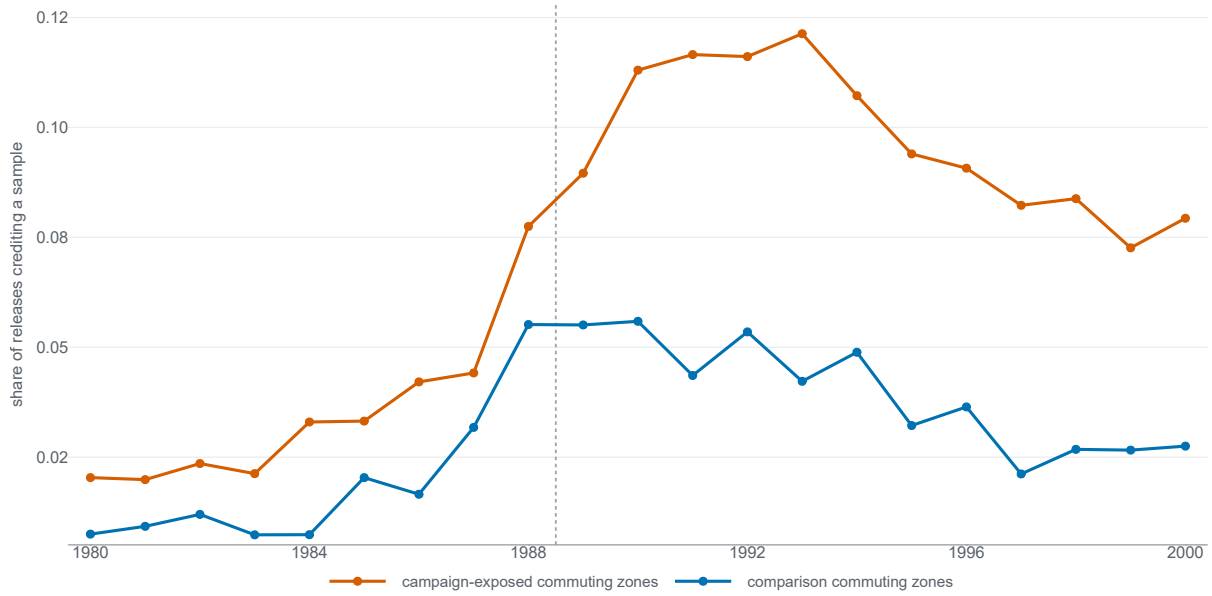
Outcome	CRV1	CR2	ν	Mean, 1980–2000	N
Panel A. Sampling adoption					
Share of releases crediting a sample	+0.0236	+0.0236	25.3	0.0205	1,852
	(0.0088)	(0.0089)			
Share of active studios crediting a sample	+0.0267	+0.0267	25.3	0.0379	1,852
	(0.0126)	(0.0128)			
Panel B. Credited people					
Credited people per 100k aged 20–64	+3.8454	+3.8454	23.3	17.7	2,625
	(2.5333)	(2.5801)			
Commuting-zone FE	Yes				
Division-by-year FE	Yes				
Clustered on	Commuting zone				

Notes. Each row reports the coefficient on $\text{Exposed}_m \times \text{Post}_t$ from a separate commuting-zone–year regression of the stated outcome, following Equation 1 in pooled form, with $\text{Post}_t = \mathbf{1}[t \geq 1989]$. The campaign year's rows are kept and enter the pre-campaign side of the comparison. **The two estimator columns carry the same point estimate by construction** and differ only in the standard error: CRV1 uses $G - 1$ degrees of freedom, and the bias-reduced CR2 uses the per-coefficient Satterthwaite ν reported beside it. **Inference uses those degrees of freedom, not normal critical values**, which matters most in the CR2 column, where ν can fall below 10. The mean column is the outcome mean over all years 1980–2000 on the estimation rows, exposed and comparison commuting zones together. It is not a pre-campaign level: the 1980–1988 mean of the sampling share is 0.0100, which is the figure the text compares the estimate with. The studio row counts studios that released at least one record crediting a sample; it describes sampled output at studios and not ownership of any device.

D.2 Employment relative to local population

Table D.2 examines the employment rate, contributor counts, and working-age population separately. Neither the linear rate nor the Poisson specifications detect a response relative to

Figure D.1



Share of records identified as using sampling, by exposure status. *Note.* Raw annual shares of records identified as using sampling, pooled separately for exposed and comparison commuting zones. Exposed commuting zones are the 18 reached by the 1988 campaign; comparison commuting zones hosted another major US tour without the AKAI promotion. Records receive equal weight in these series, while the regression weights active commuting-zone-years equally. Annual counts range from 1,545 to 2,634 records in exposed locations and from 813 to 1,801 in comparison locations. All 18 exposed zones contribute in every year, alongside 62–77 comparison zones.

population. The baseline increase in absolute contributor counts becomes imprecise after adjustment for predetermined local characteristics, while population shows little differential movement. The intervals permit meaningful employment changes in either direction.

D.3 Predetermined local characteristics

Larger recording centers may have followed different sampling paths without the campaign. Figure D.2 reports annual estimates with a predetermined characteristic interacted with year indicators: 1980 population density, 1980 urban share, and 1979 median household income, one at a time. Pre-campaign coefficients are positive on average, at +0.99 percentage points with density, +1.09 with urban share, and +1.17 with income over 1980–1987, compared with −0.65 in the baseline of Section 4.1. Post-campaign averages are 2.08, 2.23, and 1.81. Coefficients peak in 1993, at 5.27, 6.41, and 5.87 points, the only year whose interval excludes zero in each panel. The early-1990s increase remains, but its gap from the pre-campaign coefficients is smaller than in the baseline.

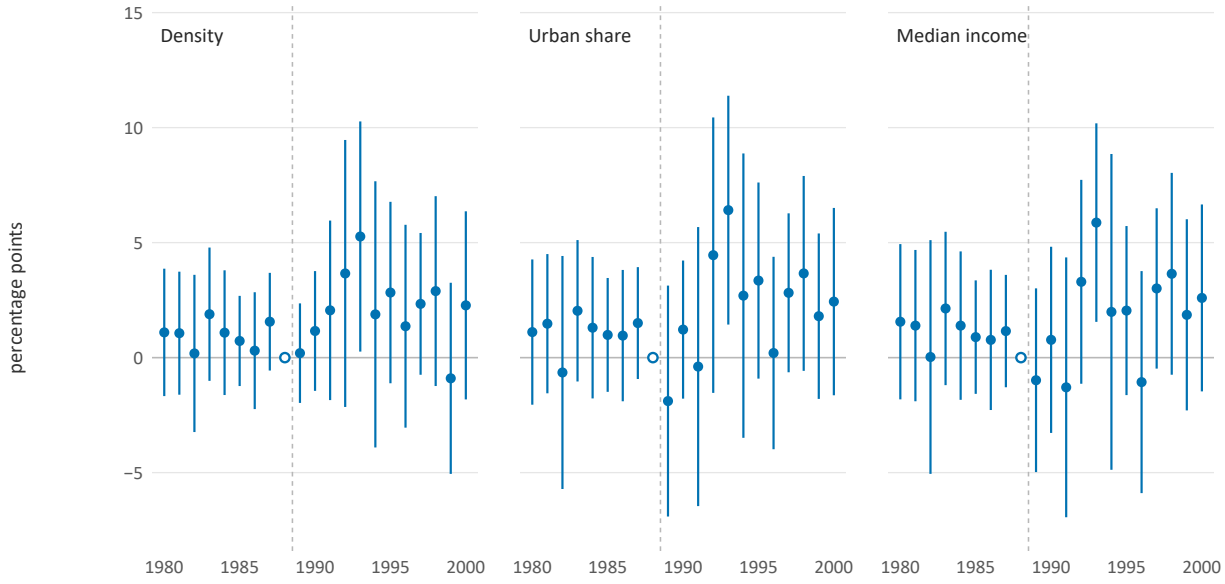
Table D.2: Employment: specification sensitivity and measurement diagnostics

	$\hat{\beta}$	95% interval	N
Panel A1. Contributors per 100k aged 20–64, linear, people per 100k			
No controls	+3.85	[−1.49, +9.18]	2,625
1980 density × year	−2.78	[−8.63, +3.08]	2,625
1980 urban share × year	+1.94	[−3.54, +7.41]	2,625
1979 median income × year	+1.30	[−4.91, +7.52]	2,625
All three × year	−3.20	[−9.28, +2.88]	2,625
Panel A2. Contributor counts, Poisson with a log working-age population offset, percentage change			
No controls	−12.9%	[−25.9%, +2.4%]	2,457
All three × year	−9.6%	[−22.0%, +4.8%]	2,457
Panel B. Numerator and denominator, linear			
Credited contributors, count, no controls	+457.5	[+67.9, +847.1]	2,625
Credited contributors, count, all three	+264.8	[−89.6, +619.3]	2,625
Log working-age population, no controls	+0.016	[−0.024, +0.056]	2,625
Log working-age population, all three	+0.003	[−0.049, +0.054]	2,625
Panel C. Measurement diagnostics, no controls in the last four rows			
Denominator timing: annual base ÷ fixed-1980 base, no controls			0.56
Denominator timing: annual base ÷ fixed-1980 base, all three			0.83
Imputed denominator rows removed (commuting-zone-years)			14
Largest annual change from removing them (people per 100k)			0.99
Largest annual change from the entity-cleaning rule (people per 100k)			0.20
Correlation of the twenty annual coefficients before and after that rule			0.9999

Note. Commuting-zone-level regressions following Equation (1) in pooled form with commuting-zone and census-division-by-year fixed effects, Post = $1[t \geq 1989]$ and 1988 in the pre-campaign period. Panels A1 and B use 125 commuting zones, including 18 exposed, over 1980–2000, with CR2 intervals and Satterthwaite degrees of freedom. The Poisson regressions in Panel A2 exclude eight comparison zones with no records, leaving 2,457 zone-years in 117 zones. Their intervals use conventional cluster-robust standard errors and normal critical values, transformed from the log scale. Entries are $100(e^{\hat{\beta}} - 1)$; the underlying coefficients are −0.138 and −0.101. Panel C compares annual and fixed-1980 population denominators, then examines imputed population and collective entities. The 14 imputed observations fall in one exposed zone. Annual changes and correlations use the twenty event-study coefficients, omitting 1988. The entity rule excludes entities always credited as groups.

Population overlap is limited: only 21 of 99 comparison zones are as populous as the smallest exposed zone, three are as populous as the median exposed zone, and four exposed zones exceed every comparison zone.

Figure D.2: Sampling estimates with predetermined local characteristics



Note. Annual sampling-share coefficients, with 1988 omitted, on 1,852 zone-years in 117 commuting zones, 18 exposed. Models include commuting-zone and census-division-by-year fixed effects. Each panel adds one characteristic interacted with year indicators: logged 1980 population density, 1980 urban share, and logged population-weighted county median household income in 1979. Panels share a vertical scale. Bars are 95% CR2 intervals with coefficient-specific Satterthwaite degrees of freedom, clustered by commuting zone.

D.4 Comparison locations and exposure assignments

Reassigning exposure to alternative sets of eighteen zones yields two-sided sampling p-values of 0.010 under unrestricted reassignment, 0.021 within census divisions, and 0.006 within divisions crossed with pre-campaign production terciles. These comparisons describe where the observed estimate lies among alternative assignments. Because the actual itinerary was not randomized, this exercise provides a comparison with alternative exposure assignments rather than inference from a randomized campaign.

A separate comparison assigns exposure to locations visited by other major tours and compares them with locations outside those tours, excluding campaign locations. Its pooled sampling estimate is +0.62 percentage points, with an interval from −1.16 to +2.40.

The campaign and comparison-tour regressions use different comparison groups. Their coefficients are reported separately, without a test of the difference. Appendix B describes the itinerary used to assign exposure.

Table D.3: Placebo assignment from the comparison tours

	Estimate (pp)	95% interval (CR2)	95% interval (CRV1)	Treated zones	Comparison zones	N
The campaign, for comparison						
Campaign exposure (Table D.1)	+2.36	[+0.52, +4.19]	—	18	99	1,852
Placebo exposure from the comparison tours						
Comparison tours	+0.62	[−1.16, +2.40]	[−1.26, +2.50]	99	226	2,967

Note. The outcome is the zone-year share of records using sampling, in percentage points. Regressions include commuting-zone and census-division-by-year effects, with 1988 in the pre-period. The campaign regression uses 18 exposed and 99 comparison zones with records. The comparison-tour regression compares those 99 zones with 226 zones outside the comparison tours, excluding campaign locations. CR2 intervals use Satterthwaite degrees of freedom and clustering by commuting zone; CRV1 intervals are also reported. Different exposure groups are not directly tested against one another.

The comparison-tour event study shows no detectable difference in any pre- or post-campaign year. Its post-campaign estimates range from −1.99 to +1.92 percentage points on 2,967 zone-years. The wide intervals leave the effect of hosting other tours imprecisely estimated.

D.5 Local economic conditions

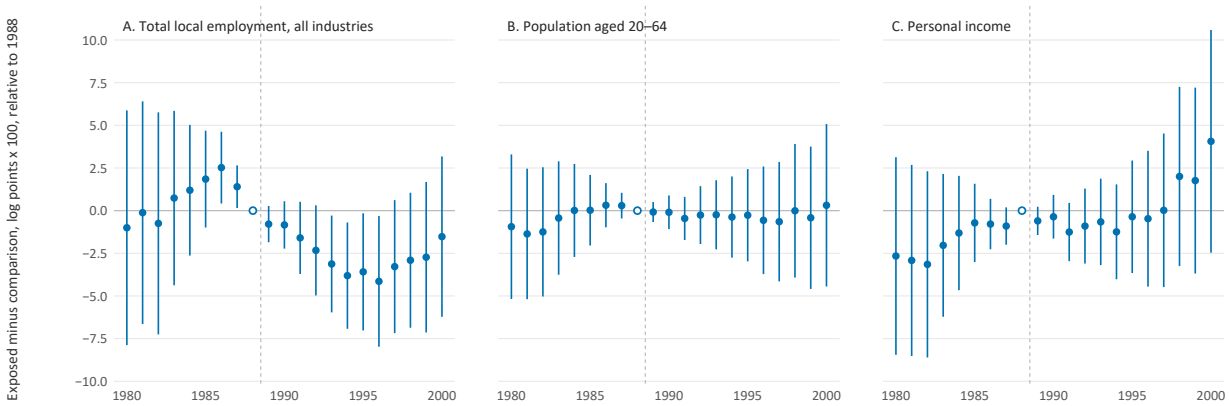
Table D.4 and Figure D.3 examine broader local employment, working-age population, and personal income. Their pooled intervals include zero, but their annual patterns differ: total employment shows pre-campaign movement, and income rises gradually across both periods. These outcomes do not show a clear common local expansion beginning with the campaign.

Table D.4: Total local employment, population, and income

	Estimate	95% interval	Annual intervals excluding zero	
	(log points)	(CR2)	1980–1987	1989–2000
Total local employment, all industries (log)	−0.032	[−0.079, +0.015]	2 of 8	4 of 12
Population aged 20–64 (log)	+0.001	[−0.043, +0.045]	0 of 8	0 of 12
Personal income (log)	+0.018	[−0.032, +0.068]	0 of 8	0 of 12

Note. Commuting-zone regressions with the design of Section 4.1: commuting-zone and census-division-by-year fixed effects, Post $= 1[t \geq 1989]$ with 1988 in the pre-campaign period, on the 1,852 zone-years in which the sampling-adoption share is defined (117 commuting zones, 18 exposed). Employment is County Business Patterns employment in all industries as imputed by Eckert et al. (2021); population is the SEER count aged 20–64; income is BEA personal income. These are overall local outcomes, not the credited music-production employment of Figure 5. Brackets are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone; the last two columns count annual coefficients (1988 omitted) whose CR2 interval excludes zero. Figure D.3 reports the annual paths.

