Orchestrating Impartiality: The Impact of "Blind" Auditions on Female Musicians

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By Claudia Goldin and Cecilia Rouse*

A change in the audition procedures of symphony orchestras—adoption of "blind" auditions with a "screen" to conceal the candidate's identity from the jury—provides a test for sex-biased hiring. Using data from actual auditions, in an individual fixed-effects framework, we find that the screen increases the probability a woman will be advanced and hired. Although some of our estimates have large standard errors and there is one persistent effect in the opposite direction, the weight of the evidence suggests that the blind audition procedure fostered impartiality in hiring and increased the proportion women in symphony orchestras. (*JEL* J7, J16)

Sex-biased hiring has been alleged for many occupations but is extremely difficult to prove. The empirical literature on discrimination, deriving from the seminal contributions of Gary Becker (1971) and Kenneth Arrow (1973), has focused mainly on disparities in earnings between groups (e.g., males and females), given differences in observable productivity-altering characteristics. With the exception of various audit studies (e.g., Genevieve Kenney and Douglas A. Wissoker, 1994; David Neumark et al., 1996) and others, few researchers have been able to address directly the issue of bias in hiring practices.[1] A change in the way symphony orchestras recruit musicians provides an unusual way to test for sex-biased hiring.

Until recently, the great symphony orchestras in the United States consisted of members who were largely handpicked by the music director. Although virtually all had auditioned for the position, most of the contenders would have been the (male) students of a select

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[1] An extensive literature exists on occupational segregation by sex and the possible reasons for the large differences in occupations between men and women today and in the past. The debate is ongoing. On the one hand are those who believe that discrimination, either individual or societal in nature, is the driving force, and on the other hand are those who claim the evidence shows women and men sort among occupations on the basis of different tastes for work characteristics. In the former category see Paula England (1982) and England et al. (1988); in the latter group see Solomon W. Polachek (1979) and Randall K. Filer (1989). It should be noted that many other studies (e.g., Ian Ayres and Joel Waldfogel, 1994) have also attempted to measure discrimination in atypical ways.

group of teachers. In an attempt to overcome this seeming bias in the hiring of musicians, most major U.S. orchestras changed their audition policies in the 1970's and 1980's making them more open and routinized. Openings became widely advertised in the union papers, and many positions attracted more than 100 applicants where fewer than 20 would have been considered before. Audition committees were restructured to consist of members of the orchestra, not just the conductor and section principal. The audition procedure became democratized at a time when many other institutions in America did as well.

But democratization did not guarantee impartiality, because favorites could still be identified by sight and through resumes. Another set of procedures was adopted to ensure, or at least give the impression of, impartiality. These procedures involve hiding the identity of the player from the jury. Although they take several forms, we use the terms "blind" and "screen" to describe the group.[2] The question we pose is whether the hiring process became more impartial through the use of blind auditions. Because we are able to identify sex, but no other characteristics for a large sample, we focus on the impact of the screen on the employment of women.[3]

Screens were not adopted by all orchestras at once. Among the major orchestras, one still does not have any blind round to their audition procedure (Cleveland) and one adopted the screen in 1952 for the preliminary round (Boston Symphony Orchestra), decades before the others. Most other orchestras shifted to blind preliminaries from the early 1970's to the late 1980's. The variation in screen adoption at various rounds in the audition process allows us to assess its use as a treatment.[4]

The change in audition procedures with the adoption of the screen allows us to test whether bias exists in its absence. In both our study and studies using audits, the issue is whether sex (or race or ethnicity), apart from objective criteria (e.g., the sound of a musical performance, the content of a resume), is considered in the hiring process. Why sex might make a difference is another matter.

Our data come from two sources: rosters and audition records. Rosters are simply lists of orchestra personnel, together with instrument and position (e.g., principal), found in orchestra programs. The audition records are the actual accounts of the hiring process kept by the personnel manager of the orchestra. Both are described in more detail below.

The audition records we have collected form an uncommon data set. Our sample includes who was advanced and hired from an initial group of contestants and also what happened to approximately two-thirds of the individuals in our data set who competed in other auditions in the sample. There are, to be certain, various data sets containing information on applicant pools and hiring practices (see, e.g., Harry Holzer and David Neumark, 1996). But our data set is unique because it has the complete applicant pool for each of the auditions and links individuals across auditions. Most important for our study is that audition procedures differed across orchestras in known ways and that the majority of the orchestras in our sample changed audition procedure during the period of study.[5]

We find, using our audition sample in an individual fixed-effects framework, that the screen increases the probability a woman will be advanced out of a preliminary round when there is no semifinal round. The screen also greatly enhances the likelihood a female contestant will be the winner in a final round. Using both the roster and auditions samples, and reasonable assumptions, the switch to blind auditions can explain about one-third of the increase in the proportion female among new hires (whereas another one-third is the result of the increased pool of female candidates). Estimates based on the roster sample indicate that blind auditions may account for 25 percent of the increase in the percentage of orchestra musicians who are female.

[2] For an article about the blind audition process see *The Economist* (1996).

[3] The screen may also have opened opportunities for individuals from less-well-known orchestras, those trained outside mainstream institutions, and those from minority groups.

[4] The blind audition procedures bear some resemblance to "double-blind" refereeing in academic journals. See Rebecca Blank (1991) for an assessment of the treatment effect of such refereeing in the *American Economic Review*.

[5] This statement is true for the roster sample. There are only a few orchestras that changed audition procedures during the years of our audition data.

I. Sex Composition of Orchestras

Symphony orchestras consist of about 100 musicians and, although the number has varied between 90 to 105, it is rarely lower or higher. The positions, moreover, are nearly identical between orchestras and over time. As opposed to firms, symphony orchestras do not vary much in size and have virtually identical numbers and types of jobs. Thus we can easily look at the proportion women in an orchestra without being concerned about changes in the composition of occupations and the number of workers. An increase in the number of women from, say, 1 to 10, cannot arise because the number of harpists (a female-dominated instrument), has greatly expanded. It must be because the proportion female within many groups has increased.

Among the five highest-ranked orchestras in the nation (known as the "Big Five")—the Boston Symphony Orchestra (BSO), the Chicago Symphony Orchestra, the Cleveland Symphony Orchestra, the New York Philharmonic (NYPhil), and the Philadelphia Orchestra—none contained more than 12 percent women until about 1980.[6] As can be seen in Figure 1A, each of the five lines (giving the proportion female) greatly increases after some point. For the NYPhil, the line steeply ascends in the early 1970's. For the BSO, the turning point appears to be a bit earlier. The percentage female in the NYPhil is currently 35 percent, the highest among all 11 orchestras in our sample after being the lowest (generally at zero) for decades. Thus the increase of women in the nation's finest orchestras has been extraordinary. The increase is even more remarkable because, as we discuss below, turnover in these orchestras is exceedingly low. The proportion of new players who were women must have been, and indeed was, exceedingly high.

Similar trends can be discerned for four other orchestras—the Los Angeles Symphony Orchestra (LA), the San Francisco Philharmonic (SF), the Detroit Symphony Orchestra, and the Pittsburgh Symphony Orchestra (PSO)—given in Figure 1B.[7] The upward trend in the proportion female is also obvious in Figure 1B, although initial levels are higher than in Figure 1A. There is somewhat more choppiness to the graph, particularly during the 1940's. Although we have tried to eliminate all substitute, temporary, and guest musicians, especially during World War II and the Korean War, this was not always possible.

The only way to increase the proportion women is to hire more female musicians and turnover during most periods was low. The number of new hires is graphed in Figure 2 for five orchestras. Because "new hires" is a volatile construct, we use a centered five-year moving average. In most years after the late 1950's, the top-ranked orchestras in the group (Chicago and NYPhil) hired about four musicians a year, whereas the other three hired about six. Prior to 1960 the numbers are extremely high for LA and the PSO, because, it has been claimed, their music directors exercised their power to terminate, at will, the employment of musicians. Also of interest is that the number of new hires trends down, even excluding years prior to 1960. The important points to take from Figure 2 are that the number of new hires was small after 1960 and that it declined over time.

The proportion female among the new hires must have been sizable to increase the proportion female in the orchestras. Figure 3 shows the trend in the share of women among new hires for four of the "Big Five" (Figure 3A) and four other orchestras (Figure 3B).[8] In both groups the female share of new hires rose over time, at a somewhat steeper rate for the more prestigious orchestras. Since the early 1980's the share female among new hires has been about 35 percent for the BSO and Chicago, and about 50 percent for the NYPhil, whereas before 1970 less than 10 percent of new hires were women.[9]

Even though the fraction of new hires who are female rises at somewhat different times

[6] The data referred to, and used in Figures 1 to 3, are from orchestral rosters, described in more detail below.

[7] Our roster sample also includes the Metropolitan Opera Orchestra and the St. Louis Symphony.

[8] A centered five-year moving average is also used for this variable.

[9] In virtually all cases the share of women among new hires has decreased in the 1990's.

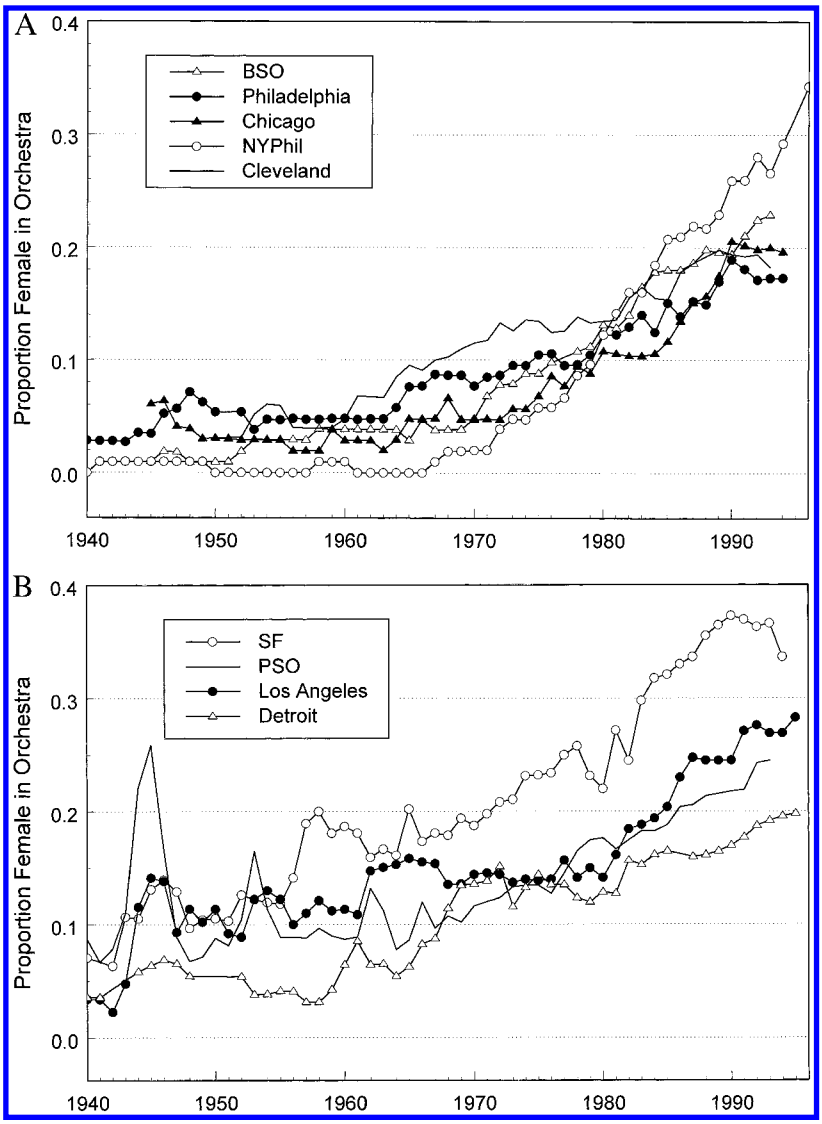

FIGURE 1. PROPORTION FEMALE IN NINE ORCHESTRAS, 1940 TO 1990's
A: THE "BIG FIVE"; B: FOUR OTHERS

Source: Roster sample. See text.