Figure D.3: Total local employment, population, and income by year



Note. Annual coefficients on exposure, 1988 omitted, in log points times 100, for the sample and specification of Table D.4. Panels share a vertical scale. Bars are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone.

D.6 Equipment in the *Mix* directories

Figure D.4 shows similar equipment-listing shares through 1990 and a higher exposed share in 1991–1993. The 53 listings naming an MPC60 or MPC3000 come from 36 studios: 23 in exposed and 13 in comparison zones. Studios can appear repeatedly, so the series describes reported equipment in each year rather than acquisition dates. Appendix A.5 describes extraction and linkage.

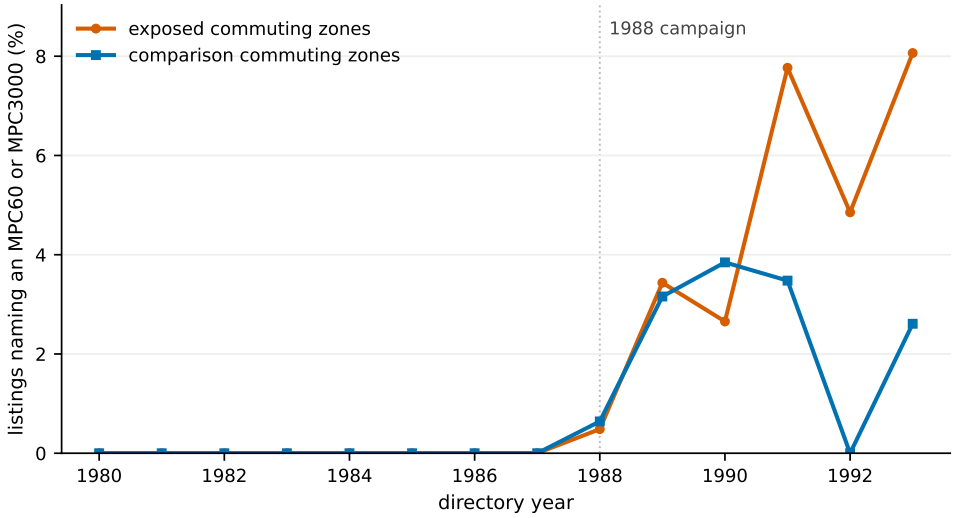
E The organization of production

This appendix examines which parts of the team change, whether individual task bundles broaden, and how the organizational estimates depend on the specification and measurement of contributions.

E.1 Team composition and individual task breadth

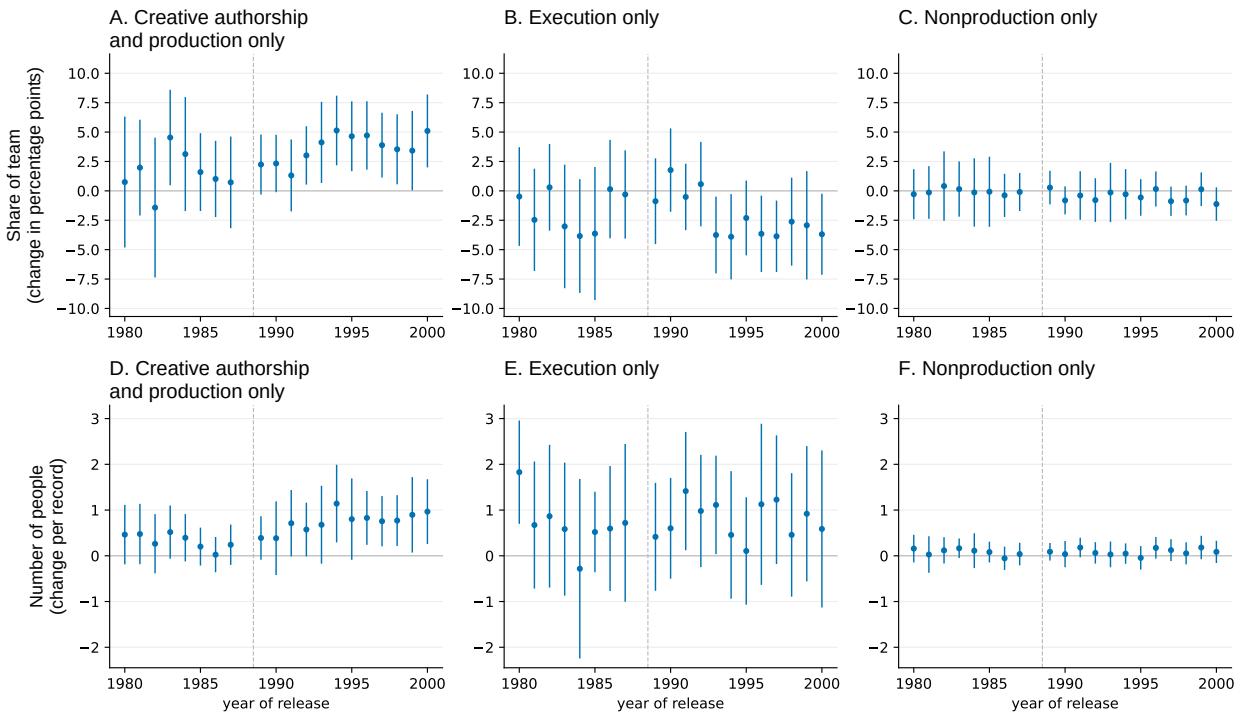
Table E.1 locates the change within the team. Records gain 0.449 musicians working exclusively in creative authorship and production, with a 95% interval of $[+0.081, +0.818]$. The other contributor categories show no detectable decline, and the total-team estimate is imprecise.

Figure D.4: Studio listings naming an Akai MPC, by year



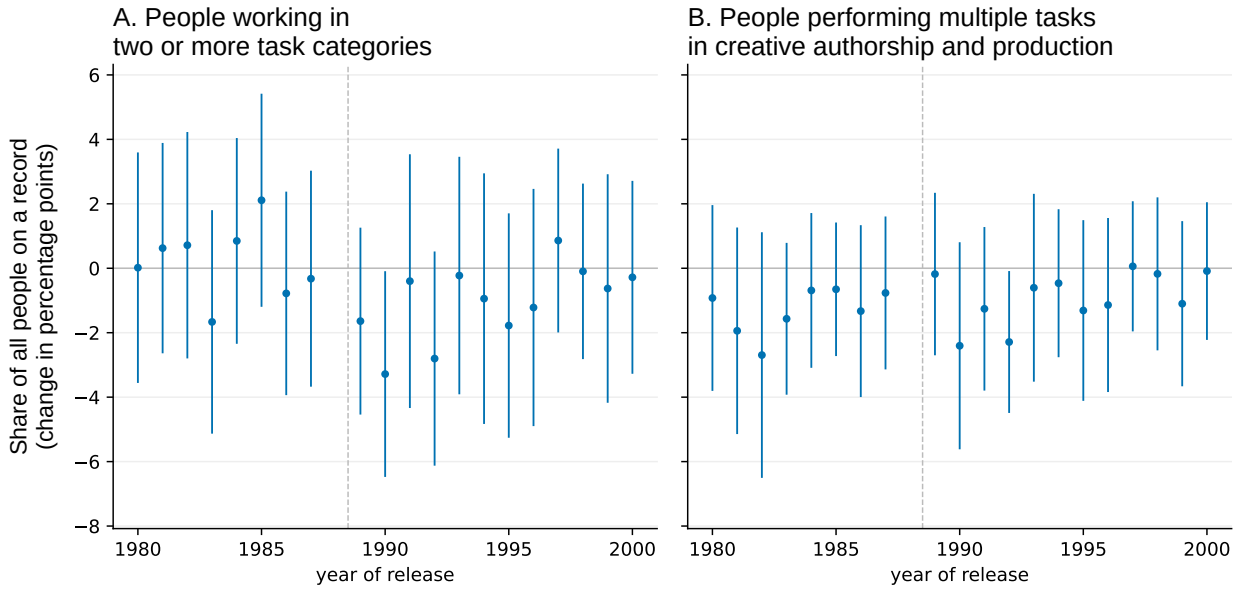
Note. Annual share of *Mix* directory listings whose text names an Akai MPC60 or MPC3000 ("MPC60" or "MPC3000", with or without a space or hyphen), 1980–1993, without smoothing. The two models are not distinguished, and "MPC" without a model number is not counted. Exposed and comparison commuting zones are the paper's 18 and 107 (Section 4.1); listings elsewhere are excluded, and zones are not required to produce records. The denominator is the 3,876 full-format listings resolved to a studio and located in those zones, between 29 and 505 per group and year. All 18 exposed and 80 of the 107 comparison zones contribute at least one such listing; in a given year, 4–17 exposed and 11–61 comparison zones do. Short-format listings print no equipment and are excluded rather than counted as not naming an MPC. The dotted line marks the 1988 campaign, during which the 1988 directory went to press. The share of listings printed in full format changes differentially after 1988. The series records listings of the device, not first adoption, and is not an estimate of the campaign's effect. The first device listings appear in 1988, one in each group. Subsequent annual counts range from 3 to 10 in exposed locations and from 0 to 6 in comparison locations. Repeated studio listings contribute to these counts.

Figure E.1: The effect of campaign exposure on team composition



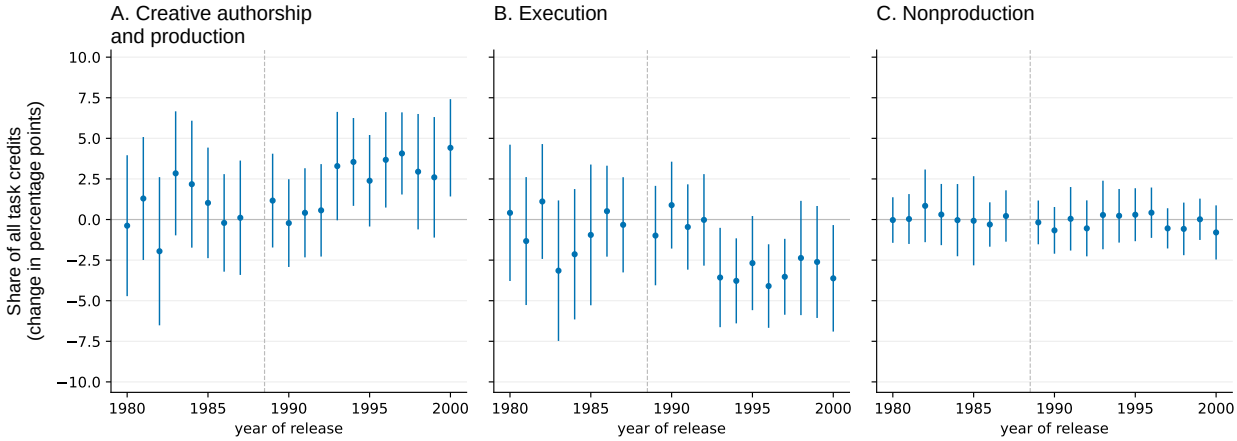
Note. Event-study estimates with 1988 as the omitted reference year. Studio and census-division-by-year fixed effects, following Equation (2). A person works only in a task category if all their classified credits on the record fall within it. Panels A–C report shares of all people on the record; Panels D–F report counts per record. People working across task categories and total team size are reported in Appendix E.1. Bars are 95% confidence intervals using CR2 with coefficient-specific Satterthwaite degrees of freedom, clustered by commuting zone. The sample contains 70,994 records, 117 commuting zones, and 18 exposed zones.

Figure E.2: The effect of campaign exposure on the breadth of individual task bundles



Note. Event-study estimates with 1988 as the omitted reference year. Studio and census-division-by-year fixed effects, following Equation (2). Panel A reports the share of all people on a record working across two or more task categories; Panel B reports the share of all people on a record holding multiple distinct tasks within creative authorship and production, whether or not they also work in another category. Panel A is also part of the team-composition decomposition in Figure E.1. Bars are 95% confidence intervals using CR2 with coefficient-specific Satterthwaite degrees of freedom, clustered by commuting zone. The sample contains 70,994 records, 117 commuting zones, and 18 exposed zones.

Figure E.3: The effect of campaign exposure on the allocation of tasks



Note. Event-study estimates for each task category's share of classified credits, with 1988 as the omitted reference year. Studio and census-division-by-year fixed effects, following Equation (2). Task shares are shares of classified credit lines, not shares of people or hours. The three categories partition these lines, so the coefficients sum to zero within each year. Panels share a vertical scale. Bars are 95% confidence intervals using CR2 with coefficient-specific Satterthwaite degrees of freedom, clustered by commuting zone. The sample contains 70,994 records, 117 commuting zones, and 18 exposed zones. Appendix E.5 reports the same annual coefficients relative to the average pre-campaign coefficient.

Table E.1: Credited team composition

Contributors per record	Pooled 1989–2000	1993–2000 contrast	Mean, 1980–1988	N
Panel A. Studio and division-year effects ($\nu = 8.13$ pooled, 7.85 for the 1993–2000 contrast)				
Creative authorship and production only	+0.449	+0.532	3.37	70,994
	(0.160)	(0.152)		
Execution only	+0.217	+0.061	8.00	70,994
	(0.196)	(0.285)		
Nonproduction only	+0.023	+0.001	1.62	70,994
	(0.071)	(0.076)		
Two or more categories	−0.132	−0.133	2.25	70,994
	(0.145)	(0.126)		
Total credited contributors	+0.556	+0.461	15.24	70,994
	(0.406)	(0.427)		
Panel B. Commuting-zone and division-year effects ($\nu = 10.40$ pooled, 10.73 for the 1993–2000 contrast)				
Creative authorship and production only	+0.653	+0.751	3.37	70,994
	(0.207)	(0.254)		
Execution only	+0.123	−0.005	8.00	70,994
	(0.299)	(0.307)		
Nonproduction only	+0.151	+0.174	1.62	70,994
	(0.079)	(0.084)		
Two or more categories	+0.020	+0.015	2.25	70,994
	(0.110)	(0.111)		
Total credited contributors	+0.947	+0.934	15.24	70,994
	(0.503)	(0.532)		
Census division-by-year effects	Yes			
Clustering	Commuting zone (117 zones, 18 exposed)			

Note. The first column reports the pooled 1989–2000 coefficient on exposure for the number of credited contributors per record, with 1988 in the pre-campaign period. The second compares the mean annual coefficient over 1993–2000 with the mean pre-campaign coefficient. The four mutually exclusive cells partition the credited team: execution only, creative authorship and production only, nonproduction only, and contributors spanning two or more families. Their coefficients therefore sum to the change in total credited team size. The mean column reports 1980–1988 averages on the estimation sample; the four category means sum to total team size. Standard errors use CR2 and are clustered by commuting zone. Credits identify attributed functions rather than hours worked, authority, or labor input.

Table E.2 counts all contributors with a creative or execution credit, including those working across categories, and reports credit lines separately. Under commuting-zone effects, creative contributors increase by 0.677, $[+0.161, +1.193]$, and authorship credit lines by 0.907, $[+0.168, +1.646]$. Under studio effects, the corresponding estimates are 0.303 and 0.346, both imprecise. These broader measures give less precise within-studio evidence than the exclusive creative count. Table E.3 shows no detectable broadening across task families or within creative authorship and production under any of the three credit classifications.

Table E.2: Overlapping counts of contributors and classified credits

Per record	Pooled 1989–2000	1993–2000 contrast	Mean, 1980–1988	N
Panel A. Studio and division-year effects ($\nu = 8.13$ pooled, 7.85 for the 1993–2000 contrast)				
Unique people, overlapping categories				
Contributors with any creative authorship and production credit	+0.303	+0.374	5.57	70,994
	(0.256)	(0.234)		
Contributors with any execution credit	+0.079	−0.087	10.20	70,994
	(0.285)	(0.363)		
Contributors credited in both†	−0.151	−0.173	2.16	70,994
	(0.147)	(0.132)		
Credit lines, overlapping categories				
Creative authorship and production credit lines	+0.346	+0.513	7.18	70,994
	(0.344)	(0.316)		
Execution credit lines	−0.172	−0.749	14.17	70,994
	(0.511)	(0.681)		
Panel B. Commuting-zone and division-year effects ($\nu = 10.40$ pooled, 10.73 for the 1993–2000 contrast)				
Unique people, overlapping categories				
Contributors with any creative authorship and production credit	+0.677	+0.767	5.57	70,994
	(0.233)	(0.264)		
Contributors with any execution credit	+0.120	−0.020	10.20	70,994
	(0.312)	(0.317)		
Contributors credited in both†	+0.002	−0.013	2.16	70,994
	(0.113)	(0.113)		
Credit lines, overlapping categories				
Creative authorship and production credit lines	+0.907	+1.041	7.18	70,994
	(0.333)	(0.375)		
Execution credit lines	+0.116	−0.235	14.17	70,994
	(0.442)	(0.426)		
Census division-by-year effects	Yes			
Clustering	Commuting zone (117 zones, 18 exposed)			

Note. The first three rows count people and the final two count credit lines. Rows overlap: a person with creative and execution credits enters both categories and the cross-category row. A person with several credits contributes once to a person count and several times to a credit-line count. The first column reports pooled 1989–2000 estimates; the second compares average 1993–2000 annual coefficients with their pre-campaign average. Means cover 1980–1988. †At least one creative and one execution credit. The sample contains 70,994 records in 117 zones, 18 exposed. Intervals use CR2 with Satterthwaite degrees of freedom, clustered by commuting zone.

Table E.3: Individual task breadth, under three credit classifications

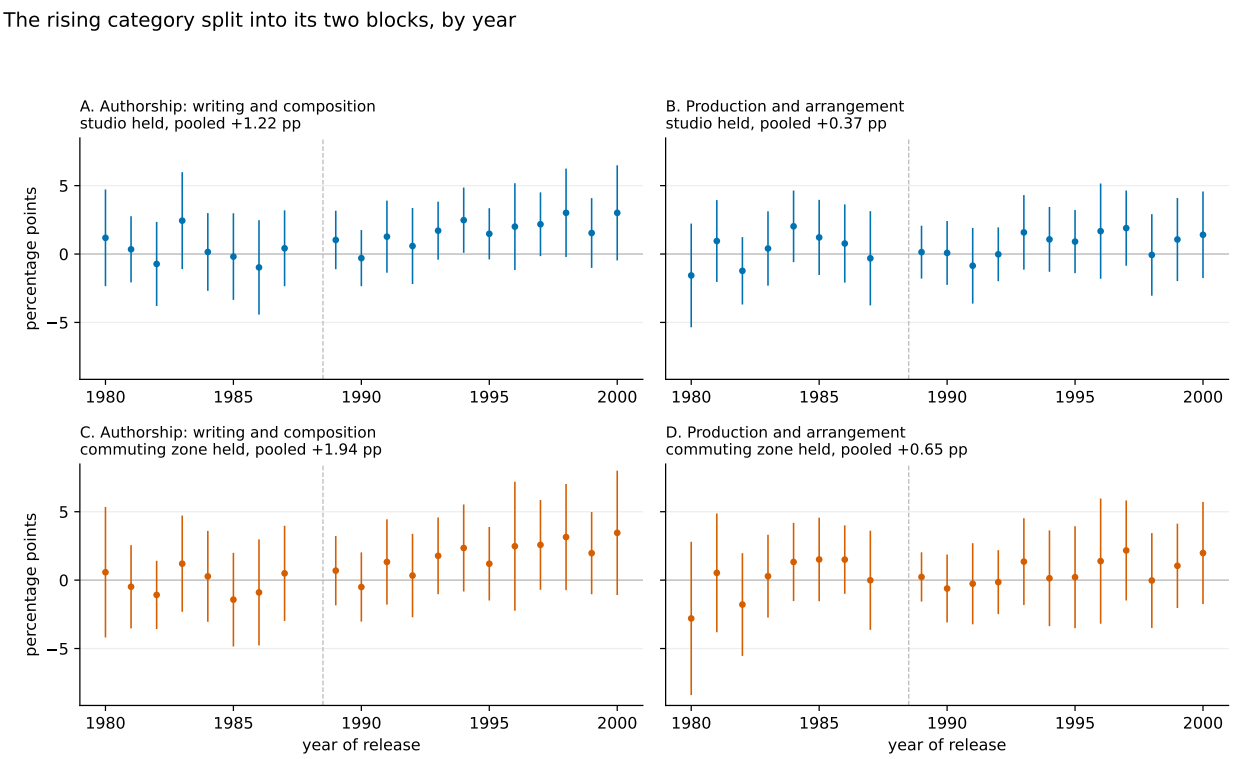
Outcome	Coef.	95% interval (CR2)	Mean, 1980–2000	1993–2000
Panel A. Baseline classification				
Works across two or more task categories	−1.35	[−3.06, +0.37]	18.6	−0.54
	(0.75)			
Two or more distinct creative credit labels	+0.01	[−1.24, +1.25]	10.3	−0.60
	(0.54)			
Two or more creative functions	−0.25	[−1.59, +1.09]	9.4	−1.17
	(0.58)			
Panel B. Missing categories assigned (2,246 of 1,716,508 credits on 1,825 records reclassified)				
Works across two or more task categories	−1.38	[−3.09, +0.33]	18.6	−0.65
	(0.74)			
Two or more distinct creative credit labels	+0.00	[−1.25, +1.25]	10.2	−0.60
	(0.54)			
Two or more creative functions	−0.25	[−1.60, +1.09]	9.4	−1.17
	(0.58)			
Panel C. Reviewed label assignments (36,847 of 1,716,508 credits on 17,650 records reclassified)				
Works across two or more task categories	−1.33	[−3.06, +0.39]	18.8	−0.55
	(0.75)			
Two or more distinct creative credit labels	−0.08	[−1.38, +1.21]	10.0	−0.85
	(0.56)			
Two or more creative functions	−0.23	[−1.62, +1.16]	9.4	−1.23
	(0.60)			

Note. Outcomes are shares of all credited contributors on a record, reported in percentage points. Records without creative-authorship-and-production credits contribute zeros. The first row measures work across two or more task categories. The next two measure breadth within creative authorship and production using distinct credit labels and broader functions, respectively: "written by" and "lyrics by" count as two labels but one function. Contributors may hold several creative functions while working exclusively within that task category. Panel A uses the baseline classification. Panels B and C use alternatives defined before estimating these specifications. Panel B classifies labels with missing source categories, affecting 2,246 of 1,716,508 credits on 1,825 records. Panel C also applies reviewed label-level assignments, affecting 36,847 credits on 17,650 records: featuring enters execution; drum programming and sequencing enter creative authorship and production; liner and sleeve notes, compilation, research, and consultancy enter nonproduction. Engineering remains in execution under both alternatives. Contributor categories are reconstructed under each classification, combining performance and technical work into execution. Specification and inference follow Table E.4. The sample contains 70,994 records in 117 commuting zones, including 18 exposed zones.

E.2 Authorship, production, and arrangement

The broad creative category combines writing and composition with production and arrangement. Figure E.4 separates these blocks, and Panels A and B of Table E.4 report finer components. Panels A and B decompose task shares, while Panel C reports contributor counts.

Figure E.4: Authorship versus production and arrangement



Note. Creative authorship and production split into authorship and production-and-arrangement functions under both fixed-effect specifications. The two blocks partition the broader family, so their annual coefficients sum to the family's coefficient. Intervals use CR2 with coefficient-specific Satterthwaite degrees of freedom and are clustered by commuting zone.

Panel C decomposes creative contributors into four mutually exclusive groups: authorship only, production and arrangement only, conducting only, and contributors spanning these components. Their coefficients sum to the headline count. Writing and composition account for about three fifths of the increase, with an interval above zero. The production-and-arrangement component is positive but imprecise; the cross-component increase has an interval above zero. Conducting contributes little and shows pre-campaign movement. The decomposition locates most of the increase in authorship without establishing a difference between component effects.

Table E.4: Creative authorship and production, decomposed

Outcome	Coef.	95% interval (CR2)	Mean, 1980–2000	1989–92	1993–2000
Panel A. The two blocks (shares of classified credits, percentage points)					
Authorship	+1.22	[−0.16, +2.60]	16.8	+0.65	+2.18
	(0.60)				
Production and arrangement	+0.37	[−1.06, +1.80]	17.5	−0.16	+1.19
	(0.62)				
Panel B. The five components (shares of classified credits, percentage points)					
Writing	+0.90	[−0.56, +2.35]	14.4	+0.43	+1.87
	(0.63)				
Composition	+0.32	[−0.06, +0.71]	2.4	+0.21	+0.30
	(0.17)				
Arrangement	+0.32	[−0.21, +0.84]	2.9	+0.21	+0.14
	(0.23)				
Production	−0.00	[−1.40, +1.39]	14.1	−0.50	+0.87
	(0.61)				
Conducting (thin)	+0.06	[−0.21, +0.33]	0.6	+0.13	+0.18
	(0.12)				
Sum of the five	+1.59	*equals the family coefficient exactly*			
Panel C. Contributors working only in creative authorship and production, counted once each (people per record)					
Authorship only	+0.272	[+0.029, +0.516]	2.22	+0.348	+0.542
	(0.106)				
Production and arrangement only	+0.106	[−0.024, +0.236]	0.96	+0.144	+0.212
	(0.057)				
Conducting only	−0.008	[−0.020, +0.004]	0.05	+0.026	+0.022
	(0.005)				
Spanning two or more of the three	+0.079	[+0.027, +0.130]	0.25	−0.003	+0.079
	(0.022)				
Sum of the four	+0.449	*equals the exclusive creative-contributor count exactly*			

Note. Panels A and B report task-share coefficients in percentage points; Panel C reports contributor counts. Pooled estimates use studio and census-division-by-year fixed effects with post-campaign years 1989–2000. The final two columns are equally weighted averages of annual coefficients relative to 1988. The mean column covers 1980–2000. Panel A groups writing and composition as authorship, and production, arrangement, and conducting as its second component. Panel B separates the five components. Panel C partitions contributors working exclusively in the creative family into authorship only, production and arrangement only, conducting only, and contributors spanning those components. Each person counts once per record; the four outcomes sum to the headline creative-contributor count, as do their estimated coefficients. Conducting is reported separately in Panel C. Brackets are 95% CR2 intervals with coefficient-specific Satterthwaite degrees of freedom, clustered by commuting zone; standard errors appear in parentheses. The sample contains 70,994 records in 117 zones, 18 exposed. The 1980–1988 mean of the headline count is 3.37.

E.3 Alternative task classifications

Separating execution into performance and technical work examines whether its aggregate share conceals different movements. Both components have negative point estimates in the later-period comparison, with limited precision. The main count results remain distinct from these changes in task shares.

I assess ambiguous labels under two alternative classifications defined before estimating these specifications. The first fills missing source categories, affecting fifteen labels and about one credit in a thousand. The second also assigns families directly from adjudicated labels, affecting twenty-six labels and about two percent of credits. It moves featuring into execution, drum programming and sequencing into creative authorship and production, and liner notes, compilation, research, and consultancy into nonproduction. Engineering remains in execution under both rules. Contributor categories are rebuilt before measuring counts or shares. The creative-contributor estimate remains positive with an interval above zero under both alternatives (Table E.5); neither produces detectable broadening of individual tasks (Table E.3).

E.4 Specification and sample sensitivity

Studio fixed effects compare records produced within the same studio. Commuting-zone fixed effects also allow changes in which studios produce records to contribute. The organizational count rises under both specifications, while individual task breadth shows no detectable increase. These comparisons describe within-studio and broader local adjustment.

Table E.5 examines the headline count under predetermined local characteristics and restricted comparison samples. Density, urban share, and income interacted with year leave a positive estimate. Restricting comparisons to larger or more active recording locations gives estimates close to the baseline.

The baseline record-level sample does not exclude compilations, reissues, remasters, or remixes by their release descriptors. A separate dating check flags records whose earliest listed release predates the assigned year by more than five years or predates 1980. Excluding the 3,548 flagged records raises the count estimate from 0.449 to 0.554, with an interval of $[+0.189, +0.918]$, and retains all commuting zones.

Genre fixed effects compare records within the same primary genre. The full-period count estimate is 0.420, $[+0.016, +0.824]$, compared with 0.449 (Table E.9). In the annual

Table E.5: Exclusive creative contributors: predetermined characteristics, sample restrictions, and credit classification

Specification	Estimate	95% interval (CR2)	Records	Comparison zones
Baseline	+0.449	[+0.081, +0.818]	70,994	99
1980 density, urban share, and income × year	+0.382	[+0.130, +0.635]	70,994	99
Comparison zones in top third of 1980–1987 records	+0.441	[+0.064, +0.817]	69,808	61
Comparison zones in top third of 1980 population	+0.426	[+0.036, +0.816]	70,257	69
Reissues excluded	+0.554	[+0.189, +0.918]	67,446	99
Credited studios in one commuting zone	+0.249	[+0.022, +0.477]	61,920	99
Records whose tie-break chose across commuting zones excluded	+0.293	[+0.066, +0.519]	66,244	99
Records whose main studio was settled by any tie-break excluded	+0.287	[+0.059, +0.516]	57,846	98
Missing credit categories assigned	+0.452	[+0.084, +0.820]	70,994	99
Reviewed credit-label assignments	+0.411	[+0.063, +0.759]	70,994	99

Note. Pooled 1989–2000 estimates for contributors working exclusively in creative authorship and production, with studio and census-division-by-year fixed effects, equal record weights, and 1988 in the pre-period. Predetermined characteristics are standardized 1980 commuting-zone values interacted with year indicators, omitting 1988. Restricted comparison samples retain zones in the top third of pre-campaign record output or population and all exposed zones. The reissue exclusion removes 3,548 records whose earliest listed release predates the assigned year by more than five years or predates 1980. The baseline retains all release formats, including compilations, reissues, remasters, and remixes. Geographic restrictions distinguish records whose studios lie in one zone from records requiring a studio tie-break. Studios span multiple zones for 9,074 records. Among 13,148 tie-broken records, 4,750 involve studios in different zones and 8,398 involve studios within one zone; only the former can change campaign exposure. The final rows reconstruct contributor categories under two classifications defined before estimation. The first fills missing source categories, affecting 2,246 credits on 1,825 records; the second also applies reviewed label-level assignments, affecting 36,847 credits on 17,650 records. Appendix E.3 describes these assignments. The pre-campaign mean is 3.37 contributors. Brackets are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone. Every row retains all 18 exposed zones.

estimates, 1994 and every year from 1996 exceed zero; the 1993–2000 coefficients average 0.52 contributors above their 1980–1987 average (Figure E.6).

E.5 Timing

Figure E.5 expresses annual estimates relative to their pre-campaign average. The creative-contributor count rises gradually in the early 1990s, while the task-share change becomes clearer around 1993. Under studio effects, count averages are +0.064 [−0.296, +0.425] in 1989–1990, +0.320 [−0.096, +0.736] in 1991–1992, +0.587 [−0.052, +1.226] in 1993–1994, and +0.513 [+0.163, +0.864] in 1995–2000. The later estimates are larger, but overlapping intervals leave the precise timing uncertain. Appendix C.3 explains how these summaries differ from the pooled coefficient.