across the orchestras, there is a discernible increase for the group as a whole in the late 1970's to early 1980's, a time when the labor force participation of women increased generally and when their participation in various professions greatly expanded. The question, therefore, is whether the screen mattered in a direct manner or whether the increase was the result of a host of other factors, including the appearance of impartiality or an increased pool of female contestants coming out of music schools. Because the majority of new hires are in their late twenties and early thirties, the question is whether the most selective music schools were producing considerably more female students in the early 1970's. We currently have information by instrument for only the Juilliard School of Music. With the exception of the brass section, the data, given in Figure 4, do not reveal

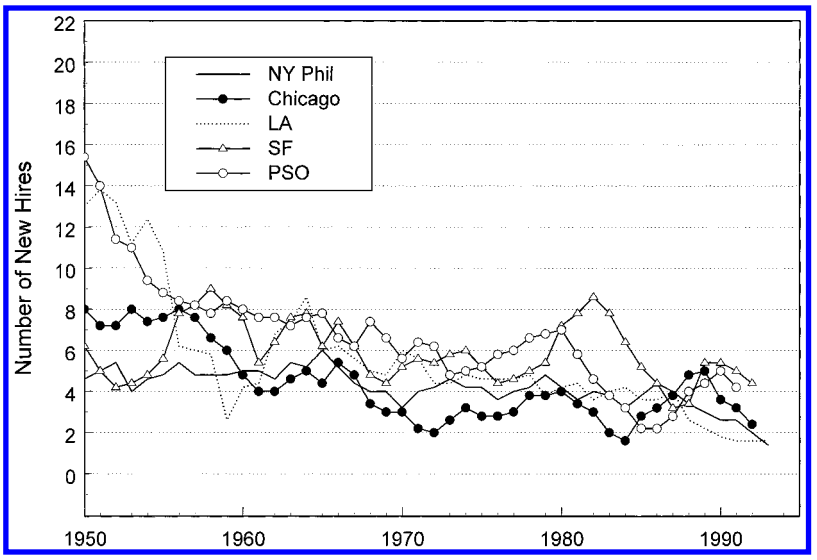

FIGURE 2. NUMBER OF NEW HIRES IN FIVE ORCHESTRAS, 1950 TO 1990's

Source: Roster sample. See text.

Notes: A five-year centered moving average is used. New hires are musicians who were not with the orchestra the previous year, who remain for at least one additional year, and who were not substitute musicians in the current year.

any sharp breaks in the fraction of all graduates who are female.[10] Thus, it is not immediately obvious that an expansion in the supply of qualified female musicians explains the marked increase in female symphony orchestra members; it could, therefore, be because of changes in the hiring procedures of orchestras.

But why would changes in audition procedures alter the sex mix of those hired? Many of the most renowned conductors have, at one time or another, asserted that female musicians are not the equal of male musicians. Claims abound in the world of music that "women have smaller techniques than men," "are more temperamental and more likely to demand special attention or treatment," and that "the more women [in an orchestra], the poorer the sound."[11] Zubin Mehta, conductor of the Los Angeles Symphony from 1964 to 1978 and of the New York Philharmonic from 1978 to 1990, is credited with saying, "I just don't think women should be in an orchestra."[12] Many European orchestras had, and some continue to have, stated policies not to hire women.[13] The Vienna Philharmonic has only recently admitted its first female member (a harpist). Female musicians, it can be convincingly argued, have historically faced considerable discrimination.[14] Thus a blind hiring procedure, such as a screen that conceals the identity of the musician auditioning, could eliminate

[10] We also have data on the sex composition of the graduates of the University of Michigan School of Music and Indiana University, but not by instrument. In the Michigan data, both for those receiving the Bachelor of Music (BM) degree and for those receiving the Master of Music (MM) degree, there is no change in the percentage female from 1972 to 1996. The Indiana University data, for both BM and MM degrees and excluding voice, piano, guitar, and early instruments, show an increase in the fraction female from 1975 to 1996. The ratio of females to males was 0.9 in 1975 but 1.2 in 1996.

[11] Seltzer (1989), p. 215.

[12] Seltzer (1989), p. 215. According to Seltzer, the fact that new hires at the NYPhil were about 45 percent female during Mehta's tenure as conductor suggests that Mehta's views may have changed.

[13] In comparison with the United Kingdom and the two Germanys, the United States in 1990 had the highest percentage female among its regional symphony orchestras and was a close second to the United Kingdom in the major orchestra category (Jutta J. Allmendinger et al., 1996).

[14] In addition, an African-American cellist (Earl Madison) brought a civil suit against the NYPhil in 1968 alleging that their audition procedures were discriminatory because they did not use a screen. The orchestra was found not guilty of discriminating in hiring permanent musicians, but it was found to discriminate in hiring substitutes.

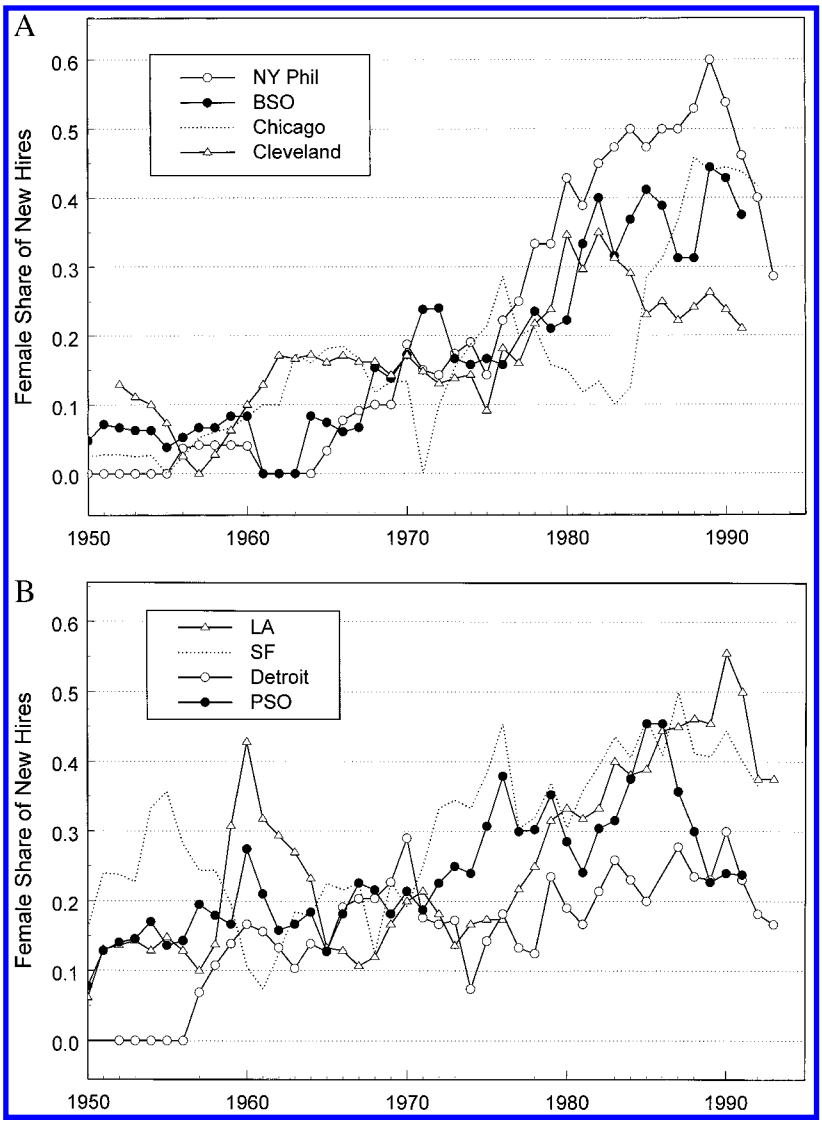

FIGURE 3. FEMALE SHARE OF NEW HIRES IN EIGHT ORCHESTRAS, 1950 TO 1990's
A: FOUR OF THE "BIG FIVE"; B: FOUR OTHERS

Source: Roster sample. See text.

Notes: A five-year centered moving average is used. New hires are musicians who were not with the orchestra the previous year, who remain for at least one additional year, and who were not substitute musicians in the current year.

the possibility of discrimination and increase the number of women in orchestras.

II. Orchestral Auditions

To understand the impact of the democratization of the audition procedure and the screen, we must first explain how orchestra auditions are now conducted. After determining that an audition must be held to fill an opening, the orchestra advertises that it will hold an audition. Each audition attracts musicians from across the country and, often,

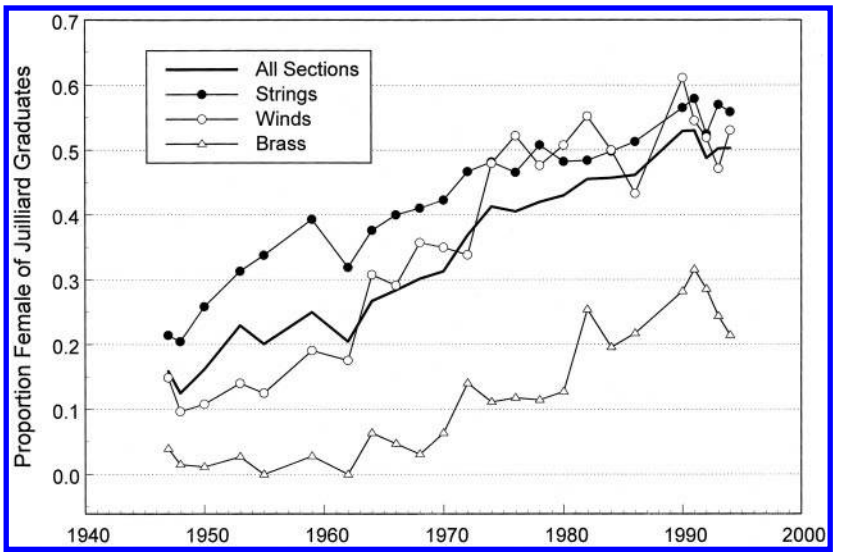

FIGURE 4. PROPORTION FEMALE OF JUILLIARD GRADUATES, TOTAL AND BY SECTION: 1947 TO 1995

Source: Juilliard Music School files.

from around the world.[15] Musicians interested in auditioning are required to submit a resume and often a tape of compulsory music (recorded according to specific guidelines) to be judged by members of the orchestra. In some orchestras this prescreening is dispositive; in others the musician has the right to audition live in the preliminary round, even if the audition committee rejects the candidate on the basis of the tape.[16] All candidates are given, in advance, most of the music they are expected to perform at the live audition.