E.6 Sample clearance and the credits counted

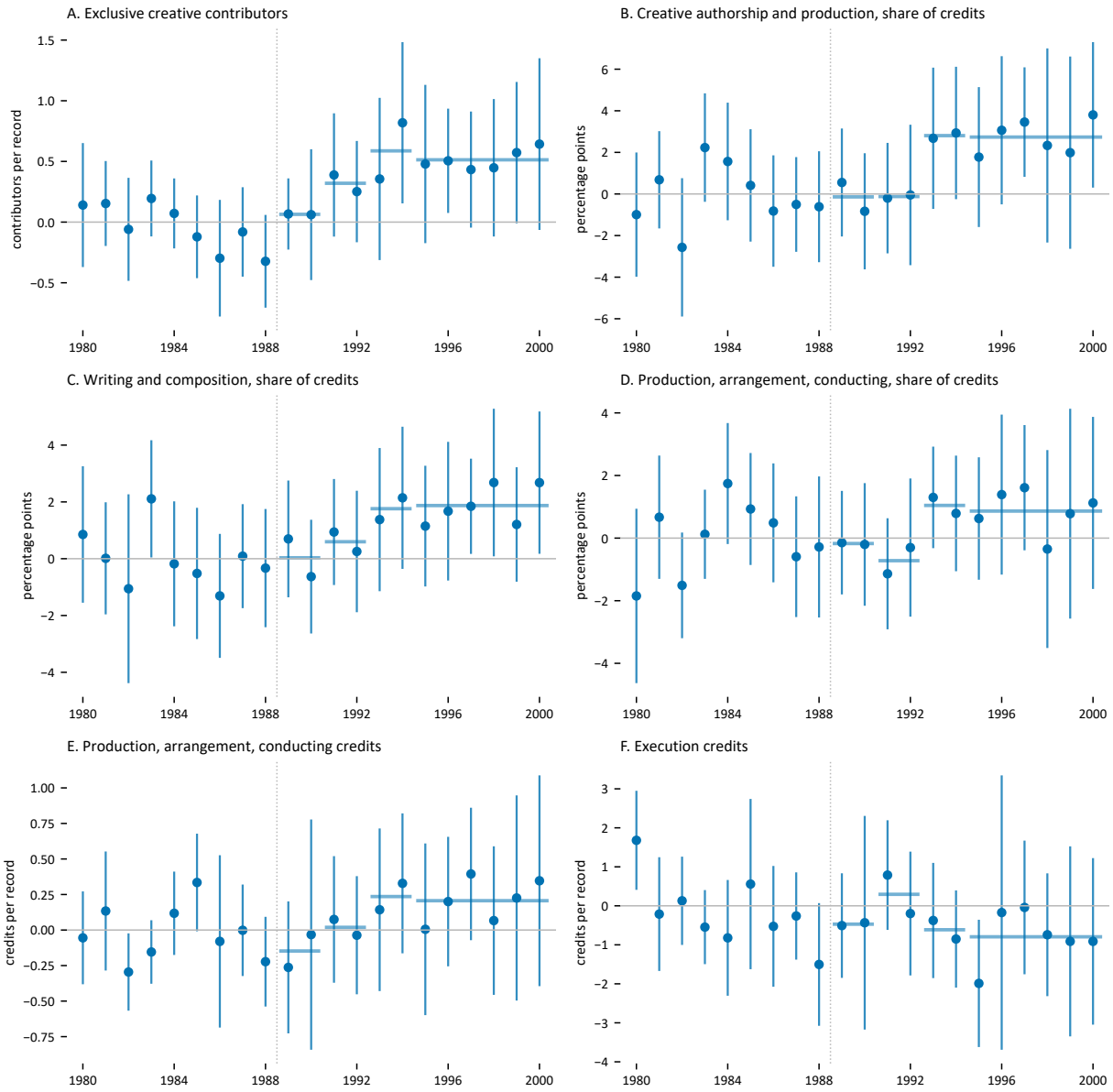
Sample clearance adds writing and composition credits for creators of reused material, one channel through which sampling can increase the number of creative contributors. To gauge the size of this channel, the removal exercise reconstructs outcomes after deleting writing and composition credits from observed sampled records released in 1992–2000. It retains production, arrangement, conducting, execution, and nonproduction credits.

Removing these credits lowers the full-period creative-contributor estimate from 0.449 to 0.352, about 22 percent, with an interval above zero. All 70,994 records remain in the regression. A contributor left with no eligible credit ceases to count. The exclusion removes new writing and composition as well as attribution to reused material. Unlisted samples can also leave clearance credits in the data. The exercise does not isolate the clearance contribution; it shows that the increase remains after removing these authorship credits.

The second block of Table E.6 excludes collective performance credits and rebuilds contributor categories. These lines name ensembles without identifying their individual members. The creative count and exclusivity-share estimates remain close to the baseline. The exclusion leaves twelve records without classified credits; the comparison uses the surviving records in the same commuting zones.

Complementary descriptive evidence comes from Dalla Riva (2025), whose data identify songwriting credits associated with samples or interpolations among Billboard Hot 100 number-one songs. Excluding those writers, the average number of songwriters rose from

Figure E.5: Organizational estimates by year, relative to the pre-campaign average



Note. Points are annual coefficients from Equation (2) minus the average of the 1980–1987 coefficients. Bars are 95% CR2 intervals for that difference, with coefficient-specific Satterthwaite degrees of freedom and clustering by commuting zone. The 1988 point is the omitted year expressed on the same scale. Horizontal segments are the 1989–1990, 1991–1992, 1993–1994, and 1995–2000 averages, measured against the same pre-campaign average. The dotted line marks the 1988 campaign. Panels B–D report shares of classified credits in percentage points; Panels A, E, and F report counts per record. Studio and census-division-by-year fixed effects; 70,994 records in 117 commuting zones, 18 of them exposed. Panels use independent vertical scales. Intervals for the period averages use the full covariance of the annual coefficients and are reported in the preceding text.

Table E.6: Contributor estimates after removing classes of credits

	Pre-period mean	Pooled 1989–2000	1993–2000 minus pre-campaign average
Eligible writing and composition credits removed			
Exclusive creative contributors			
As observed	3.37	+0.449	+0.532
		[+0.081, +0.818]	[+0.180, +0.884]
Credits removed		+0.352	+0.360
		[+0.032, +0.672]	[+0.077, +0.643]
Share of contributors working exclusively in creative authorship and production (pp)			
As observed	26.3	+2.18	+2.78
		[−0.22, +4.58]	[−0.63, +6.20]
Credits removed		+1.93	+2.32
		[−0.53, +4.38]	[−1.08, +5.72]
Collective performance credits removed			
Exclusive creative contributors			
As observed	3.37	+0.449	+0.532
		[+0.081, +0.818]	[+0.180, +0.884]
Credits removed		+0.438	+0.527
		[+0.063, +0.813]	[+0.178, +0.876]
Share of contributors working exclusively in creative authorship and production (pp)			
As observed	26.3	+2.19	+2.80
		[−0.23, +4.60]	[−0.64, +6.24]
Credits removed		+2.08	+2.75
		[−0.30, +4.47]	[−0.64, +6.13]

Note. Outcomes are reconstructed after removing the indicated credits. Block 1 removes writing and composition credits from sampled records released in 1992–2000, retaining all 70,994 records. Block 2 removes collective performance credits without assigning a performer count to an ensemble. It drops 32,874 lines and leaves twelve records without classified credits; both comparison rows use the remaining 70,982 records. Pooled estimates cover 1989–2000; later contrasts average 1993–2000 annual coefficients relative to their pre-campaign average. Means cover 1980–1988 on each block's sample. Models include studio and census-division-by-year effects, with 117 zones and 18 exposed. Brackets are 95% CR2 intervals clustered by commuting zone.

2.0 in 1980–1984 to 3.1 in 1996–2000 (Table E.7). This comparison concerns commercially successful songs across the industry. It shows that the broader increase in songwriting credits also appears after excluding attribution to reused material.

E.7 Alternative exposure assignments

Table E.8 compares the organizational estimates with alternative assignments of eighteen exposed zones. For the main count, the two-sided p-values are 0.127 under unrestricted reassignment, 0.132 within census division, and 0.034 within division and pre-campaign production terciles. The comparison depends on which alternative assignments are allowed. It does not rely on the actual itinerary having been randomized.

E.8 Release format

Short-form records have shorter credit lists, so a given change in contributions can generate a larger share response. Table E.9 reports counts and shares by format. Later-period count

Table E.7: Songwriting and production credits among number-one songs

	First reached number one				
	1980–1984	1985–1988	1989–1991	1992–1995	1996–2000
Songs	82	117	84	42	63
Songwriters	2.00	2.15	2.12	3.07	3.73
Songwriters excluding sampled/interpolated writers	2.00	2.12	2.04	2.52	3.08
Producers	1.96	2.10	1.71	1.81	1.97
Distinct people, adjusted songwriters and producers	3.00	3.30	2.89	3.19	3.78

Note. Source: Dalla Riva (2025), accompanying Hot 100 number-ones database. Periods refer to the first week a song reached number one. Each song receives equal weight. Entries report mean numbers of credited songwriters and producers; the adjusted songwriting count excludes writers credited through samples or interpolations, following the source's coding. The final row counts the union of the adjusted songwriter and producer lists, so a person listed in both counts once, after harmonizing names the source spells in two ways or lists under both a professional and a legal name. The sample comprises 388 songs first reaching number one during 1980–2000.

Table E.8: Reassigning campaign exposure to alternative commuting zones

Reassignment scheme	Share exclusive to the category	Contributors exclusive to the category
Any 18 commuting zones	0.241	0.127
Within census division	0.278	0.132
Within census division and third of pre-1988 production	0.167	0.034
The same procedure for additional organizational outcomes		
Contributors with any execution credit	—	0.835
Total credited contributors	—	0.466

Note. Two-sided reassignment p-values based on 9,999 alternative assignments, all of which returned an estimate. Each draw assigns exposure to eighteen of the 117 commuting zones, subject to the stratification rule indicated in the row: one stratum under unrestricted reassignment, nine census divisions, and twenty-seven division-by-tercile cells. Each entry is the share of draws with an absolute post-campaign contrast at least as large as the observed contrast, without studentization. One division-by-tercile cell contains only exposed zones, so its assignment is fixed across draws. Studio and census-division-by-year fixed effects throughout. The last two outcomes can also respond to the campaign. The exercise compares the observed estimate with other plausible assignments and does not assume that the tour itinerary was random.

estimates are positive in both groups, with an imprecise difference between them in Panel C. The creative-share response is larger for short-form records. Genre fixed effects change the count estimates little, overall and within each format; Figure E.6 reports the annual paths. Excluding executive-producer and featuring credits reduces the count estimate by about an eighth in each format group, leaving it positive.

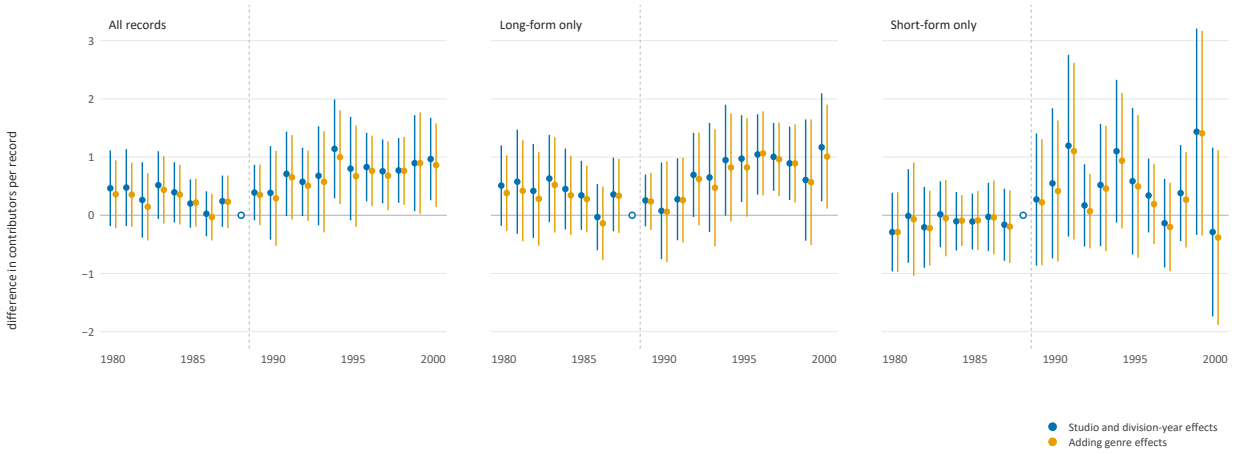


Figure E.6: Adding genre fixed effects, by release format: contributors

Note. Annual coefficients on campaign exposure, 1988 omitted and its records kept in the pre-campaign period, for Panel A of Table E.9: contributors whose classified credits on the record fall entirely within creative authorship and production. Blue series hold studio and census-division-by-year effects; orange series add fixed effects for the record's primary genre, the first of its Discogs genre tags in alphabetical order. Panels share a vertical scale. Bars are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone.

Table E.9: Main organizational outcomes by release format

	All records	Long-form only	Short-form only
Panel A. Contributors confined to creative authorship and production			
Step, 1993–2000 vs. pre	+0.532	+0.504	+0.604
	(0.152)	(0.176)	(0.399)
Pooled, Post = $1[t \geq 1989]$	+0.449	+0.335	+0.632
	(0.160)	(0.144)	(0.406)
+ genre effects	+0.420	+0.355	+0.552
	(0.176)	(0.151)	(0.403)
Excluding executive-producer and featuring credits	+0.388	+0.295	+0.545
	(0.155)	(0.141)	(0.367)
Mean, 1980–1987	3.40	4.00	2.01
Panel B. Share of classified credits in creative authorship and production			
Step, 1993–2000 vs. pre	+2.753	+1.143	+3.623
	(1.444)	(0.901)	(2.780)
Pooled, Post = $1[t \geq 1989]$	+1.589	+0.007	+3.348
	(1.041)	(0.723)	(1.851)
+ genre effects	+1.569	+0.036	+2.874
	(1.037)	(0.671)	(1.756)
Excluding executive-producer and featuring credits	+1.453	+0.018	+2.912
	(1.056)	(0.677)	(1.912)
Mean, 1980–1987 (%)	36.44	30.96	49.05
Records	70,994	44,147	26,847

Panel C. The difference between formats, tested directly

	Studio block		Commuting zone	
	Pooled	Step	Pooled	Step
Contributors confined to creative authorship and production				
β_1, long-form	+0.598	+0.773	+0.758	+0.823
β_2, short-form difference	−0.295	−0.540	−0.123	+0.055
95% interval	[−1.08, +0.48]	[−1.64, +0.56]	[−0.76, +0.51]	[−1.03, +1.14]
Share of classified credits in creative authorship and production				
β_1, long-form	−0.52	−0.45	−0.72	−0.75
β_2, short-form difference	+3.90	+6.43	+6.05	+8.01
95% interval	[+0.47, +7.32]	[−1.14, +14.00]	[−0.17, +12.27]	[−0.30, +16.32]

Note. Panel A is measured in contributors and Panel B in percentage points of classified credits. Long-form records carry an *Album*, *LP*, or *Mini-Album* descriptor. Panels A and B include studio and census-division-by-year fixed effects. Standard errors use CR2 and are clustered by commuting zone. The mean row is taken over 1980–1987, the reference window of the step contrast above it, which omits the campaign year; the 1980–1988 means quoted in Section 4.3, which keep that year, are 3.37 contributors and 36.6 percent. Panel C interacts exposure and the post-campaign indicator with short-form status, including the corresponding lower-order terms. β_1 is the long-form effect and β_2 the short-form minus long-form difference. Models use all 70,994 records. Intervals for β_2 use CR2, clustered by commuting zone. The credit-exclusion row rebuilds contributor categories after removing executive-producer and featuring labels. It removes 35,998 classified credits and leaves 47 records without classified credits, yielding 70,947 records: 44,126 long-form and 26,821 short-form. All 117 zones and 18 exposed zones remain. Baseline count estimates on these same records are 0.448, 0.337, and 0.628, respectively. The exclusion lowers the 1980–1988 creative-contributor mean from 3.37 to 3.17 and the creative-credit share from 36.6 to 35.7 percent.

F Device capabilities and artist backgrounds

The sampler combined reuse of recorded sound with sequencing and rhythm programming. This appendix examines whether organizational responses vary with pre-campaign production practices and describes the backgrounds of artists associated with sampling.

F.1 Predetermined production practices

I measure pre-campaign production practices using records released in 1980–1987. Sampling propensity is the share of a genre's records using sampling; machine intensity is the share of classified credits carrying an explicit machine-related label, calculated by genre or studio.[28] For this exercise, primary genre is the alphabetically first Discogs tag. Studio measures require pre-campaign classified credits, with an additional specification requiring at least three records and twenty credits. Each index enters as a split at the median across units and as a standardized continuous measure. The studio median is zero, so that split distinguishes any prior machine credit from none.

Table F.1 reports a larger creative-contributor response in the high-intensity genre group: a difference of 0.675, $[+0.155, +1.195]$. Machine intensity and sampling propensity place the same five genres above their medians: Electronic, Funk/Soul, Hip Hop, Pop, and Reggae. This binary comparison cannot distinguish the two production practices. Their continuous measures differ, but both yield imprecise interactions; studio-level interactions are also small and imprecise. The evidence for heterogeneity depends on the measure and does not identify which device function drives the response.

F.2 Studio sampling propensity

This subsection asks whether the reorganization in Section 4.3 differs between studios where sampling was more and less common before the campaign. A genre's sampling rate is the share of its 1980–1987 records that credit a sample; a studio's sampling propensity is the average of that rate over the studio's own 1980–1987 records, so the campaign cannot affect it. I divide studios at the median, weighting by records: 24,120 records fall in studios above the median and 24,316 below. The split reflects both genre composition and the studio's own earlier sampling. Records in Electronic, Funk/Soul, and Hip Hop make up 49.6 percent of the

[28] The labels are programmed by, sequenced by, drum programming, sequencer, drum machine, electronic drums, MIDI controller, and computer.

Table F.1: Creative contributors, by predetermined production practices

Moderator	Contributors per record, creative authorship and production only			Records high / low	Zones high / low
	At the reference level	Differential	At the exposed mean		
A. Genre-level machine intensity					
Above vs. below the median	+0.221	+0.675	+0.470	70,994	117
	[−0.043, +0.485]	[+0.155, +1.195]	[+0.110, +0.831]	22,810 / 48,184	109 / 116
Standardised, continuous	+0.458	+0.197	+0.470	70,994	117
	[+0.085, +0.832]	[−0.024, +0.417]	[+0.088, +0.851]		
B. Studio-level machine intensity, studios clearing the pre-campaign volume floor					
Above vs. below the median	+0.405	+0.089	+0.464	42,099	90
	[−0.274, +1.084]	[−0.760, +0.939]	[+0.129, +0.799]	26,014 / 16,085	54 / 88
Standardised, continuous	+0.441	+0.058	+0.452	42,099	90
	[+0.088, +0.794]	[−0.437, +0.553]	[+0.123, +0.780]		
C. Studio-level machine intensity, every studio with a pre-campaign record					
Above vs. below the median	+0.400	+0.059	+0.435	48,436	107
	[−0.259, +1.059]	[−0.757, +0.874]	[+0.092, +0.779]	26,687 / 21,749	60 / 107
Standardised, continuous	+0.420	+0.047	+0.427	48,436	107
	[+0.046, +0.794]	[−0.685, +0.778]	[+0.099, +0.755]		
D. Comparison: genre-level sampling propensity before 1988					
Above vs. below the median	+0.221	+0.675	+0.470	70,994	117
	[−0.043, +0.485]	[+0.155, +1.195]	[+0.110, +0.831]	22,810 / 48,184	109 / 116
Standardised, continuous	+0.460	+0.195	+0.462	70,994	117
	[+0.109, +0.810]	[−0.159, +0.548]	[+0.113, +0.811]		

Note. The outcome counts contributors working exclusively in creative authorship and production. Regressions interact exposure and the post-period with the stated moderator, include lower-order terms and studio and census-division-by-year effects, and retain 1988 as pre-campaign. Machine intensity is the 1980–1987 share of classified credits in the eight machine-related labels; sampling propensity is the share of records using sampling. Moderators are defined by primary genre in Panels A and D and by studio in Panels B and C. Primary genre is the alphabetically first tag. Binary moderators split units at their median; continuous moderators are standardized across units. The reference effect is for the below-median group or the mean continuous index. The differential is the high-minus-low difference or change per standard deviation. The exposed-mean effect evaluates the moderator at its average among exposed records. Panels A and D give identical binary genre groups. Panel C includes 2,808 studios with pre-campaign classified credits; Panel B retains 1,320 with at least three records and twenty credits. At the studio median of zero, the binary split identifies any prior machine credit. High/low record counts partition each sample, while zone counts overlap. Brackets are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone.

1980–1987 records of upper-half studios and 8.0 percent of those of lower-half studios, and 49.4 percent of upper-half records against 16.5 percent of lower-half records come from studios that themselves credited a sample in 1980–1987. Studio and census-division-by-year effects are shared by all groups; each group has its own year effects, and exposure is interacted with year separately for each group, with 1988 omitted and its records kept. Group-specific year effects allow studios with different pre-campaign sampling propensities to follow different annual paths common to exposed and comparison locations. With a single group, the design reproduces the estimates in Section 4.3. Figures report annual coefficients relative to 1988. The full-period comparison averages the 1989–2000 coefficients and subtracts their 1980–1987 average. Shorter-window comparisons summarize the observed time path and help interpret its persistence.

Sampling was more common in the upper half before the campaign, 4.6 percent of records against 1.2 percent. Over 1989–2000 it rises by 2.7 percentage points in the upper half, $[-1.3, +6.8]$, and by -0.3 in the lower half, $[-2.9, +2.2]$ (Table F.2). The full-period increase in the share of creative-only contributors is similar across the halves: 2.6 percentage points in the upper half and 2.0 in the lower half, with intervals including zero. The annual estimates suggest a difference in persistence (Figure F.2). Both shares rise during the mid-1990s; the lower half subsequently falls back, while the upper half remains elevated. In the upper half, the creative task share also rises and the execution share falls. The execution share is a share of credits: the number of contributors working only in execution does not decline in either half. Neither half shows differential movement in these shares before the campaign.

Table F.3 summarizes the timing visible in the annual estimates by comparing 1997–2000 with 1993–1996. The lower half's subsequent decline is clearly estimated, while the difference in the evolution of the two halves provides suggestive evidence of a more persistent response in the upper half.[29]

The pattern toward the end of the observation period also appears under alternative specifications (Table F.4, which summarizes 1997–2000). Removing clearance-eligible writing and composition credits from records that credit a sample and were released from 1992 onward, adding primary-genre-by-year effects, and dropping each exposed commuting zone in turn each leave point estimates between 70 and 79 percent of the baseline; neither the baseline nor any of these estimates excludes zero. Measuring genre sampling rates in comparison zones only classifies 95.5 percent of records the same way and gives similar estimates. Dividing

[29]The creative-only contributor share changes by -3.5 percentage points in the lower half, $[-5.0, -1.9]$, and by 1.6 in the upper half, $[-3.4, +6.6]$. The difference between these changes is 5.1, $[-0.1, +10.3]$. These comparisons describe the time path rather than replace the full-period estimates.

studios instead by whether they credited any sample in 1980–1987 gives larger point estimates toward the end of the period, of about 8 percentage points, and essentially none among studios that did not. Over the full 1989–2000 period, the execution share falls by 5.6 percentage points more in studios that credited a sample before the campaign, $[-11.0, -0.1]$.

The 22,558 records from studios with no 1980–1987 record cannot be compared with an earlier pre-period: 413 of them date from 1988 and none from earlier years. Table F.5 therefore reports the average of their 1989–2000 coefficients relative to 1988 alone, beside the same 1988-relative calculation for the two halves. Their share of creative-only contributors is 6.0 percentage points higher, $[-1.3, +13.3]$, and the number of creative-only contributors 0.97 higher, $[-0.16, +2.11]$; the upper half's corresponding estimates are 4.3, $[+1.5, +7.1]$, and 0.92, $[+0.25, +1.59]$. Changes of this size are therefore not confined to studios with an established sampling practice, although without a pre-period these estimates rest on 1988 alone.

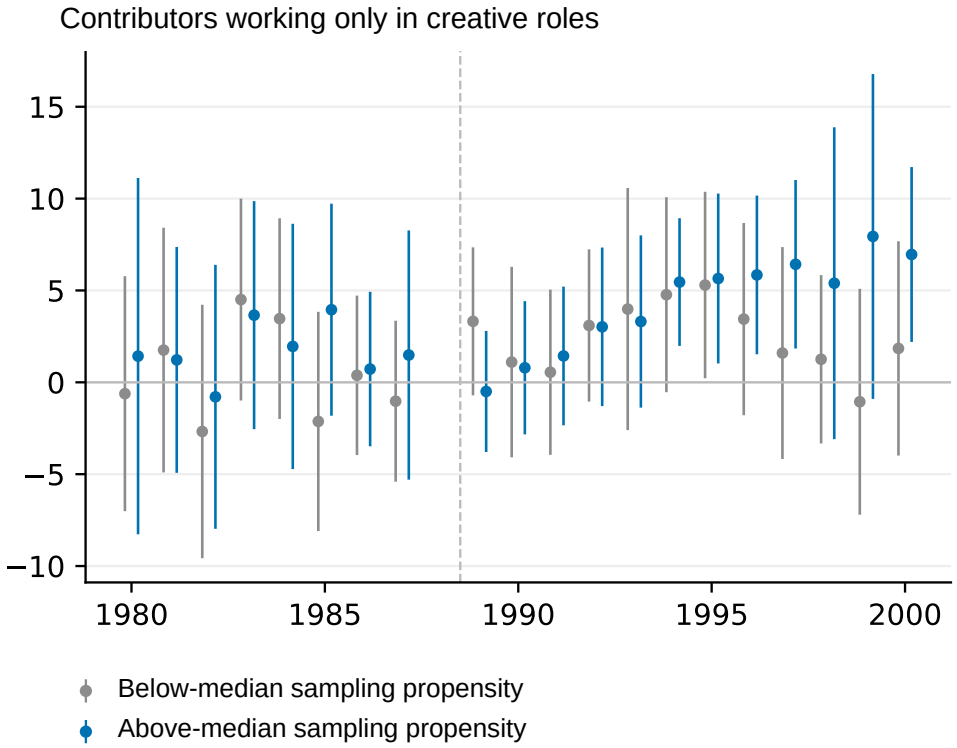
Whether a record credits a sample responds to exposure, so comparisons by record status are descriptive. Table F.6 reports the share of records crediting a sample by studio group and exposure (Panel A) and estimates the same design separately within records that do and do not credit a sample (Panel B). Within records that do not credit a sample, the upper-half execution share changes by -2.7 percentage points over 1989–2000, $[-7.6, +2.1]$, similar to the change across all records. Records that credit a sample are too few to estimate annual coefficients; their pooled estimates are uninformative.

Table F.2: Changes after the campaign, by studio sampling propensity

	1989–2000 minus 1980–1987			1997–2000 minus 1980–1987	
	Below	Above	Above − below	Above	Above − below
Records crediting a sample (pp)	−0.3 [−2.9, +2.2]	+2.7 [−1.3, +6.8]	+3.0 [−2.8, +8.9]	+4.0 [−0.4, +8.5]	+4.4 [−1.7, +10.5]
Creative authorship and production, share of credits (pp)	+1.7 [−1.2, +4.6]	+2.2 [−3.1, +7.5]	+0.5 [−5.3, +6.4]	+5.0 [−2.3, +12.3]	+3.2 [−4.3, +10.7]
Execution, share of credits (pp)	−0.7 [−4.0, +2.6]	−2.7 [−7.2, +1.8]	−2.0 [−7.8, +3.7]	−5.0 [−11.2, +1.2]	−4.1 [−11.5, +3.2]
Only creative authorship and production, share of people (pp)	+2.0 [−1.2, +5.1]	+2.6 [−3.1, +8.4]	+0.6 [−5.7, +7.0]	+5.0 [−3.0, +13.0]	+4.5 [−4.2, +13.3]
Only creative authorship and production, contributors	+0.48 [−0.22, +1.18]	+0.41 [−0.25, +1.07]	−0.07 [−1.25, +1.12]	+0.93 [−0.41, +2.27]	+0.91 [−1.06, +2.88]

Note. Each cell is the average of the annual coefficients in the stated window minus their 1980–1987 average, from the regression in Figure F.2; the figure plots the same coefficients relative to 1988. Below and above refer to the median of pre-campaign studio sampling propensity; "above − below" is the difference on the same fit. Brackets are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone.

Figure F.1: Creative specialists by pre-campaign studio sampling propensity



Note. Annual estimates of campaign exposure for the share of contributors on a record working only in creative authorship and production, in percentage points relative to 1988. Studios are divided at the record-weighted median of their pre-campaign sampling propensity, calculated from the genres they recorded in 1980–1987. The regression includes studio and census-division-by-year fixed effects and group-specific year effects. Bars are 95% CR2 confidence intervals, clustered by commuting zone. The differences between the groups are imprecisely estimated. Appendix Figure F.2 reports the other outcomes; Appendix Tables F.2 and F.3 report contrasts across periods.