Live auditions today generally consist of three rounds: preliminary, semifinal, and final. But there is considerable variation. Although all orchestras now have a preliminary round, some have two final rounds and in many there was no semifinal round until the 1980's. The preliminary is generally considered a screening round to eliminate unqualified candidates. As a result, the committee is free to advance as many, or as few, as they wish. Candidates advanced from the semifinal round are generally considered "acceptable for hire" by the audition committee (which does not include the music director, a.k.a. conductor, until the finals). Again, this means that the committee can advance as many as it wishes. The final round generally results in a hire, but sometimes does not.[17]

In blind auditions (or audition rounds) a screen is used to hide the identity of the player from the committee.[18] The screens we have seen are either large pieces of heavy (but sound-porous) cloth, sometimes suspended from the ceiling of the symphony hall, or look like large room dividers. Some orchestras also roll out a carpet leading to center stage to muffle footsteps that could betray the sex of the candidate.[19] Each candidate for a blind audition is given a number, and the jury rates the candidate's

[15] Orchestral auditions, particularly for the nation's most prestigious orchestras, are national if not international, in scope. Many contestants, the vast majority of whom receive no travel reimbursement, travel long distances to audition. The auditions span the fewest number of days possible to minimize hotel charges.

[16] The tape, in this case, provides information to the candidate of his or her likelihood of success, sparing the musician a potentially large travel expense.

[17] There is one exception to this general rule. In rare cases when the committee cannot decide between two or three candidates, each is invited to play with the orchestra before the final decision is made.

[18] It may also serve to hide the identity of the committee from the player, although that is not its main function. We use the terms "blind" and "screen" interchangeably.

[19] Or, if a carpet is not placed on the stage, the personnel manager may ask a woman to take off her shoes and he provides the compensating footsteps.

performance next to the number on a sheet of paper. Only the personnel manager knows the mapping from number to name and from name to other personal information.[20] The names of the candidates are not revealed to the juries until after the last blind round.

Almost all preliminary rounds are now blind. The semifinal round, added as the number of applicants grew, may be blind. Finals are rarely blind and almost always involve the attendance and input of the music director.[21] Although the music director still wields considerable power, the self-governance that swept orchestras in the 1970's has served to contain the conductor's authoritarianism. The music director can ignore the audition committee's advice, but does so at greater peril. Once an applicant is chosen to be a member of an orchestra, lifetime tenure is awarded after a brief probationary period. The basis for termination is limited and rarely used. The positions we are analyzing are choice jobs in the musical world. In 1995 the *minimum starting* base salary for musicians at the BSO was $1,400 per week (for a 52-week year), not including recording contracts, soloist fees, overtime and extra service payments, bonuses, and per diem payments for tours and Tanglewood.[22]

Are blind auditions truly blind, or can a trained, accomplished musician identify contestants solely from differences in playing style, just as academics can often identify authors of double-blind papers they get to referee? Unlike double-blind refereeing, for which one sees an entire paper with its distinctive writing style, methodology, sources, and citations, the candidates play only predetermined and brief excerpts from the orchestral repertoire. Each candidate typically has just 5 to 10 minutes to play for the audition committee, particularly in the early rounds. There is little or no room for individuality to be expressed and not much time for it to be detected.[23] Even when an individual musician is known in advance to be auditioning, jury members often cannot identify that individual. Only the rare, well-known candidate, with an unusually distinctive musical style could conceivably be correctly identified.

The many musicians and personnel managers with whom we have spoken uniformly deny that identification is possible for the vast majority of contestants. They also observe that, although it is tempting to guess the identity of a contestant, particularly in the later rounds, audition committee members, more often than not, find they are wrong. To base a hiring decision on speculation would not be in the best interests of the orchestra. Further, although an individual committee member may believe that he or she knows the identity of a player, it would be rare for the entire committee to be secure in such knowledge. Thus, even if one committee member's vote is swayed by such a belief, the committee's vote must correspond to the consensus view of the player's musical ability for it to determine the outcome. Thus, auditions held with a screen, apart from very few exceptions, are truly blind.

The audition procedures of the 11 orchestras in the roster sample are summarized in Table 1.[24] Although audition procedures are now part of union contracts, that was not the case in the more distant past and the procedures were not apparently recorded in any surviving documents. We gathered information on these procedures from various sources, including union contracts, interviews with personnel managers, archival documents on auditions, and a mail survey we conducted of orchestral musicians concerning the proce-

[20] The personnel manager is generally a musician who played with the orchestra for some time and knows the players and the conductor well. The duties involve managing the day-to-day work of the orchestra, getting substitute musicians, making travel plans, and arranging the hiring of new musicians.

[21] It is almost always the case that if an orchestra in, say, the spring of 1986 holds a blind preliminary round for a position, it will have all its candidates audition blind in that round and in all other preliminary rounds during that season, should there be any. That is, there is generally no discretion on the part of the jury (and certainly not on the part of the contestant) in terms of the audition procedure, particularly once an audition is underway.

[22] Most of the orchestra contracts in the group we have examined have similar base salaries. Union contracts list only the minimum or base starting salary and minimum increments for seniority. We do not know how many musicians have individually negotiated rates above the stated minimum amounts.

[23] Also, there is generally not a standing audition committee that might become familiar with the musicians who audition frequently.

[24] We identify the orchestras by letter, rather than by name, to preserve confidentiality of the audition sample.

TABLE 1—ORCHESTRA AUDITION PROCEDURE SUMMARY TABLE

Orchestra	Preliminaries	Semifinals	Finals
A	Blind since 1973	Blind (varies) since 1973	Not blind
B	Blind since at least 1967	Use of screen varies	Blind 1967–1969; since winter 1994
C	Blind since at least 1979 (definitely after 1972)	Not blind: 1991–present Blind: 1984–1987	Not blind
D	Blind since 1986	Blind since 1986; varies until 1993	1st part blind since 1993; 2nd part not blind
E	Use of screen varies until 1981	Use of screen varies	Not blind
F	Blind since at least 1972	Blind since at least 1972	Blind since at least 1972
G	Blind since 1986	Use of screen varies	Not blind
H	Blind since 1970	Not blind	Not blind
I	Blind since 1979	Blind since 1979	Blind since fall 1983
J	Blind since 1952	Blind since 1952	Not blind
K	Not blind	Not blind	Not blind

Notes: The 11 orchestras (A through K) are those in the roster sample described in the text. A subset of eight form the audition sample (also described in the text). All orchestras in the sample are major big-city U.S. symphony orchestras and include the "Big Five."

Sources: Orchestra union contracts (from orchestra personnel managers and libraries), personal conversations with orchestra personnel managers, and our mail survey of current orchestra members who were hired during the probable period of screen adoption.

dures employed during the audition that won them their current position.

An obvious question to ask is whether the adoption of the screen is endogenous. Of particular concern is that more meritocratic orchestras adopted blind auditions earlier, producing the spurious result that the screen increased the likelihood that women were hired.[25] We estimate a probit model of screen adoption by year, conditional on an orchestra's not previously having adopted the screen (an orchestra exits the exercise once it adopts the screen). Two time-varying covariates are included to assess commonly held notions about screen adoption: the proportion female (lagged) in the orchestra, and a measure of tenure (lagged) of then-current orchestra members. Tenure is included because personnel managers maintain the screen was advocated more by younger players.

As the proportion female in an orchestra increases, so does the likelihood of screen adoption in the preliminary round, as can be seen in columns (1) and (2) in Table 2, although the effects are very small and far from statistically significant.[26] We estimate a similar effect when we assess the role of female presence on the adoption of blind finals [see column (3)]. The impact of current tenure, measured by the proportion with less than six years with the orchestra, is—contrary to general belief—negative and the results do not change controlling for whether the orchestra is one of the "Big Five."[27] In all, it appears that orchestra sex composition had little influence on screen adoption, although the stability of the personnel may have increased its likelihood.[28]

[25] Note, however, it is unlikely that the orchestras that sought to hire more women chose to adopt the screen earlier since the best way to increase the number of women in the orchestra is to have not-blind auditions (so that one could be sure to hire more women).

[26] An increase in the proportion female from 0 to 0.35, the largest for any of the orchestras (see Figure 1), would enhance the likelihood of adopting the screen in the preliminary round by a mere 0.0021 percentage points.

[27] Our measure of tenure begins at the first date for which we have rosters, but not earlier than 1947. Tenure then cumulates for each member until the individual exits the orchestra. Because tenure will increase for all orchestras with time, we use the proportion of all members with fewer than six years of tenure.

[28] A change in conductor could also have led to a change in the audition policy, but we find no supporting evidence. For example, current players contend that Charles Munch had complete authority in hiring at the BSO before 1952. The BSO adopted the screen in 1952, but Munch was

TABLE 2—ESTIMATED PROBIT MODELS FOR THE USE OF A SCREEN

	Preliminaries blind		Finals blind
	(1)	(2)	(3)
(Proportion female)$_{t-1}$	2.744	3.120	0.490
	(3.265)	(3.271)	(1.163)
	[0.006]	[0.004]	[0.011]
(Proportion of orchestra	−26.46	−28.13	−9.467
personnel with <6	(7.314)	(8.459)	(2.787)
years tenure)$_{t-1}$	[−0.058]	[−0.039]	[−0.207]
"Big Five" orchestra		0.367	
		(0.452)	
		[0.001]	
pseudo R^2	0.178	0.193	0.050
Number of observations	294	294	434

Notes: The dependent variable is 1 if the orchestra adopts a screen, 0 otherwise. Huber standard errors (with orchestra random effects) are in parentheses. All specifications include a constant. Changes in probabilities are in brackets. "Proportion female" refers to the entire orchestra. "Tenure" refers to years of employment in the current orchestra. "Big Five" includes Boston, Chicago, Cleveland, New York Philharmonic, and Philadelphia. The data begin in 1947 and an orchestra exits the exercise once it adopts the screen. The unit of observation is an orchestra-year.
Source: Eleven-orchestra roster sample. See text.