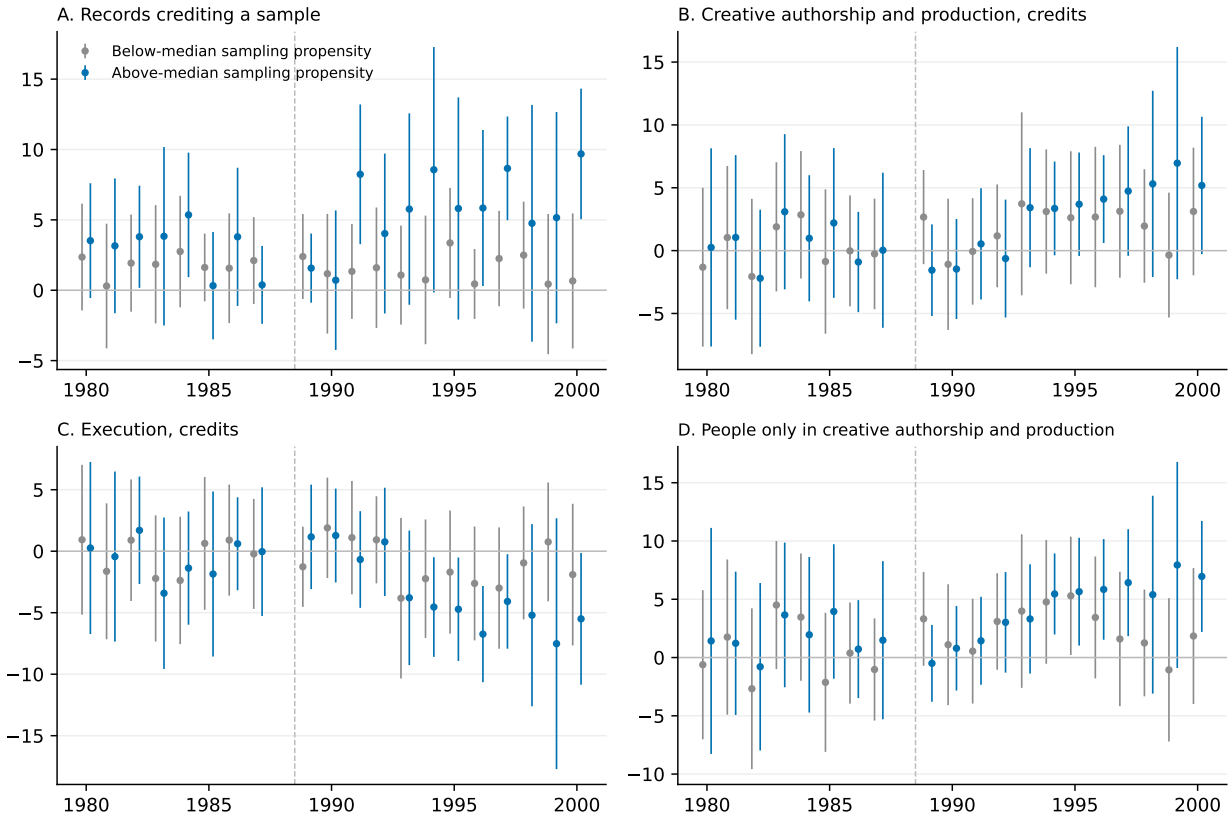


Figure F.2: Organizational outcomes by studio sampling propensity

Note. Annual coefficients on campaign exposure relative to 1988 (dashed line) for studios below (grey) and above (blue) the median of pre-campaign sampling propensity, estimated in one regression with shared studio and census-division-by-year effects and group-specific year effects; 1988 is omitted and its records kept. These coefficients are relative to 1988, not to the 1980–1987 average used in the table summaries. Panels report percentage points. Panels B and C are shares of classified credits; Panel D is the share of people on a record whose classified credits all fall in creative authorship and production. Bars are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone. The sample contains 70,994 records, 117 commuting zones, and 18 exposed zones.

Table F.3: Changes along the annual paths, by studio sampling propensity

	1997–2000 minus 1993–1996		Change in the above − below gap
	Below	Above	
Records crediting a sample (pp)	+0.1 [−2.1, +2.2]	+0.6 [−3.8, +4.9]	+0.5 [−3.7, +4.7]
Creative authorship and production, share of credits (pp)	−1.1 [−3.1, +1.0]	+1.9 [−2.4, +6.2]	+3.0 [−0.6, +6.6]
Execution, share of credits (pp)	+1.3 [−0.5, +3.1]	−0.6 [−4.5, +3.2]	−2.0 [−5.6, +1.7]
Only creative authorship and production, share of people (pp)	−3.5 [−5.0, −1.9]	+1.6 [−3.4, +6.6]	+5.1 [−0.1, +10.3]
Only creative authorship and production, contributors	−0.86 [−1.73, +0.01]	+0.49 [−0.60, +1.57]	+1.34 [−0.06, +2.75]
Only execution, contributors	−0.16 [−1.28, +0.97]	+0.96 [−0.10, +2.03]	+1.12 [−0.36, +2.60]
All contributors	−0.74 [−2.71, +1.23]	+1.80 [+0.39, +3.21]	+2.54 [+0.28, +4.79]

Note. The first two columns are the average of the 1997–2000 coefficients minus the average of the 1993–1996 coefficients within each half; the last column is that difference for the upper half minus the lower half. All contrasts are on the regression in Figure F.2. Brackets are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone.

Table F.4: Alternative specifications for the persistence pattern

	Baseline	Clearance-eligible credits removed	Genre-by-year effects	One exposed zone dropped (range)	Comparison-zone propensity	Studio's own 1980–1987 sampling
Creative authorship and production, share of credits (pp)	+5.0 [−2.3, +12.3]	+3.5 [−3.5, +10.5]	+3.8 [−1.9, +9.6]	[+3.9, +5.4]	+4.9 [−2.7, +12.6]	+8.3 [−4.7, +21.3]
Execution, share of credits (pp)	−5.0 [−11.2, +1.2]	−3.8 [−9.9, +2.2]	−3.8 [−9.3, +1.8]	[−5.5, −3.9]	−4.5 [−11.4, +2.3]	−8.3 [−17.9, +1.4]
Only creative authorship and production, share of people (pp)	+5.0 [−3.0, +13.0]	+3.6 [−4.3, +11.5]	+3.6 [−2.5, +9.8]	[+3.7, +6.0]	+4.8 [−3.4, +12.9]	+7.7 [−6.6, +22.0]

Note. Each cell is the 1997–2000 average of the annual coefficients minus the 1980–1987 average for studios above the median of pre-campaign sampling propensity. Clearance-eligible credits removed: writing and composition credits on records that credit a sample and were released in 1992–2000 are removed, and the outcomes are rebuilt from the remaining credits. Genre-by-year effects: primary genre by year added to the design. One exposed zone dropped: the range of point estimates over 18 refits. Comparison-zone propensity: genre sampling rates computed on comparison zones only. Studio's own 1980–1987 sampling: studios that credited at least one sample in 1980–1987 (15,921 records), against those that credited none. Brackets are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone.

Table F.5: Studios with no 1980–1987 record

	No 1980–1987 record		Below	Above
	1989–2000	1997–2000	1989–2000	1989–2000
Records crediting a sample (pp)	+5.1 [−2.4, +12.6]	+5.0 [−3.1, +13.1]	+1.5 [−1.5, +4.5]	+5.7 [+1.4, +10.1]
Creative authorship and production, share of credits (pp)	+3.2 [−3.0, +9.3]	+3.4 [−3.2, +9.9]	+1.9 [−2.1, +5.9]	+2.8 [−0.9, +6.5]
Execution, share of credits (pp)	−3.6 [−9.9, +2.8]	−3.2 [−10.0, +3.6]	−1.1 [−4.6, +2.4]	−3.3 [−6.9, +0.3]
Only creative authorship and production, share of people (pp)	+6.0 [−1.3, +13.3]	+5.9 [−1.8, +13.6]	+2.4 [−1.7, +6.6]	+4.3 [+1.5, +7.1]
Only creative authorship and production, contributors	+0.97 [−0.16, +2.11]	+1.16 [−0.07, +2.39]	+0.49 [−0.71, +1.70]	+0.92 [+0.25, +1.59]
Only execution, contributors	−1.67 [−3.87, +0.53]	−1.55 [−3.72, +0.63]	+1.13 [−0.45, +2.71]	+1.05 [−1.06, +3.17]
All contributors	−1.11 [−3.83, +1.62]	−0.80 [−3.62, +2.02]	+1.63 [−1.33, +4.59]	+2.34 [−0.53, +5.22]

Note. Each cell is the average of the annual coefficients in the stated window relative to 1988, not minus a 1980–1987 average: studios with no 1980–1987 record have 413 records in 1988 and none earlier, so they have no earlier pre-period. The below and above columns apply the same 1988-relative calculation to the two halves for comparison. All estimates are from the regression in Figure F.2, which includes these 22,558 records as a separate group. Brackets are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone.

Table F.6: Records that do and do not credit a sample (descriptive)

A. Share of records crediting a sample (percent)

	1980–1988	1989–1996	1997–2000
Above median, exposed	5.1	16.5	15.6
Above median, comparison	3.5	8.5	3.7
Below median, exposed	1.5	4.2	3.6
Below median, comparison	0.7	1.8	2.1

B. Within each record group (descriptive)

	Above median		Above − below	
	1989–2000	1997–2000	1989–2000	1997–2000
Records not crediting a sample				
Creative authorship and production, share of credits (pp)	+2.3 [−3.3, +7.9]	+4.7 [−2.9, +12.2]	+0.8 [−5.3, +6.8]	+2.8 [−4.9, +10.5]
Execution, share of credits (pp)	−2.7 [−7.6, +2.1]	−4.7 [−11.3, +1.9]	−2.3 [−8.3, +3.7]	−3.9 [−11.3, +3.5]
Only creative authorship and production, share of people (pp)	+2.8 [−3.2, +8.7]	+4.9 [−3.3, +13.1]	+1.0 [−5.7, +7.6]	+4.4 [−4.5, +13.2]
Only creative authorship and production, contributors	+0.39 [−0.15, +0.94]	+0.75 [−0.22, +1.71]	−0.14 [−1.10, +0.81]	+0.55 [−0.87, +1.98]
Records crediting a sample (1989–2000 against 1980–1988, pooled)				
Creative authorship and production, share of credits (pp)			−10.4 [−40.0, +19.1]	
Execution, share of credits (pp)			+12.9 [−22.7, +48.4]	
Only creative authorship and production, share of people (pp)			−12.0 [−55.7, +31.8]	
Only creative authorship and production, contributors			−2.43 [−11.93, +7.07]	

Note. Descriptive: whether a record credits a sample responds to exposure, so neither panel identifies an effect within a record group. Panel A reports the share of records crediting a sample by group, exposure, and period. Panel B estimates the design of Figure F.2 separately within each record group. For records not crediting a sample, each cell is the average of the annual coefficients in the window minus their 1980–1987 average. Records crediting a sample (4,206) are too few for annual coefficients, so their row reports the pooled 1989–2000 against 1980–1988 coefficient, upper minus lower half. Brackets are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone.

F.3 Artist backgrounds and sampling

The background comparison asks whether sampling is associated with different routes into music production. Artists on sampled records are more often self-taught, less often formally trained, and younger on average. The comparison is descriptive and does not identify entry or training changes caused by the campaign.

Biographical coverage varies across characteristics. The relevant comparison is between artists with information on the same characteristic, with sample sizes reported alongside each difference. Appendix A.7 describes the collection and classification of the biographies.

Table F.7 compares artists active in 1980–1988 and 1989–2000 separately, counting each artist once per period. In the later period, 65.2 percent of artists on sampled records are self-taught, compared with 37.3 percent of other artists, a difference of 27.9 percentage points, $[+10.5, +45.3]$. Formal training is reported for 15.5 versus 39.7 percent, and conservatory training for 9.8 versus 30.2 percent. Artists associated with sampling are born 12.7 years later on average and start their careers at ages 1.7 years younger. Technical literacy is mentioned for 14.2 versus 6.8 percent, but the 7.4-point difference is imprecise, $[-0.3, +15.0]$.

Coverage differs by characteristic and sampling status. Training is observed for 3,626 of the 5,583 linked artists active after 1988, and age at career start for 3,502. Each row compares artists with information on that characteristic. The panels share 2,124 artists with linked biographies, so they are reported as separate descriptive comparisons rather than a before-and-after contrast.

G Sampling and the organization of production

This appendix compares task allocation on records using sampling and other records. Sampling is not assigned, so the comparison is descriptive. I use three task categories: creative authorship and production, execution, and nonproduction. The three shares partition classified credits, so their estimated differences sum to zero.

G.1 Sampling and task allocation

For record a, I estimate

$$Y_a = \beta \, \text{HasSample}_a + \alpha_{s(a)} + \rho_{d(a),t(a)} + \varepsilon_a, \tag{G.1}$$

Table F.7: Artist backgrounds and sampling: group levels, differences and coverage

Characteristic	Artists on sampled records			Other artists			Sampled minus other
	Level	Observed *N*	Coverage (%)	Level	Observed *N*	Coverage (%)	
Panel A. Main artists active 1980–1988: 242 associated with sampling, 3,186 others							
Share of the group (%)							
Self-taught	57.4	155	64.0	42.0	2,053	64.4	+15.43 [−17.02, +47.89]
Formal musical training	17.4	155	64.0	34.4	2,053	64.4	−16.97 [−35.89, +1.95]
Conservatory training	9.7	155	64.0	25.3	2,053	64.4	−15.65 [−22.69, −8.61]
Technical literacy mentioned†	8.3	242	100.0	7.2	3,186	100.0	+1.11 [−7.79, +10.01]
Mean (years)							
Year of birth	1951.6	238	98.3	1944.4	2,916	91.5	+7.26 [+0.74, +13.78]
Age at career start	19.09	222	91.7	20.39	1,973	61.9	−1.30 [−3.82, +1.23]
Panel B. Main artists active 1989–2000: 768 associated with sampling, 4,815 others							
Share of the group (%)							
Self-taught	65.2	451	58.7	37.3	3,175	65.9	+27.90 [+10.47, +45.32]
Formal musical training	15.5	451	58.7	39.7	3,175	65.9	−24.20 [−39.05, −9.34]
Conservatory training	9.8	451	58.7	30.2	3,175	65.9	−20.45 [−34.00, −6.89]
Technical literacy mentioned†	14.2	768	100.0	6.8	4,815	100.0	+7.36 [−0.28, +15.00]
Mean (years)							
Year of birth	1961.1	744	96.9	1948.4	4,320	89.7	+12.65 [+6.48, +18.83]
Age at career start	19.06	681	88.7	20.77	2,821	58.6	−1.70 [−2.60, −0.81]

Note. Each artist counts once per period and joins the sampling group if any record on which they are billed uses sampling in that period. Comparisons use linked biographies with information on the characteristic. Biographies cover 22.4% of 15,326 artists active in 1980–1988 and 16.5% of 33,807 active in 1989–2000. Coverage columns give the fraction of linked artists with an observed characteristic in each group. Artists can appear in both periods. Brackets are 95% CR2 intervals clustered by commuting zone, with Satterthwaite degrees of freedom of 2.7–3.9; comparisons cover 58–81 zones. †Technical literacy indicates a biographical mention, with zero for silence on the subject. Training distinguishes no training, self-teaching, individual instruction, and formal training; conservatory training is a subset of formal training. Birth years outside 1900–1985 and career-start ages outside 3–60 are missing. Appendix A.7 gives the source definitions; Figure 7 reports standardized comparisons.

where HasSample_a indicates that at least one track on record a is identified as using sampling. The outcome is the share of classified credits assigned to each task category. Studio fixed effects $\alpha_{s(a)}$ compare records produced within the same studios, and census-division-by-year fixed effects $\rho_{d(a),t(a)}$ account for contemporaneous geographic conditions. The sample contains 70,994 records, of which 4,206 are identified as using sampling.

Table G.1 reports raw means and adjusted pooled differences. Records using sampling allocate 46.5 percent of credits to creative authorship and production, compared with 33.5 percent for other records; execution accounts for 42.9 and 56.8 percent. Adjusting for studio and census-division-by-year fixed effects gives differences of +4.63 percentage points $[+3.43, +5.83]$ for creative work and -6.17 $[-7.28, -5.07]$ for execution. This pattern is consistent with the direction of the campaign estimates, but does not identify the effect of adopting sampling.

Table G.1: Records crediting a sample and other records, pooled

	Group mean (%)		Raw	Adjusted
Function family	Sampled	Not	difference	difference
Creative authorship and production	46.5	33.5	+13.01	+4.63 [+3.43, +5.83]
Execution	42.9	56.8	−13.86	−6.17 [−7.28, −5.07]
Nonproduction	10.6	9.7	+0.85	+1.54 [+0.59, +2.50]

Note. Group means are unadjusted record-level task shares; raw differences subtract the two means. Adjusted differences are coefficients on the sampling indicator with studio and census-division-by-year fixed effects. Differences are in percentage points. Execution combines performance and technical credits at record level, and the three families partition classified credits. Brackets are 95% CR2 intervals with coefficient-specific Satterthwaite degrees of freedom, clustered by commuting zone. The sample contains 70,994 records, including 4,206 using sampling, in 117 commuting zones. The associations are descriptive.

H Product characteristics and content measures

This appendix describes the acoustic and lyrical distance measures, the comparisons needed to interpret them, sensitivity to representation and coverage, and chart performance.