III. The Role of Blind Auditions on the Audition and Hiring Process

A. *Data and Methods*

Audition Records.—We use the actual audition records of eight major symphony orchestras obtained from orchestra personnel managers and the orchestra archives. The records are highly confidential and occasionally contain remarks (including those of the conductor) about musicians currently with the orchestra. To preserve the full confidentiality of the records, we have not revealed the names of the orchestras in our sample.

Although availability differs, taken together we obtained information on auditions dating from the late 1950's through 1995. Typically, the records are lists of the names of individuals who attended the auditions, with notation near the names of those advanced to the next round. For the preliminary round, this would indicate advancement to either the semifinal or final round. Another list would contain the names of the semifinalists or finalists with an indication of who won the audition.[29] From these records, we recorded the instrument and position (e.g., section, principal, substitute) for which the audition was held. We also know whether the individual had an "automatic" placement in a semifinal or final round. Automatic placement occurs when a musician is already known to be above some quality cutoff and is invited to compete in a semifinal or final round.[30] We also recorded whether the individual was advanced to the next round of the current audition.

We rely on the first name of the musicians to determine sex. For most names establishing sex was straightforward.[31] Sexing the Japanese and Korean names was equally straightforward, at least for our Japanese and Korean consultants. For more difficult cases, we checked the names in three baby books (Connie Lockhard Ellefson, 1990; Alfred J. Kolatch, 1990; Bruce Lansky, 1995). If the name was listed as male- or female-only, we considered the sex known. The gender-neutral names (e.g., Chris, Leslie, and Pat) and some Chinese names (for which sex is indeterminate in the absence of Chinese characters) remained ambiguous. Using these procedures, we were able to determine the sex of 96 percent of our audition sample.[32] We later assess the impact that sex misclassification may have on our results.

In constructing our analysis sample, we exclude incomplete auditions, those in which there were no women (or only women) competing, rounds from which no one was advanced, and the second final round, if one exists, for which

conductor from 1949 to 1962. Our inability to explain the timing of screen adoption may result from our lack of intimate knowledge of the musical world, although it is also difficult to explain blind refereeing policy among economics journals (see the list in Blank, 1991).

[29] In rare cases, we have additional information on the finalists, such as resumes.

[30] The person will be known to be above a quality cutoff either because the individual is a current member of a comparable orchestra or because the person was a semifinalist or finalist in a previous audition.

[31] For 13 percent of the contestants, sex was confirmed by personnel managers, resumes, or audition summary sheets.

[32] Most of the remainder were sexed using census data by assigning to them the dominant sex of individuals with their first name.

TABLE 3—DESCRIPTIVE STATISTICS ABOUT AUDITIONS, BY YEAR AND ROUND OF AUDITION

Year	Number of auditions	Proportion female	Number of musicians	Number of auditions	Proportion female	Number of musicians	Number of auditions	Proportion female
			Completely blind auditions			Not completely blind auditions		
All	254	0.367	43.4	60	0.393	38.1	194	0.359
		(0.013)	(3.13)		(0.029)	(1.74)		(0.015)
Pre-1970	10	0.187				16.3	10	0.187
		(0.042)				(2.27)		(0.042)
1970–1979	69	0.329				31.4	69	0.329
		(0.026)				(2.10)		(0.026)
1980–1989	102	0.394	42.5	33	0.375	39.6	69	0.403
		(0.019)	(4.29)		(0.034)	(2.73)		(0.022)
1990+	73	0.390	44.6	27	0.415	50.6	46	0.375
		(0.027)	(4.64)		(0.049)	(4.52)		(0.033)
Round				Blind rounds			Not-blind rounds	
Preliminaries, without semifinals	170	0.357	34.3	125	0.367	24.7	45	0.327
		(0.015)	(1.87)		(0.017)	(2.33)		(0.029)
Preliminaries, with semifinals	137	0.396	45.5	134	0.395	49.3	3	0.425
		(0.019)	(2.54)		(0.019)	(17.0)		(0.205)
Semifinals	114	0.415	12.3	89	0.404	10.4	25	0.455
		(0.019)	(0.649)		(0.022)	(1.21)		(0.043)
Finals	167	0.430	4.93	28	0.472	7.12	130	0.422
		(0.016)	(0.448)		(0.040)	(0.310)		(0.017)

Notes: The unit of observation for the top portion is the audition, whereas it is the round for the bottom portion (e.g., proportion female in the top portion of the table is averaged across the auditions). Standard errors are in parentheses.
Source: Eight-orchestra audition sample. See text.

the candidates played with the orchestra.[33] In addition, we generally consider each round of the audition separately. These sample restrictions exclude 294 rounds (199 contained no women) and 1,539 individuals. Our final analysis sample has 7,065 individuals and 588 audition rounds (from 309 separate auditions) resulting in 14,121 person-rounds and an average of 2.0 rounds per musician.[34]

As can be seen in the bottom portion of Table 3, 259, or 84 percent, of our 307 preliminary rounds were blind, 78 percent of the 114 semifinals were blind, but just 17 percent of the 167 final rounds were blind. Most of our audition sample is for the period after 1970. The blind preliminaries contained 40 candidates on average, whereas those without the screen had 26. Women were about 37 percent of all preliminary candidates but 43 percent of finalists, and the difference holds for both the blind and not-blind auditions. The percentage female among all candidates increased over time, from 33 percent in the 1970 to 1979 period to 39 percent in the post-1990 years (see upper portion).

Roster Data.—Our second source of information comes from the final results of the audition process, the orchestra personnel rosters. We collected these data from the personnel page of concert programs, one each year for eleven major symphony orchestras. These records are in the public domain and thus we have used the orchestra names in the graphs containing those data alone. As opposed to the auditionees, we were able to confirm the sex of the players with the orchestra personnel managers and

[33] Although the results are unaffected, harp auditions are excluded because it has typically been a female-dominated instrument.

[34] See Table A1 for descriptive statistics.

archivists. We considered a musician to be new to the orchestra in question if he or she had not previously been a regular member of that orchestra (i.e., we did not count returning members as new). We excluded, when possible, temporary and substitute musicians, as well as harpists and pianists. Our final sample for 1970 to 1996 has 1,128 new orchestra members (see Table A2).

Econometric Framework.—We take advantage of the variation that exists across orchestras, time, and audition round to identify the effect of the screens on the likelihood that a female is advanced from one round to the next and ultimately hired. The probability that individual i is advanced (or hired) from an audition at orchestra j, in year t, from round r, is a function of the individual's sex (F), whether a screen is used (B), and other individual (X) and orchestral (Z) factors, that is:

$$(1) \qquad P_{ijtr} = f(X_{it}, F_i, B_{jtr}, Z_{jtr}).$$

The screen, it will be recalled from Table 1, varies across orchestra, time, and audition round. Orchestras adopted the screen in different years. Some used the screen in the preliminary round only, whereas others used the screen for the entire audition process. We use this variation to estimate a differences-in-differences strategy. In linear form, we write

$$(2) \quad P_{ijtr} = \alpha + \beta F_i + \gamma B_{jtr} + \delta(F_i \times B_{jtr}) + X_{it}\theta_1 + Z_{jtr}\theta_2 + \varepsilon_{ijtr}.$$

The coefficient on B_{jtr}, γ, identified from the men who audition with a screen, controls for whether all individuals are more or less likely to be advanced from a blind than from a not-blind audition. Thus the parameter of interest is that on the interaction between F_i and B_{jtr}, δ, which measures the change in the probability that a woman will be advanced if a screen is used, relative to her auditioning without a screen (after accounting for other blind audition effects). We also test whether the use of the screen eliminates sex differences in the likelihood an individual is advanced from one round to the next. Because no restrictions exist on the number of individuals advanced from the preliminary and semifinal rounds, there is no zero-sum game between men and women for these rounds.

B. *The Effect of the Screen on the Likelihood of Being Advanced*

Tabulations and Regression Results With and Without Individual Fixed Effects.—The raw data in Tables 4 and 5 can reveal the impact on women of changes in the audition process and provide an important introduction to the data. We demonstrate that in the absence of a variable for orchestral "ability," women fare *less* well in blind auditions than otherwise. But if the orchestral "ability" of the candidate is held fixed, the screen provides an unambiguous and substantial *benefit* for women in almost all audition rounds.

Table 4 gives the success rate by sex, round of audition, and over time. We define "relative female success" as the proportion of women advanced (or hired) minus the proportion of men advanced (or hired). The relative success of female candidates appears worse for blind than for not-blind auditions and this finding also holds for each round of the audition process. One interpretation of this result is that the adoption of the screen lowered the average quality of female auditionees in the blind auditions. Only if we can hold quality constant can we identify the true impact of the screen.

Because we have the names of the candidates, we are able to link their success in one audition to that in another. (In our sample, 24 percent of the individuals competed in more than one audition.) In Table 5 we report audition success statistics, by round and overall, for musicians who appear more than once in our sample and for whom at least one audition (or round) was blind and one was not blind. The evidence tells a very different story from that in Table 4, and taken together they suggest that blind auditions expanded the pool of female applicants to include more who were less qualified. When we limit the sample to those who auditioned both with and without a screen, the success rate for women competing in blind auditions is almost always higher than in those that were not blind.

TABLE 4—AVERAGE SUCCESS AT AUDITIONS BY SEX, YEAR, AND ROUND OF AUDITION

	Relative female success		
Year	All auditions	Completely blind auditions	Not completely blind auditions
All	−0.001	−0.022	0.006
	(0.008)	(0.012)	(0.010)
Pre-1970	0.053		0.053
	(0.115)		(0.115)
1970–1979	0.001		0.001
	(0.021)		(0.021)
1980–1989	−0.006	−0.039	0.010
	(0.009)	(0.016)	(0.009)
1990+	−0.003	−0.001	−0.003
	(0.010)	(0.017)	(0.013)
Round	All rounds	Blind rounds	Not-blind rounds
Preliminaries, without semifinals	−0.032	−0.048	0.012
	(0.019)	(0.021)	(0.040)
Preliminaries, with semifinals	−0.048	−0.052	0.116
	(0.016)	(0.016)	(0.228)
Semifinals	−0.030	−0.059	0.071
	(0.038)	(0.044)	(0.080)
Finals	0.009	−0.028	0.016
	(0.036)	(0.102)	(0.038)

Notes: For the top part of the table "success" is a "hire," whereas for the bottom portion "success" is advancement from one stage of an audition to the next. The unit of observation for the top portion is the audition, whereas it is the round for the bottom portion (e.g., relative female success in the top portion of the table is averaged across the auditions). Standard errors are in parentheses. "Relative female success" is the proportion of women advanced (or hired) minus the proportion of men advanced (or hired). By hired, we mean those who were advanced from the final round out of the entire audition.
Source: Eight-orchestra audition sample. See text.

Take the preliminary round with no semifinals, for example, in Table 5. In the blind auditions 28.6 percent of the women are advanced, as are 20.2 percent of the men. But in the not-blind column, just 19.3 percent of the women are advanced, although 22.5 percent of the men are. Even though a woman has a small advantage over a man when the screen is used (by 8.4 percentage points), her success rate, relative to that of a man, is increased by 11.6 percentage points above that in the not-blind regime. Note that because these are the *same* women, Table 5 suggests that a woman enhances her own success rate by 9.3 percentage points by entering a blind preliminary round. Not only do these differences suggest that women are helped by the screen, the differences are large relative to the average rate of success.[35]

Women's success is also enhanced by the screen in the finals and for the overall audition (termed "hired" in the table). For the finals, a woman's success rate is increased by 14.8 percentage points moving to blind auditions (23.5 − 8.7) and is enhanced by a hefty 28.1 percentage points above that of men. All success rates are very low for auditions as a whole, but the female success rate is 1.6 times higher (increasing from 0.017 to 0.027) for blind than for not-blind auditions. The only anomalous result in the table concerns the semifinals, to which we return later. We now show that these results stand up to the controls we can add, including the year of the audition and the instrument.[36]

[35] Because of the infrequency of position availability, it is unlikely there was much gaming by women (e.g., trying out only for blind auditions), although the change in the general environment of auditions could have altered the pool of contestants.

[36] We do not discuss the regression analog to Table 4, that is, the analysis without individual fixed effects, because we have firmly established that individual fixed effects matter. Table A3 shows the results of regressions

TABLE 5—AVERAGE SUCCESS AT AUDITIONS BY SEX AND STAGE OF AUDITION FOR THE SUBSET OF MUSICIANS WHO AUDITIONED BOTH BLIND AND NOT BLIND

	Blind		Not blind	
	Proportion advanced	Number of person-rounds	Proportion advanced	Number of person-rounds
	Preliminaries without semifinals			
Women	0.286	112	0.193	93
	(0.043)		(0.041)	
Men	0.202	247	0.225	187
	(0.026)		(0.031)	
	Preliminaries with semifinals			
Women	0.200	20	0.133	15
	(0.092)		(0.091)	
Men	0.083	12	0.000	8
	(0.083)		(0.000)	
	Semifinals			
Women	0.385	65	0.568	44
	(0.061)		(0.075)	
Men	0.368	68	0.295	44
	(0.059)		(0.069)	
	Finals			
Women	0.235	17	0.087	23
	(0.106)		(0.060)	
Men	0.000	12	0.133	15
	(0.000)		(0.091)	
	"Hired"			
Women	0.027	445	0.017	599
	(0.008)		(0.005)	
Men	0.026	816	0.027	1102
	(0.005)		(0.005)	

Notes: The unit of observation is a person-round. Standard errors are in parentheses. For the round in question, only musicians who auditioned more than once and who auditioned at least once behind a screen and at least once without a screen are included. "Hired" means those who were advanced from the final round out of the entire audition. Blind in the "hired" category means for all rounds. Not blind in the "hired" category means that at least one round was not blind. This difference in the definition of what constitutes a "blind" round or audition is one reason why the number of observations in the first four panels is less than the number of observations in the "hired" panel. The number of observations also differ because we exclude auditions or rounds in which no individual is advanced or in which there are only women or no women. Finally, unlike in subsequent tables, we exclude a few candidates for whom we could not determine or impute their sex. Note that the binding constraint for the preliminaries is the not-blind category, for which we have only one orchestra. The binding constraint in the "hired" category are the blind auditions, for which we have (at most) three orchestras. Musicians can appear more than once in either the blind or not-blind categories.
Source: Eight-orchestra audition sample. See text.

The results given in Table 6 are the regression analogs to the raw tabulations in Table 5.[37] Because the effect of the blind procedure could differ by the various rounds in the audition process, we divide audition rounds into the three main rounds (preliminary, semifinal, and final) and also separate the preliminaries into those that were followed by a semifinal

comparable to those in Table 6 but without individual fixed effects.

[37] In the (total) subsample of individuals auditioning both with and without a screen, all eight orchestras in our audition sample are represented, and seven of the orchestras changed audition policy during our sample time frame. The sample sizes in Table 6 are considerably larger than those in Table 5. The reason is that the regressions in Table 6 include *all* individuals whether or not they auditioned more than once, whereas Table 5 includes only those who auditioned at least twice, blind *and* not blind.

TABLE 6—LINEAR PROBABILITY ESTIMATES OF THE LIKELIHOOD OF BEING ADVANCED: WITH INDIVIDUAL FIXED EFFECTS

	Preliminaries							
	Without semifinals		With semifinals		Semifinals		Finals	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Blind	−0.017	0.003	0.109	0.224	0.026	0.102	−0.154	−0.060
	(0.039)	(0.046)	(0.172)	(0.242)	(0.089)	(0.096)	(0.150)	(0.149)
Female × Blind	0.125	0.111	0.013	−0.025	−0.179	−0.235	0.308	0.331
	(0.068)	(0.067)	(0.215)	(0.251)	(0.126)	(0.133)	(0.196)	(0.181)
Number of auditions attended		−0.020		0.010		0.015		0.126
		(0.014)		(0.010)		(0.030)		(0.028)
Years since last audition		−0.005		−0.006		−0.005		0.016
		(0.007)		(0.005)		(0.013)		(0.015)
Automatic placement						−0.096		−0.069
						(0.064)		(0.073)
"Big Five" orchestra		−0.154		−0.059		0.006		−0.059
		(0.035)		(0.024)		(0.081)		(0.084)
Total number of auditioners in round (÷100)		−0.003		0.014		−0.371		−0.262
		(0.081)		(0.031)		(0.521)		(0.756)
Proportion female at the audition round		0.118		0.312		0.104		0.067
		(0.139)		(0.134)		(0.218)		(0.159)
Principal		−0.079		−0.078		−0.082		−0.185
		(0.037)		(0.019)		(0.066)		(0.076)
Substitute		0.165		0.123		0.167		0.079
		(0.081)		(0.093)		(0.183)		(0.217)
p-value of H_0: Blind + (Female × Blind) = 0	0.053	0.063	0.342	0.285	0.089	0.170	0.222	0.042
Year fixed effects?	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.748	0.775	0.687	0.697	0.774	0.794	0.811	0.878
Number of observations	5,395	5,395	6,239	6,239	1,360	1,360	1,127	1,127

Notes: The unit of observation is a person-round. The dependent variable is 1 if the individual is advanced to the next round and 0 if not. Standard errors are in parentheses. All specifications include individual fixed effects, an interaction for the sex being missing and a blind audition round, a dummy indicating if years since last audition is missing, and [in columns (3)–(8)] whether an automatic placement is missing.
Source: Eight-orchestra audition sample. See text.

round and those that were not. In the even-numbered columns we include year and instrument fixed effects, as well as individual and audition covariates. The individual correlates are whether the musician had an automatic placement in a semifinal or final round, years since the last audition in the sample, and the number of previous auditions in which we observe the musician to have competed. We also control for the total number of musicians in the round, the proportion female among contestants, and whether the audition is for a principal or substitute position.

Because 42 percent of the individuals in our sample competed in more than one round in our data set (24 percent of the musicians competed in more than one audition) and 6 percent competed both with and without a screen for a particular type of round (e.g., semifinal), we are able to use an individual fixed-effects strategy to control for contestant "ability" that does not change with time. In all columns of Table 6 we include individual fixed effects, in which case the identification is from individuals who auditioned both with and without a screen.[38] The

[38] There are 639 person-rounds comprised of individuals who auditioned at a preliminary round that was not followed by a semifinal round [columns (1) and (2) of Table 6], both with and without a screen; on average these individuals competed in 2.7 such preliminary rounds. There are 55 person-rounds comprised of individuals who auditioned at a preliminary round that was followed by a semifinal round [columns (3) and (4)], both with and without a screen; on average these individuals competed in 2.4 such preliminary rounds. There are 223 person-rounds comprised of individuals who auditioned at a semifinal [columns (5) and (6)],

effect of the screen here, therefore, is identified from differing audition procedures both within and across orchestras.[39] Note that we include a dummy variable for whether the orchestra is among the "Big Five," to control for the quality of the orchestra.

The coefficient of interest is the interaction between "Female" and "Blind." A positive coefficient would show that screened auditions enhance a woman's likelihood of advancement. Because screened auditions are more likely to take place in later years than auditions without screens, the interaction between "Female" and "Blind" might simply reflect the fact that female musicians get better over time. Note, however, that for this effect to bias the coefficient, female musicians would have to improve faster with time than male musicians. Nevertheless, we have also included (in the individual covariates) the number of previous auditions the musician attended in our sample, the number of years since the last audition in the sample, and whether the candidate was an automatic placement. The coefficient on "Blind" reveals whether blind auditions change the likelihood that all contestants are advanced.

As in the raw tabulations of Table 5, we find that the screen has a *positive* effect on the likelihood that a woman is advanced from the preliminary round (when there is no semifinal) and from the finals.[40] The effects, moreover, are statistically significant in both cases. The effect in the semifinal round, however, remains strongly negative.[41] In addition, the magnitudes of the effects in Table 6 are similar to those implied by the raw tabulations (Table 5). For preliminaries that are not preceded by a semifinal, the blind audition increases the likelihood that a woman will be selected by about 11 percentage points. For female musicians who made it to the final round, the individual fixed-effects regression result indicates that the screen increases the likelihood of their winning by about 33 percentage points.[42]

Assessing Potential Biases.—A concern with the preceding fixed-effects analysis is that, as noted earlier, female musicians who are improving over time are those who switch from not-blind to blind auditions and that the growth rate of their "ability" is faster than that of men. We attempted to address this potential bias by including several individual time-varying co-

both with and without a screen; on average these individuals participated in 2.8 semifinal rounds. Finally, there are 67 person-rounds comprised of individuals who auditioned at a final round [columns (7) and (8)], both with and without a screen; on average these individuals participated in 2.4 final rounds. It should be noted that the number of person-rounds off of which we are identified in Table 6 can also be found in Table 5, with one exception. There are 223 person-rounds comprised of individuals who auditioned at the semifinal, both with and without a screen, in Table 6 and only 221 in Table 5 because there are two individuals we could not sex. We include these individuals in the regressions in Table 6 and add a dummy variable indicating that the sex is missing.

[39] An analysis of variance (ANOVA) across the entire sample, that is pooling all rounds, indicates that 19 percent of the variation in the use of the screen is across orchestras. Looking by audition round reveals that 73 percent of the variation in preliminaries, 53 percent of the variation in semifinals, and 71 percent of the variation in finals is across orchestras. By contrast, in Table 7 (which includes a subset of the orchestras, see table notes), just 1 percent of the variation in the use of the screen is across orchestras.