H.1 Distance from the previous year's releases

The acoustic measure uses eleven Spotify characteristics: danceability, energy, speechiness, acousticness, instrumentalness, liveness, valence, tempo, mode, key, and time signature.

Loudness is excluded following Askin and Mauskapf (2017). Features are matched to recordings using normalized artist and title strings, with an ISRC fallback. The seven continuous characteristics already bounded by zero and one enter unchanged. Tempo is rescaled using its first and ninety-ninth percentiles over the reference corpus; key is divided by eleven, mode is binary, and time signature is transformed as $(x - 1)/4$. The resulting vector is scaled to unit length. The reference corpus contains recordings dated 1980–2000 with a complete vector and a music genre.

Distance is one minus a genre-weighted cosine similarity to the preceding year's recordings. For recording i in genre g, similarity is $\sum_h w_{gh} \sum_{j \in h} \cos(v_i, v_j)/N_{t-1}$. Here N_{t-1} is the number of prior-year recordings, and w_{gh} is the cosine similarity between the prior-year genre centroids, with $w_{gg} = 1$. The denominator is the number of recordings, without renormalization by the weights. Non-negative feature vectors yield non-negative weights. Genres with at most one prior-year recording receive the smallest off-diagonal weight; absent genres contribute no recordings. Each recording takes the rarest of its Discogs genre tags as primary genre.

The comparison includes all measured prior-year recordings, both within and outside the focal genre, with at least 8,311 peers per scored recording. Off-diagonal genre weights range from 0.689 to 0.998 and average 0.942. Own-genre recordings account for 18.5 percent of comparison mass. Record outcomes average measured track positions equally, retaining recordings first observed no more than one year before the record. No minimum track-coverage threshold is imposed.

Lyrics are represented by 1,024-dimensional embeddings from `bert-large-uncased`. Eligible recordings have English-language Genius metadata, no instrumental flag, and at least five cleaned words. The model's tokenizer splits text into consecutive chunks of up to 510 content tokens. I mean-pool non-special token embeddings within chunks, combine chunks using token-count weights, and normalize the vector to unit length. The lyrical distance follows the same prior-year, genre-weighted construction and record aggregation as the acoustic measure. Its genre weights range from 0.934 to 0.999.

Coefficients and interval endpoints are reported in standard deviations measured over records released through 1987. The regressions retain 1988 in the pre-campaign period. Acoustic distance is available for 30,924 records and lyrical distance for 14,125, with all eighteen exposed zones represented in each sample.

H.2 Lyric length

The same lyric can produce different embedding distances at different text lengths. I estimate a correction using lyrics drawn at a fixed seed across word-count deciles, comparing versions truncated to 64, 128, 256, 384, and 510 tokens with the full text. The correction interpolates linearly between the mean biases at those lengths and remains constant outside the range. I subtract it from each recording's distance before averaging tracks to records. This treats truncations of longer lyrics as informative about the length distortion in shorter lyrics.

The regression intervals condition on the estimated length correction and do not incorporate uncertainty from its estimation.

The raw lyrical estimate is $+0.023$ pre-period standard deviations, with an interval from -0.337 to $+0.382$. After correction it is $+0.195$, with an interval from -0.273 to $+0.662$. As a sensitivity on the same 14,125 records and under the same correction, the earlier construction, which compares a record with the previous two years and applies no genre weighting, gives $+0.053$ with an interval from -0.253 to $+0.359$. The correction changes the point estimate, but no version of the measure detects a lyrical response.

H.3 Fixed effects and individual acoustic characteristics

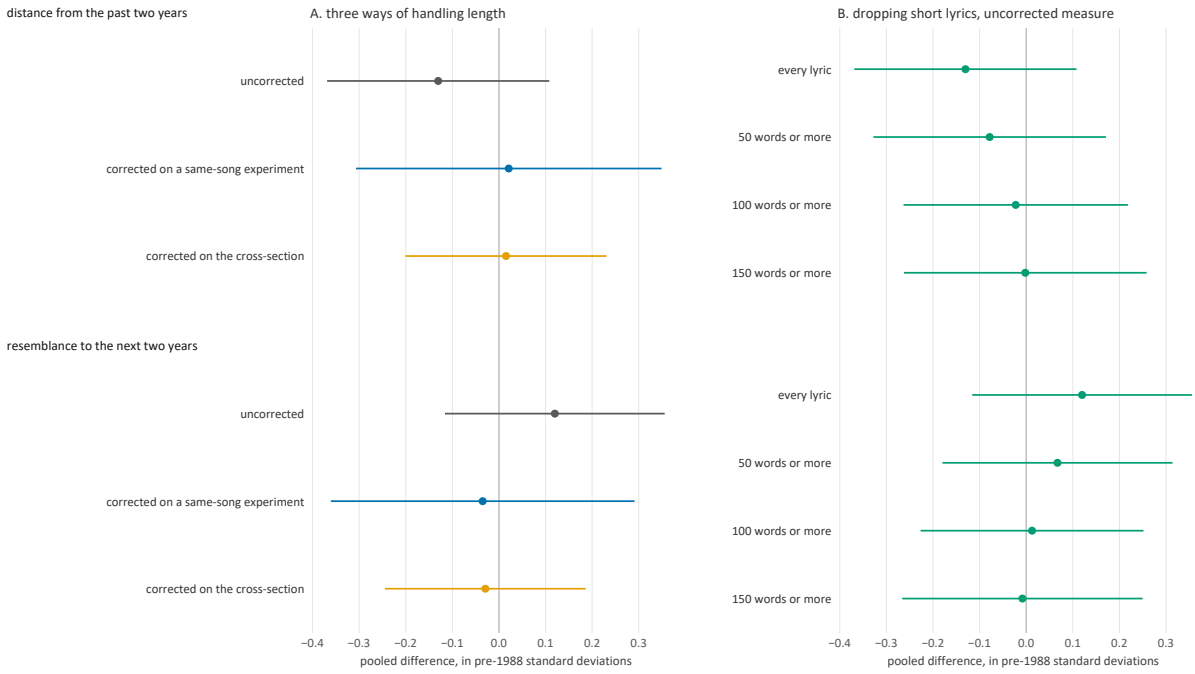
On the same 30,924 records, the acoustic coefficient is 0.169 pre-period standard deviations under commuting-zone fixed effects and 0.162 under studio fixed effects. The corresponding intervals are $[0.066, 0.272]$ and $[0.044, 0.279]$. The estimated increase is similar under these two comparisons.

Individual-feature diagnostics use absolute deviations from a commuting zone's pre-campaign mean, on a different sample of 32,950 records in 105 commuting zones. That benchmark differs from distance to the previous year's releases, so those diagnostics do not establish which features contribute to the main acoustic-distance result.

H.4 Recent output and within-genre distance

Table H.1 compares distance from all recent releases with distance from recent releases in the same genre, on the same 30,924 records. The broader measure increases following campaign exposure; within-genre distance shows no detectable increase. This places the acoustic response in relation to the broader mix of recent output.

Figure H.1: Sensitivity of lyrical distance to text length



Note. Diagnostic estimates using the earlier two-year lyrical comparison measures. Panel A compares the uncorrected measure with corrections based on within-lyric truncation experiments and cross-sectional length differences. Panel B varies the minimum lyric length for the uncorrected measure. The series distinguish distance from the previous two years and resemblance to the next two years. The text reports the current prior-year outcome and its correction.

The second row keeps the broad measure and its records and adds primary-genre fixed effects. The estimate falls from 0.169 to 0.051 pre-period standard deviations, [+0.014, +0.087]. Holding primary genre fixed substantially reduces the estimate. This comparison shows that genre matters for the magnitude, but does not decompose the response into changes in genre composition and changes within genres. Genre effects change the regression comparison rather than the set of releases a record is compared with. Figure H.2 reports the annual paths: with genre effects, pre-campaign coefficients average 0.01 standard deviations and post-campaign coefficients 0.06, positive in every year from 1991 but individually imprecise.

Table H.1: Alternative comparison sets for acoustic distance

Comparison set	Commuting-zone effects	Studio effects
Genre-weighted, whole prior year	+0.169	+0.162
	[+0.066, +0.272]	[+0.044, +0.279]
adding primary-genre effects	+0.051	–
	[+0.014, +0.087]	
Unweighted, whole prior year	+0.135	+0.131
	[+0.048, +0.222]	[+0.018, +0.244]
Own genre only	+0.025	+0.011
	[−0.121, +0.172]	[−0.097, +0.119]
Direct test of the difference		
Genre-weighted minus own genre	+0.144	+0.150
	[+0.035, +0.253]	[+0.015, +0.286]

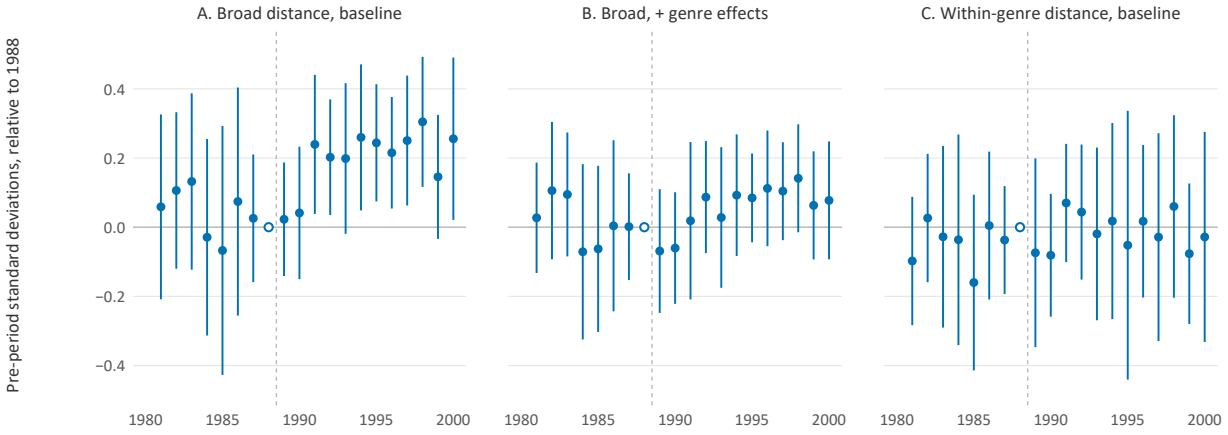
Note. Pooled campaign-exposure coefficients in pre-period standard deviations on 30,924 records in 106 zones, 18 exposed. The second row keeps the genre-weighted outcome, its comparison set, its records and its standardization, and adds fixed effects for the record's primary genre to the commuting-zone and division-by-year effects. It changes the regression comparison, not the comparison set, and is not estimated with studio effects. The primary genre is the first of a record's Discogs genre tags in alphabetical order. The own-genre comparison set is defined by each recording's own genre. The last row regresses the difference between the separately standardized broad and within-genre measures, both baseline, on exposure and the same controls. The broad comparison includes own-genre releases, so this difference is not an outside-genre-only measure. Requiring at least thirty own-genre peers leaves estimates essentially unchanged on 30,909 records. The genre-weighted measure correlates 0.96 with its unweighted counterpart and 0.62 with within-genre distance. Brackets are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone.

The standardized response is larger for the broad measure by 0.144 under commuting-zone effects, [+0.035, +0.253], and 0.150 under studio effects, [+0.015, +0.286]. These direct tests use the difference between the measures as the outcome.

H.5 Genre composition

Changes in the genres produced locally can affect distance from recent output. Table H.2 reports genre shares in the local production panel and among the records used in the acoustic

Figure H.2: Annual acoustic-distance estimates: broad distance, with genre effects, and within genre



Note. Event-study estimates with 1988 as the omitted reference year and 95% CR2 intervals with coefficient-specific Satterthwaite degrees of freedom, clustered by commuting zone. Panels A and B measure a record's distance from all of the previous year's releases, weighted by genre proximity. Panel C measures its distance from the previous year's releases in its own genre only, defined by each recording's genre. Panels A and C include commuting-zone and census-division-by-year fixed effects. Panel B adds fixed effects for the record's primary genre, defined as the first of its Discogs genre tags in alphabetical order. All three panels use the same 30,924 records in 106 commuting zones, 18 exposed, with no difference in sample. Each outcome is divided by its own pre-period (1981–1987) standard deviation: Panels A and B share the broad measure's, and Panel C uses the within-genre measure's. The panels share one vertical scale. Panel B changes the regression comparison; Panel C changes the musical reference set. Differences in which coefficients are distinguishable from zero across panels are not a test of differences between the effects; Table H.1 reports the direct test for broad and within-genre distance.

regression. The latter holds the acoustic sample and regression weights fixed. Records with several genre tags split a weight of one across their tags.

In the acoustic sample, rock has a negative pooled estimate and jazz a positive one, both imprecise. Some other genres show pre-campaign differences, which limits a causal reading of their post-campaign coefficients. Figure H.3 retains those annual paths. These results examine genre composition; they do not decompose the acoustic-distance estimate.

Table H.2: Campaign exposure and genre composition

	Commuting-zone-years, all records			Records in the acoustic regression		
	Pre-period mean	Estimate	95% interval (CR2)	Pre-period mean	Estimate	95% interval (CR2)
Genre shares (percentage points)						
Rock	36.4	−5.08	[−14.09, +3.93]	32.1	−7.22	[−14.79, +0.36]
Jazz	6.1	+2.15	[−1.94, +6.23]	9.3	+5.05	[−0.24, +10.34]
Folk, World & Country	23.9	+0.44	[−6.57, +7.44]	23.4	−0.89	[−4.31, +2.53]
Electronic	3.7	+0.23	[−1.74, +2.19]	7.0	−1.35	[−5.75, +3.04]
Funk / Soul	13.9	−2.62	[−7.13, +1.90]	12.5	+0.83	[−10.21, +11.86]
Hip Hop	1.7	+4.09	[−0.74, +8.91]	1.7	+3.25	[−3.88, +10.39]
Pop	5.3	−0.20	[−2.20, +1.81]	4.6	−1.45	[−2.88, −0.02]
Classical	3.3	−0.17	[−2.35, +2.02]	2.9	+1.55	[+0.05, +3.04]
Blues	2.8	+1.20	[−0.32, +2.72]	3.5	−0.02	[−1.40, +1.36]
Latin	1.7	+0.05	[−1.20, +1.30]	1.9	−0.09	[−1.31, +1.13]
Reggae	0.6	−0.40	[−1.00, +0.21]	0.7	+0.05	[−0.47, +0.58]
Other	0.5	+0.30	[−0.18, +0.79]	0.4	+0.29	[−0.57, +1.15]
Genre diversity, $1 - \sum_g s_g^2$						
Diversity (index ×100)	46.7	+0.68	[−5.24, +6.60]	—	—	—
Observations	1,852 commuting-zone-years			30,924 records		
Commuting zones (exposed)	117 (18)			106 (18)		
Weighting	each zone-year once			each record once		

Notes. Pooled 1989–2000 coefficients on campaign exposure. Each record's Discogs genre tags share a weight of one, so a record with two tags adds one half to each; *Other* pools Stage & Screen, Non-Music, Children's, and Brass & Military. *Left:* a commuting-zone-year's genre share is the weighted fraction of its records in the genre; zone-years without records are left out, and each remaining zone-year counts once, so these columns describe local genre composition. Diversity is one minus the sum of the twelve squared shares; it rises mechanically with the number of records in a zone-year, so it is noisier in small zones. *Right:* the record's genre weight is the outcome in the acoustic regression itself — the same records, fixed effects, and equal record weights — so these columns describe the genre mix of the records whose acoustic distance is measured. They cover 30,924 of the 70,999 records. Both designs have commuting-zone and census-division-by-year effects, keep 1988 in the pre-period, and are clustered by commuting zone; intervals are CR2 with Satterthwaite degrees of freedom. Pre-period means are 1980–1988 means in comparison zones. The share coefficients sum to zero within each column. Figure H.3 reports the annual coefficients.