[40] An exception occurs when preliminaries are followed by semifinals. There are, however, only three preliminary rounds that are not blind when there is also a semifinal round (see Table 3). Thus the coefficients in columns (3) and (4) of Table 6 are identified using very few separate audition rounds. We also note that when we estimate fixed-effects logit models we obtain results similar to those in columns (1) and (2) in Table 6 (and in Table 7). Because of the small samples with the identifying requirements of the fixed-effects logit, standard errors for the estimates in columns (3)–(8) of Table 6 could not be computed. Further, for the results without individual fixed effects, logits and linear probability models give qualitatively similar results.

[41] This result on the semifinals is robust across time, instrument, position, and orchestra. One interpretation is that it represents a form of affirmative action by the audition committees. Committees may hesitate to advance women from the preliminary round if they are not confident of the candidate's ability. On the other hand, semifinals are typically held the same day as are preliminaries and give the audition committee a second chance to hear a candidate before the finals. Thus, audition committees may actively advance women to the final round only when they are reasonably confident that the female candidate is above some threshold level of quality. If juries actively seek to increase the presence of women in the final round, they can do so only when there is no screen.

[42] As noted earlier, an obvious explanation for the importance of the individual fixed effects in the estimation is that the screen altered the pool of female applicants; however, we have been unable to show this empirically.

variates (in the even-numbered columns of Table 6). The inclusion of these individual covariates had little effect on the estimated effect of the screen.

A related concern is that those individuals who get hired at their first audition, and therefore do not contribute to the identification of the effect in the presence of individual fixed effects, are more able musicians than those who audition multiple times. (Alternatively, some individuals who audition and are not hired may get discouraged and not audition again and are therefore worse than those who audition multiple times.) Although this is a potential source of bias, it is important to remember that only a very small number of musicians win an audition in any given year, since there are just a handful of auditions (for a given instrument) among the major orchestras. Furthermore, many of the contestants in our sample did audition at least twice.

In addition, there are three pieces of empirical evidence that suggest this potential source of bias is not a major problem in our data. First, we control for the number of previous auditions in the even columns of Table 6, and this control does not change the results significantly. Second, there is no significant difference in the proportion female among those who auditioned both with and without a screen and those who auditioned only once (or who auditioned under only one policy regime). Finally, the coefficient estimates generated when the sample is restricted to those who auditioned at least three times are not perceptibly different from those generated from the full sample or from the sample of individuals who auditioned both with and without a screen. (These results are presented in Table A4.)

A third potential bias is that, because the effect of the screen is partially identified from differing audition procedures across orchestras, the results in Table 6 may indicate that orchestras that use screens are less discriminatory against women than those that do not. Specifically, because we include individual fixed effects, a bias would arise if women who are improving faster than average are more likely to audition for orchestras that use screens and are more likely to be advanced because these orchestras are intrinsically less discriminatory. Our sample contains only one orchestra per audition round that changed policy. As a result, we cannot separate the estimation by audition round and include orchestra fixed effects. We can, however, pool the audition rounds for the three orchestras that changed audition policy during our sample frame and include both individual and orchestra fixed effects.[43] These results are presented in Table 7.

In column (1) of Table 7 we include individual fixed effects, in which case the identification is from individuals who auditioned both with and without a screen. We add orchestra fixed effects in column (2) such that the identification now is from individuals who auditioned for a particular orchestra both before and after the orchestra began using a screen.[44] Finally, in column (3) we exclude individual but keep orchestra fixed effects to illustrate the importance of individual fixed effects. Again, the coefficient on "Blind" shows whether all musicians are more likely to be advanced when the audition is blind. The interaction between whether the individual is female and whether the audition is blind indicates whether women receive an extra boost relative to men when the screen is used.

The coefficient of interest is positive in columns (1) and (2) but negative in column (3), similar to the difference between the tabulations in Tables 4 and 5. In addition, the estimated effect of the blind auditions on the success of women is similar to that in Table 6. The point is that individual fixed-effects estimation matters; orchestra fixed effects, however, do not matter. In all cases, blind auditions increase the probability of advancement for both men and women. More

[43] We do not include the type of audition round since we have only one orchestra that changed procedures for the preliminaries, one that changed for the semifinals, and one that changed for the finals (and for which there were musicians who auditioned for that orchestra and audition round with and without a screen). We have also estimated these regressions separately for each of these three orchestras. Although the point estimates are not statistically significant, the magnitudes are quite similar to those presented in Table 6 for the corresponding round of the audition.

[44] In this subsample, there are 1,776 person-rounds comprised of individuals who auditioned for a particular orchestra, both behind and without a screen; on average these 552 individuals competed in 3.2 audition rounds.

TABLE 7—LINEAR PROBABILITY ESTIMATES OF THE LIKELIHOOD OF BEING ADVANCED: WITH INDIVIDUAL AND ORCHESTRA FIXED EFFECTS

	Include individual fixed effects		Exclude individual fixed effects
	(1)	(2)	(3)
Blind	0.404	0.399	0.103
	(0.027)	(0.027)	(0.018)
Female × Blind	0.044	0.041	−0.069
	(0.039)	(0.039)	(0.022)
Female			−0.005
			(0.019)
p-value of H_0: Blind + (Female × Blind) = 0	0.000	0.000	0.090
Individual fixed effects?	Yes	Yes	No
Orchestra fixed effects?	No	Yes	Yes
Year fixed effects?	Yes	Yes	Yes
Other covariates?	Yes	Yes	Yes
R^2	0.615	0.615	0.048
Number of observations	8,159	8,159	8,159

Notes: The unit of observation is a person-round. The dependent variable is 1 if the person is advanced to the next round and 0 if not. Standard errors are in parentheses. All specifications include an interaction for the sex being missing and a blind audition; "Other covariates" include automatic placement, years since last audition, number of auditions attended, size of the audition round, proportion female in audition round, whether a principal or substitute position, and a dummy indicating whether years since last audition is missing. These regressions include only the orchestras that changed their audition policy during our sample years and for which we observe individuals auditioning for the audition round both before and after the policy change. These regressions include 4,836 separate persons and are identified off of 1,776 person-rounds comprised of individuals who auditioned both before and after the policy change for a particular orchestra. *Source:* Eight-orchestra audition sample (three orchestras of which are used; see Notes). See text.

important, even though the effect is not statistically significant, the blind procedure has a positive effect on women's advancement.[45]

Finally, sex misclassification may also bias our estimates because, if the misclassification errors are uncorrelated with the equation error, the estimated effect of the screen will be attenuated (see, e.g., Richard Freeman, 1984). To address this potential problem, we use a less-subjective assessment of the probability that the individual is male or female. A U.S. Bureau of the Census tabulation, based on the postenumeration survey of the 1990 census, gives us the proportion female and male of the top 90 percent of all names.[46]

In Table 8 we estimate the same specifications given by columns (2), (4), (6), and (8) of Table 6 and column (2) of Table 7 using the census data in two ways. First, we simply replace our female covariate with the census probability.[47] Note that we also use a census estimate of the percentage of the audition round that is female (slightly changing our sample size), and a census estimate of the percentage of our sample for which the sex is indeterminate. In addition, our interaction term is constructed using the census probabilities. Second, we use

[45] Although the results from these three orchestras may not generalize to the other five, it should be noted that the coefficient estimate in column (3) of Table 7 is similar to that derived from a similar regression on the entire sample. This result is not surprising because the primary reason we are able to include both individual and orchestra fixed effects for these three orchestras is because they have unusually good record keeping, which allows us to observe the results of many auditions rather than another reason that might be correlated with how meritocratic the orchestra is.

[46] These data can be downloaded from http://www.census.gov/ftp/pub/genealogy/names. A possible problem with the data is that names are generational; a male name in one generation may become female in another.

[47] We do not impute census probabilities for the individuals whose sex we know with certainty (see footnote 31).

TABLE 8—LINEAR PROBABILITY ESTIMATES OF THE LIKELIHOOD OF BEING ADVANCED: ADDRESSING SEX MISCLASSIFICATION

Part A: Preliminary rounds

	Preliminaries			
	Without semifinals		With semifinals	
	OLS	IV	OLS	IV
Blind	−0.012	0.057	−0.174	0.290
	(0.043)	(0.045)	(0.093)	(0.241)
Female × Blind	0.139	0.137	0.272	−0.035
	(0.066)	(0.068)	(0.188)	(0.251)
Other covariates?	Yes	Yes	Yes	Yes
Individual fixed effects?	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes
R^2	0.771			
Number of observations	5,696	5,395	6,546	6,239

Part B: Semifinal and final rounds, and with orchestra fixed effects

	Semifinals		Finals		With orchestras fixed effects	
	OLS	IV	OLS	IV	OLS	IV
Blind	0.100	−0.197	−0.028	−0.025	0.010	0.061
	(0.083)	(0.700)	(0.125)	(0.141)	(0.028)	(0.033)
Female × Blind	−0.242	−0.193	0.160	0.324	0.069	0.052
	(0.120)	(0.429)	(0.171)	(0.181)	(0.035)	(0.036)
Other covariates	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.776		0.848		0.654	
Number of observations	1,600	1,360	1,509	1,127	8,882	8,159

Notes: The unit of observation is a person-round. The dependent variable is 1 if the individual is advanced to the next round and 0 if not. Standard errors are in parentheses. The instruments are the census probability that the individual is female, a dummy for whether the person has been sexed with certainty, and proportion female calculated using the census data and an interaction between whether the census data are missing and a screen has been used. The "OLS" columns use these as regressors. All specifications include an interaction for the sex being missing and a blind audition; "Other covariates" include automatic placement, years since last audition, number of auditions attended, whether a "Big Five" orchestra, size of the audition round, proportion female at the audition round, whether a principal or substitute position, and a dummy indicating whether years since last audition and automatic audition are missing. These are the same specifications as in columns (2), (4), (6), and (8) of Table 6 and column (2) of Table 7. The sample sizes change because in the even-numbered columns we simply replace our female covariate with the census probability and also use a census estimate of the percentage of the audition round that is female, which changes the sample size slightly.
Source: Eight-orchestra audition sample. See text.

the census probability as an instrument for our estimate (and for the percentage of the audition that is female, the percentage missing sex, and the interaction between female and whether the audition is blind).

The results are quite robust across these different methods for addressing potential measurement error. More important, the coefficients and their standard errors are generally similar in magnitude to those in Tables 6 and 7. With the exception of the semifinal round, the screen appears to have increased the likelihood that a woman would be advanced.[48]

[48] Another potential bias is from the short panel, which may affect the consistency of the estimates (Hsiao, 1986). We address the extent of this short panel problem in two ways. We first restrict our sample to those whom we observe auditioning at least three times (for the same round). Second, we restrict the estimation to those who auditioned at least once in a blind round and at least once in a not-blind round (those off of whom we are identified). The results do not change markedly from those in Table 6, showing that the short panel may not be a problem. See Table A4.

TABLE 9—LINEAR PROBABILITY ESTIMATES OF THE EFFECT OF BLIND AUDITIONS ON THE LIKELIHOOD OF BEING HIRED WITH INDIVIDUAL FIXED EFFECTS

	Without semifinals		With semifinals		All	
	(1)	(2)	(3)	(4)	(5)	(6)
Completely blind audition	−0.024	0.047	0.001	0.006	0.001	0.005
	(0.028)	(0.041)	(0.009)	(0.011)	(0.008)	(0.009)
Completely blind audition × female	0.051	0.036	0.001	−0.004	0.011	0.006
	(0.046)	(0.048)	(0.016)	(0.016)	(0.013)	(0.013)
Year effects?	No	Yes	No	Yes	No	Yes
Other covariates?	No	Yes	No	Yes	No	Yes
R^2	0.855	0.868	0.692	0.707	0.678	0.691
Number of observations	4,108	4,108	5,883	5,883	9,991	9,991

Notes: The unit of observation is a person-round. The dependent variable is 1 if the individual is advanced (or hired) from the final round and 0 if not. Standard errors are in parentheses. All specifications include individual fixed effects, whether the sex is missing, and an interaction for sex being missing and a completely blind audition. "Other covariates" are the size of the audition, the proportion female at the audition, the number of individuals advanced (hired), whether a "Big Five" orchestra, the number of previous auditions, and whether the individual had an automatic semifinal or final.
Source: Eight-orchestra audition sample. See text.

C. *The Effect of the Screen on the Hiring of Women*

Using the Audition Sample.—Our analysis, thus far, has concerned the rounds of the audition process and the degree to which the screen enhances the likelihood of a woman's advancing from one round to the next. We turn now to the effect of the screen on the actual hire and estimate the likelihood an individual is hired out of the initial audition pool.[49] Whereas the use of the screen for each audition round was, more or less, an unambiguous concept, that for the entire process is not and we must define a blind audition. The definition we have chosen is that a blind audition contains all rounds that use the screen. In using this definition, we compare auditions that are completely blind with those that do not use the screen at all or use it for the early rounds only. We divide the sample into auditions that have a semifinal round and those that do not, because the previous analysis suggested they might differ.

The impact of completely blind auditions on the likelihood of a woman's being hired is given in Table 9, for which all results include individual fixed effects.[50] The impact of the screen is positive and large in magnitude, but only when there is no semifinal round. Women are about 5 percentage points more likely to be hired than are men in a completely blind audition, although the effect is not statistically significant. The effect is nil, however, when there is a semifinal round, perhaps as a result of the unusual effects of the semifinal round. The impact for all rounds [columns (5) and (6)] is about 1 percentage point, although the standard errors are large and thus the effect is not statistically significant. Given that the probability of winning an audition is less than 3 percent, we would need more data than we currently have to estimate a statistically significant effect, and even a 1-percentage-point increase is large, as we later demonstrate.

[49] There are four auditions in which the committee could not choose between two players and therefore asked each to play with the orchestra. We consider both to be winners. The results are not sensitive to this classification. For this analysis we exclude auditions with no women, all women, or no winner; these exclusions do not change the results.

[50] In Table 9 we are identified off of individuals who competed in auditions that were completely blind *and* those that were not completely blind (that is, *any* one round could not be blind). The unit of observation is the person-round and there are 92 fulfilling this criterion for auditions without a semifinal [columns (1) and (2)]; on average these persons competed in 3.6 auditions in this sample. There are 625 person-rounds fulfilling this criterion that included a semifinal [columns (3) and (4)] and on average these persons competed in 3.5 auditions in this sample. Finally, there are 911 person-rounds fulfilling this criterion across all audition [columns (5) and (6)] and on average these persons competed in 3.5 auditions in this sample. The sample off of which we are identified is larger for all auditions than for the sum of the other two because some individuals auditioned both with and without a semifinal round.

TABLE 10—PROBIT ESTIMATES OF THE EFFECT OF BLIND AUDITIONS ON THE SEX OF NEW MEMBERS: 1970 TO 1996

	Any blind auditions	Only blind preliminaries and/or semifinals vs. completely blind auditions
	(1)	(2)
Any blind auditions	0.238	
	(0.183)	
	[0.075]	
Only blind preliminaries and/or semifinals		0.232
		(0.184)
		[0.074]
Completely blind auditions		0.361
		(0.438)
		[0.127]
Section:		
Woodwinds	−0.187	−0.188
	(0.114)	(0.114)
	[−0.058]	[−0.058]
Brass	−1.239	−1.237
	(0.157)	(0.157)
	[−0.284]	[−0.284]
Percussion	−1.162	−1.164
	(0.305)	(0.305)
	[−0.235]	[−0.235]
p-value of test: only blind preliminaries and/or semifinals = completely blind		0.756
pseudo R^2	0.106	0.106
Number of observations	1,128	1,128

Notes: The dependent variable is 1 if the individual is female and 0 if male. Standard errors are in parentheses. All specifications include orchestra fixed effects and orchestra-specific time trends. Changes in probabilities are in brackets; see text for an explanation of how they are calculated. New members are those who enter the orchestra for the first time. Returning members are not considered new. The omitted section is strings.
Source: Eleven-orchestra roster sample. See text.

Using the Roster Data.—The roster data afford us another way to evaluate the effect of the screen on the sex composition of orchestras. Using the rosters we know the sex of new hires each year for 11 orchestras, and we also have information (see Table 1) on the year the screen was adopted by each orchestra. We treat the orchestra position as the unit of observation and ask whether the screen affects the sex of the individual who fills the position. We model the likelihood that a female is hired in a particular year as a function of whether the orchestra's audition procedure involved a screen, again relying on the variation over time within a particular orchestra. Thus, in all specifications, we include orchestra fixed effects and an orchestra-specific time trend.

The roster data extend further back in time than do the audition data and could conceivably begin with the orchestra's founding, although there is no obvious reason to include many years when none used the screen. We report, in Table 10, the effects of the screen on the hiring of women from 1970 to 1996 using a probit model. The screen is first defined to include any blind auditions [column (1)]. In column (2) we estimate separate effects for orchestras using blind preliminary (and semifinal) rounds but not blind finals and those with completely blind auditions.

To interpret the probit coefficient, we first predict a base probability, under the assumption that each orchestra does not use a screen. We then predict a new probability assuming the orchestra uses a screen. The mean difference in the probabilities is given in brackets.

The coefficient on blind in column (1) is positive, although not significant at any usual level of confidence. The estimates in column (2) are positive and equally large in magnitude to those in column (1). Further, these estimates show that the existence of any blind round makes a difference and that a completely blind process has a somewhat larger effect (albeit with a large standard error).[51] According to the point estimates in column (1) of Table 10, blind auditions increase the likelihood a female will be hired by 7.5 percentage points. The magnitude of the effect must be judged relative to the overall average and, for the period under consideration, it was about 30 percent.[52] Thus blind auditions increased the likelihood a female would be hired by 25 percent.

Making Further Sense of the Results on Hiring.—The audition sample results suggest that blind auditions increase the probability of eventual success for a female candidate by 5 percentage points, but only if there is no semifinal round. The average effect for both types of auditions is closer to 1 percentage point (with a large standard error). The following example, using assumed values based on the actual data, demonstrates that an increase of about 2 percentage points in the probability of a woman's success out of an audition can explain the entire change in female hires, allowing the share of candidates who are female to increase from 0.2 to 0.3. Thus an increase of 1 percentage point—our point estimate—can account for a substantial share.

Consider two regimes: one without the screen (not blind) and another with the screen (blind). In the not-blind regime, assume that 20 percent of the candidates are female and that in the blind regime 30 percent are female.[53] We know that in the era (say, before 1970) when few orchestras used the screen for the preliminary round (see Table 1), 10 percent (that is, 0.0996) of new hires were women. Also assume that 30 candidates enter each audition, independent of audition regime, and that one musician is hired out of each audition. Using these assumptions, taken from the actual data, the success rate for the typical female audition candidate in the not-blind regime will be 0.0166 and that for the typical male will be 0.0375. If in the blind regime, however, the percentage of new hires who are female increases to 35 percent (its approximate figure for the past 10 years), the success rate for a female audition candidate must have increased to 0.0389 (and that for a male must have decreased to 0.0310). That is, for consistency with the data on percent female, the success rate for female candidates would have had to increase by about 2.2 percentage points, moving from the not-blind to the blind regime. Our point estimate is that about half of that increase—1 percentage point—was the result of the effect of the screened audition process.

Using the example we just offered, the increase in the probability of a woman's being hired out of an audition accounts for 66 percent of the total increase in the fraction female among new hires. Half of the 66 percent comes from the switch to blind auditions.[54] The other half could have resulted, for example, from a

[51] We have also attempted to interact the effect of blind auditions with section dummies. We find that the main effect of blind auditions is almost identical to that for the string section, which is not surprising given that the strings comprise 65 percent of the observations. In addition, fewer than 4 percent of the musicians hired into the percussion and brass sections are female.

[52] See Table A2.

[53] The fraction female in the not-blind regime (taking it to be the period before 1970) is 0.187 in our data (see Table 3). In the blind regime it was between 0.35 and 0.4. We have chosen the more conservative 0.3 in the example because we want to use a number that is independent of the switch to using the screen. That is, we would like to use a fraction female that is solely the result of increases in female participation in general but independent of changes in audition procedures.

[54] The proportion female among new hires is $(n \cdot \lambda \cdot \alpha)$, where n = the number of audition candidates (in this example $n = 30$); λ = the success rate of the average female candidate, which may be enhanced by the screen (in this example λ increases from 0.0166 to 0.0389 or by 2.2 percentage points, about half of which is due to the screen, based on our estimates); and α = the fraction female among candidates (assumed here to increase from 20 to 30 percent independent of λ). The percentage of the total change accounted for by the change in λ is given by $(n \cdot \alpha \cdot \Delta\lambda)/\Delta(n \cdot \lambda \cdot \alpha)$ or on average by $[(30 \cdot 0.25 \cdot 0.022)/(0.35 - 0.0996) = 66$ percent. (The 0.25 figure is the average of that in the treatment period and that previously.) Since half is accounted for by the screen, about 33 percent of the increase in the proportion female among new hires comes from the blind audition process.

greater acceptance of female musicians by music directors. The remainder (34 percent) of the increase in the fraction female among new hires is accounted for by the increased percentage female among audition candidates. That portion comes primarily from the increase in the fraction female among music school graduates.

The point estimates from the roster data also suggest that a substantial portion of the increase in female hires across the two regimes, not-blind and blind, can be explained by the change in audition procedures. In the not-blind regime about 10 percent of all hires are female but in the blind regime about 35 percent are, a difference of 25 percentage points. The estimates in column (1) of Table 10 show that the switch to the blind regime increases the likelihood a woman will be hired by 7.5 percentage points—30 percent of the total change—although we emphasize that the coefficient is imprecisely estimated.