H.6 Alternative audio representation and coverage

MusicFlamingo embeddings provide a second representation of the audio. The 1,280-dimensional vectors average frame representations from the audio tower of

Figure H.3: Genre shares by year

Note. Annual coefficients on exposure for each genre share, in percentage points; 1988 is the omitted year. Blue: commuting-zone-year shares from all records, each zone-year weighted once (1,852 zone-years, 117 commuting zones). Orange: the record's genre weight in the acoustic regression, each record weighted once (30,924 records, 106 commuting zones; no 1980 records). Both have commuting-zone and census-division-by-year effects. Bars are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone. Panels use independent vertical scales. Table H.2 reports the pooled estimates.

`nvidia/music-flamingo-hf`, revision `35a2c907`, before projection. Each recording is represented by one thirty-second preview decoded at 16 kilohertz, averaging valid frames only. Vectors are centered on the mean of the whole embedded corpus of 228,879 recordings, have their first principal component removed, and are scaled to unit length before any similarity is formed; genre centroids for the weights are formed from the uncentered vectors, because a centroid cosine on the component-removed vectors can be negative. Record values are the equal-weight mean of track values under the same one-year rule as the acoustic measure, and coefficients are divided by the outcome's standard deviation among records released in or before 1987, as elsewhere in this appendix.

On 26,870 records in 104 commuting zones with both representations, the engineered-feature estimate is 0.177 pre-period standard deviations, with an interval from 0.040 to 0.315. The embedding estimate is 0.129, with an interval from −0.248 to 0.505. The alternative representation is less precise and does not clearly confirm the main result.

Matching the embeddings' comparison set and genre weights to the primary measure gives 0.155, $[-0.217, +0.526]$, on 26,867 records in the same 104 zones. The two embedding constructions correlate 0.98, while the matched construction correlates 0.19 with the engineered-feature measure. Changing the comparison set has little influence; changing the representation of sound matters more.

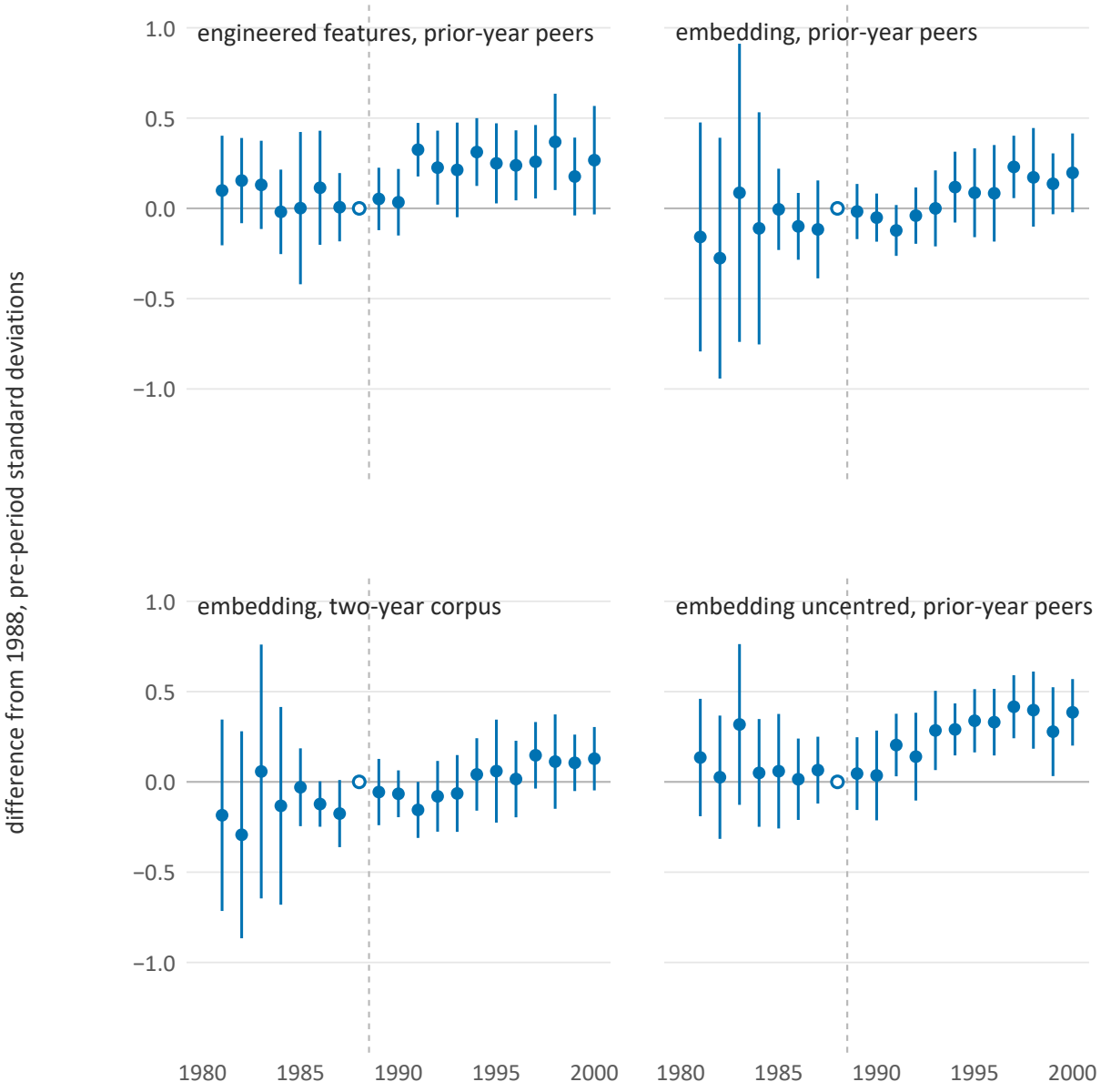
The acoustic measures are observed for a subset of records. Exposure changes the probability of observing the main features by −1.16 percentage points, $[-5.79, +3.48]$, and the share of tracks covered by −1.67 points, $[-6.49, +3.15]$, on 67,510 records in 116 zones. Lyrical coverage also shows no detectable change (Figure H.5). These imprecise coverage estimates leave possible selection into the measured samples unresolved.

H.7 Chart performance

Chart outcomes examine whether campaign exposure changed the commercial performance of eligible records. They do not estimate the effect of acoustic distance on success.

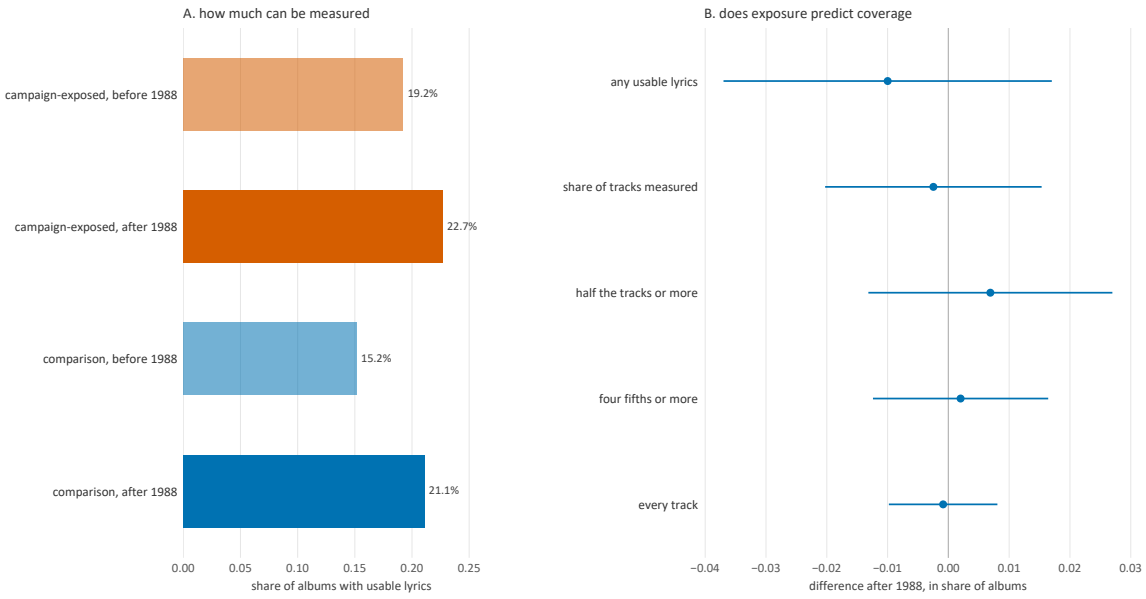
The weekly *Billboard* 200 source covers April 1967 to July 2024. Albums and EPs account for 50,268 eligible records. Matching uses normalized performer and title keys and chart debuts from one year before to two years after the assigned release year, preferring exact-year matches. Status resolves for 49,967 records; 301 remain unresolved. Links comprise 4,495 automatic matches, 242 reviewed matches, 869 reissues, and 34 accepted earlier links. Other resolved records are classified as non-charting. Review of 312 near misses accepted 242,

Figure H.4: Alternative audio representations, commuting-zone specification



Note. Annual estimates for alternative measures of distance from recent audio output on the common sample of 26,867 records. All outcomes are expressed in pre-period standard deviations. The first panel uses the eleven engineered acoustic characteristics. The remaining panels use alternative constructions based on MusicFlamingo embeddings. Commuting-zone and census-division-by-year fixed effects.

Figure H.5: Coverage of the lyrical content measure



Note. Difference-in-differences estimates for whether a record is observed in the lyrical content sample, using the same exposure design as the main content analysis. I do not detect a differential change in lyrical coverage following campaign exposure.

rejected 53, and left 17 unresolved. The baseline excludes unresolved records; Panel B of Table H.3 assigns the 295 remaining after duplicate and reissue restrictions to each extreme coding.

Outcomes cover chart issues from January of the release year through December of the following year. Because the record data carry release years and not release months, that window runs between twelve and twenty-four months from release. Outcomes include entry, weeks on the chart, and rank-weighted indices with exponents one and one-half. These indices summarize chart performance and are not converted into sales. The baseline analysis retains 46,139 records in 115 commuting zones after keeping one copy of each duplicated release and excluding reissues.

As a descriptive check on the chart index, I use certification records linked through an earlier album match. Among certified albums charting within the outcome window, the index with exponent one correlates 0.71 with certified units. Certification is not an outcome in the campaign analysis.

Billboard introduced point-of-sale counts on 25 May 1991 and moved older titles to a separate catalog chart. Division-by-year effects absorb common annual changes in chart measurement. Panel B also splits release cohorts at 1991. Because outcomes follow records through the year after release, the earlier cohort includes chart observations after the measurement change; the split does not isolate its effect.

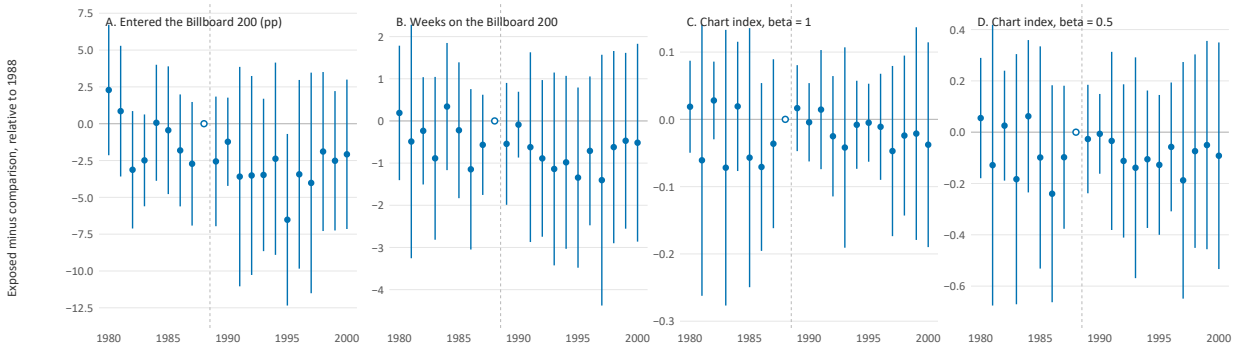
Table H.3 gives a chart-entry estimate of -2.18 percentage points, $[-6.88, +2.52]$; other chart outcomes are also imprecise. Genre-by-year adjustment gives -1.67, $[-6.10, +2.76]$, on the same records, with little change in the other outcomes. Figure H.6 shows several negative pre-campaign coefficients and no clear post-campaign break. The estimates leave the commercial response uncertain.

Table H.3: Campaign exposure and *Billboard* 200 performance

	Estimate	95% interval (CR2)	Mean, 1980–1988 Comparison	Exposed
A. Pooled 1989–2000, reported sample				
Entered the Billboard 200 (pp)	−2.18	[−6.88, +2.52]	8.40	16.19
Weeks on the Billboard 200	−0.41	[−1.22, +0.41]	1.68	3.46
Chart index, $\beta = 1$	+0.014	[−0.027, +0.054]	0.045	0.110
Chart index, $\beta = 0.5$	−0.008	[−0.113, +0.098]	0.220	0.488
B. Entered the Billboard 200 (pp), alternative specifications				
Unresolved records coded as not charting	−2.16	[−6.91, +2.59]	8.39	16.07
Unresolved records coded as their candidate run	−2.04	[−6.52, +2.44]	8.47	16.34
Duplicate copies and reissues added	−1.93	[−6.58, +2.73]	8.11	14.79
Window extended to December of $y + 2$	−2.09	[−6.80, +2.62]	8.49	16.21
Albums only	−2.51	[−8.08, +3.06]	8.98	17.20
Genre-by-year effects added	−1.67	[−6.10, +2.76]	8.40	16.19
Commuting-zone instead of studio effects	−2.07	[−6.29, +2.15]	8.40	16.19
Cohorts 1989–1990	−0.96	[−3.32, +1.39]	8.40	16.19
Cohorts 1991–2000	−2.55	[−8.67, +3.56]	8.40	16.19

Note. Record-level estimates with studio and census-division-by-year fixed effects (Panel B's commuting-zone row replaces the studio effects), Post = $1[t \geq 1989]$ with 1988 in the pre-campaign period, and every record weighted once. The sample is the albums and EPs among the paper's records whose Billboard 200 status is resolved, keeping one copy of each duplicated release and excluding reissues: 46,139 records in 115 commuting zones, 18 of them exposed. An outcome counts only Billboard 200 issues dated from 1 January of the release year to 31 December of the following year. The chart index sums $\text{rank}^{-\beta}$ over those weeks; it ranks chart performance and is not a measure of sales. Records charting in the window: 491 of 5,845 comparison and 1,675 of 10,348 exposed records in 1980–1988; 831 of 12,112 and 1,698 of 17,834 in 1989–2000. The first two rows of Panel B add the 295 records whose link could not be resolved, coded as not charting and as charting whenever a candidate run has a week in the window. The cohort rows split Post into two terms in one regression; they separate the earliest post-campaign cohorts from the rest, and not the SoundScan transition, because the two-year window of a 1990 record runs past 25 May 1991. Brackets are 95% CR2 intervals with Satterthwaite degrees of freedom (about 7.4 in Panel A), clustered by commuting zone.

Figure H.6: *Billboard* 200 performance by year



Note. Annual coefficients on campaign exposure, 1988 omitted, for the sample and specification of Table H.3: Panel A, entry into the *Billboard* 200 in the release year or the following year (percentage points); Panel B, weeks on the chart in that window; Panels C and D, the chart index $\sum \text{rank}^{-\beta}$ with $\beta = 1$ and $\beta = 0.5$. Panels use independent vertical scales. Bars are 95% CR2 intervals with Satterthwaite degrees of freedom, clustered by commuting zone.