One may wonder why there was disparate treatment of female musicians before the screen was used. A great orchestra is not simply a collection of the finest musicians. It is, rather, a group of great musicians who play magnificently as an ensemble. Substantial amounts of specific human capital are acquired on the job and tenure differences by sex, therefore, could influence hiring decisions.[55] Leaves of absence are ordinarily allowed for medical (including maternity) and professional reasons. We find, using the roster sample from 1960 to 1996, that the average female musician took 0.067 leaves per year, whereas the average male musician took 0.061, a difference that is not statistically significant, and that their length of leave was trivially different. Tenure differences were also small and some specifications show that women accumulated more years with an orchestra, given their starting year and orchestra.[56] Turnover and leaves of absence do not appear to differ by sex and thus should not have rationally influenced hiring decisions.

IV. Conclusion

The audition procedures of the great U.S. symphony orchestras began to change sometime in the 1970's. The changes included increasing the number of candidates at auditions—a democratization of the process—and using a physical screen during the audition to conceal the candidate's identity and ensure impartiality. We analyze what difference blind auditions have meant for female musicians.

We have collected, from orchestral management files and archives, a sample of auditions for eight major orchestras. These records contain the names of all candidates and identify those advanced to the next round, including the ultimate winner of the competition. The data provide a unique means of testing whether discrimination existed in the various rounds of a hiring process and even allow the linkage of individuals across auditions. A strong presumption exists that discrimination has limited the employment of female musicians, especially by the great symphony orchestras. Not only were their numbers extremely low until the 1970's, but many music directors, ultimately in charge of hiring new musicians, publicly disclosed their belief that female players had lower musical talent.

The question is whether hard evidence can support an impact of discrimination on hiring. Our analysis of the audition and roster data indicates that it can, although we mention various caveats before we summarize the reasons. Even though our sample size is large, we identify the coefficients of interest from a much smaller sample. Some of our coefficients of interest, therefore, do not pass standard tests of statistical significance and there is, in addition, one persistent result that goes in the opposite direction. The weight of the evidence, however, is what we find most persuasive and what we

[55] Musicians of the Vienna Philharmonic made this argument in a radio broadcast by the West German State Radio in February 1996 [translation provided by William Osborne]. See also *New York Times* (1996) in which a player for the Vienna Philharmonic argued that female musicians would cost the orchestra considerably more because substitutes would have to be hired if they became pregnant.

[56] The general specification is number of actual years with an orchestra as a function of the starting year, section dummies, and a female dummy, for the period since 1959. The coefficient on the female dummy is −0.299 with a large standard error (the mean of tenure is 11.7 years). With the addition of orchestra fixed effects, the coefficient on the female dummy is +0.062, again with a large standard error. The difference in tenure by sex, therefore, is extremely small.

have emphasized. The point estimates, moreover, are almost all economically significant.

Using the audition data, we find that the screen increases—by 50 percent—the probability that a woman will be advanced from certain preliminary rounds and increases by severalfold the likelihood that a woman will be selected in the final round. By the use of the roster data, the switch to blind auditions can explain 30 percent of the increase in the proportion female among new hires and possibly 25 percent of the increase in the percentage female in the orchestras from 1970 to 1996.[57] As in research in economics and other fields on double-blind refereeing (see, e.g., Blank, 1991), the impact of a blind procedure is toward impartiality and the costs to the journal (here to the orchestra) are relatively small. We conclude that the adoption of the screen and blind auditions served to help female musicians in their quest for orchestral positions.

[57] The point estimate for the increased likelihood a woman would be a new hire, as a result of the adoption of blind auditions, is 7.5 percentage points using the roster data (see Table 10). Because the percentage female among new hires increased from 10 to 35 percent from before 1970 to the 1990's, our estimate implies that 30 percent of the 25 percentage-point increase can be explained by the adoption of the screen. How this increase affected the percentage female in the orchestra depends on the sex composition of the orchestra, retirement (or turnover), and the time frame. We assume a 25-year time frame (from 1970 to 1995) and two retirements (thus two hires) per year. An increase in the percentage female among new hires from 10 percent (its level pre-1970) to 17.5 percent (10 + 7.5%) implies that in 25 years, 13.75 women (out of 100) will be in the orchestra, or an increase of 3.75. The actual increase was 15 women, meaning 25 percent of the increase can be explained by the adoption of the screen. We assume in this example that the age distribution of the 100 players in 1970 is uniform between ages 25 and 74, that all hires occur at age 25, and that men and women are drawn from the same age distribution.

Appendix

Table A1—Sample Descriptive Statistics, Audition Data

	Preliminaries							
	Without semifinals		With semifinals		Semifinals		Finals	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Advanced	0.184	0.387	0.185	0.388	0.349	0.477	0.200	0.400
Blind	0.793	0.405	0.976	0.152	0.808	0.394	0.122	0.328
Female	0.376	0.485	0.374	0.484	0.410	0.492	0.411	0.492
Female × Blind	0.305	0.461	0.362	0.481	0.325	0.469	0.056	0.230
Missing female	0.002	0.047	0.002	0.047	0.004	0.066	0	0
Missing female × Blind	0.002	0.043	0.002	0.047	0.004	0.061	0	0
Years since last audition	2.480	1.661	2.621	2.209	2.432	2.393	2.272	1.895
Years since last audition, missing	0.663	0.473	0.505	0.500	0.386	0.487	0.505	0.500
Automatic placement	—	—	—	—	0.267	0.443	0.137	0.345
Number of auditions attended	1.611	1.137	2.147	1.717	2.490	1.886	2.051	1.513
"Big Five" orchestra	0.607	0.488	0.323	0.467	0.213	0.409	0.391	0.488
Total number of auditioners	44.348	22.202	64.279	35.914	15.054	7.187	8.622	4.445
Proportion female at round	0.375	0.206	0.373	0.239	0.407	0.211	0.411	0.213
Principal	0.192	0.394	0.368	0.482	0.353	0.478	0.278	0.448
Substitute	0.025	0.157	0.005	0.071	0.010	0.101	0.021	0.141
Number of observations (person-rounds)	5,395		6,239		1,360		1,127	

Source: Eight-orchestra audition sample. See text.

TABLE A2—SAMPLE DESCRIPTIVE STATISTICS, ROSTER DATA: 1970 TO 1996

	Mean	Standard deviation
Proportion female among new hires	0.293	0.455
$(\text{Proportion female})_{t-1}$	0.179	0.081
Only blind preliminary auditions	0.572	0.495
All auditions blind	0.104	0.305
Section:		
Strings	0.642	0.480
Woodwinds	0.158	0.365
Brass	0.165	0.371
Percussion	0.035	0.185
Number of observations	1,128	

Note: Means are musician weighted, not audition weighted.
Source: Eleven-orchestra roster sample. See text.

TABLE A3—LINEAR PROBABILITY ESTIMATES OF THE LIKELIHOOD OF BEING ADVANCED: BY ROUND

	Preliminaries							
	Without semifinals		With semifinals		Semifinals		Finals	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female	0.007	0.011	−0.054	−0.085	0.103	0.099	0.002	0.0004
	(0.025)	(0.025)	(0.069)	(0.069)	(0.061)	(0.061)	(0.028)	(0.028)
Female × Blind	−0.062	−0.067	0.005	0.037	−0.142	−0.137	−0.091	−0.078
	(0.028)	(0.028)	(0.070)	(0.070)	(0.066)	(0.067)	(0.075)	(0.075)
Blind audition	0.015	0.040	0.024	0.027	0.053	0.115	0.058	0.123
	(0.022)	(0.030)	(0.057)	(0.062)	(0.049)	(0.078)	(0.058)	(0.089)
p-value of H_0: Female + (Female × Blind) = 0	0.000	0.000	0.000	0.000	0.210	0.222	0.207	0.271
Other covariates?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Instrument fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Orchestra fixed effects?	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.062	0.070	0.033	0.045	0.074	0.081	0.064	0.068
Number of observations (person-rounds)	5,395	5,395	6,239	6,239	1,360	1,360	1,127	1,127

Notes: The dependent variable is 1 if the individual is advanced to the next round and 0 if not. Standard errors are in parentheses. All specifications include dummies indicating whether the sex is missing, and an interaction for the sex being missing and a blind audition. "Other covariates" include automatic round, number of auditions attended, whether a "Big Five" orchestra, size of round, proportion female at the round, and whether a principal (including assistant and associate principal) or substitute position; except in columns (2), (4), (6), and (8) for which "Other covariates" include only automatic placement and number of auditions attended. These results are comparable to those in Table 6 but without individual fixed effects.
Source: Eight-orchestra audition sample. See text.

TABLE A4—LINEAR PROBABILITY ESTIMATES OF THE LIKELIHOOD OF BEING ADVANCED: ASSESSING SHORT-PANEL BIAS

	Part A: Preliminary rounds			
	Preliminaries			
	Without semifinals		With semifinals	
	I[a]	II[b]	I[a]	II[b]
Blind	−0.024	−0.042	−0.047	−0.095
	(0.066)	(0.063)	(0.383)	(0.744)
Female × Blind	0.126	0.095	−0.035	0.041
	(0.095)	(0.071)	(0.403)	(0.275)
p-value of H_0: Blind + (Female × Blind) = 0	0.233	0.502	0.807	0.943
Other covariates?	Yes	Yes	Yes	Yes
Individual fixed effects?	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes
R^2	0.491	0.537	0.423	0.732
Number of observations (person-rounds)	1,025	639	1,928	55

	Part B: Semifinals and finals, and with orchestra fixed effects					
	Semifinals		Finals		With orchestras fixed effects	
	I[a]	II[b]	I[a]	II[b]	I[a]	II[b]
Blind	0.060	0.169	0.123	−0.140	0.084	0.352
	(0.133)	(0.109)	(0.356)	(0.449)	(0.047)	(0.056)
Female × Blind	−0.179	−0.284	0.157	0.403	0.042	0.021
	(0.195)	(0.142)	(0.408)	(0.415)	(0.051)	(0.041)
p-value of H_0: Blind + (Female × Blind) = 0	0.438	0.298	0.212	0.587	0.011	0.000
Other covariates?	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.438	0.593	0.721	0.728	0.506	0.603
Number of observations (person-rounds)	269	223	127	67	2,321	1,776

Notes: The dependent variable is 1 if the individual is advanced to the next round and 0 if not. Standard errors are in parentheses. These are the same specifications as in columns (2), (4), (6), and (8) of Table 6 and column (2) of Table 7.
Source: Eight-orchestra audition sample. See text.

[a] Includes those who auditioned at least three times (for the relevant round).

[b] Includes those who auditioned at least once in a blind audition and at least once in a not-blind audition (for the relevant round).

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