Does Involvement in High School Music Programs Benefit Earnings in Later Life?

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Abstract

This paper uses the 1979 NLSY survey data to analyze if there is any empirical benefit from participation in music programs in high school on future labor market outcomes, which will be measured with hourly wages of the individuals 15 years after the beginning of the survey. The study will be based on the Becker Theory of Human Capital and will use an expanded Mincer Equation. This study continues off of previous literature performed on the labor market effects of other extracurricular activity involvement like the impact athletic participation in college and high school. On average, those who were involved with music spent more time attaining education, had higher cognitive ability, and earned about an 8.29% higher wage than those who were not involved. An OLS is ran both with and without an ability proxy to test for signaling theory, which is not found to be present. After running an OLS regression with ability proxy included, this study finds an insignificant relationship between participation and wage. Those who participated in music in high school are indeed better off than their counterparts who did not, but it is not due to building human capital specifically from the participation or from signaling of the traits. An Oaxaca Decomposition test is performed to determine that the wage difference between music and non-music individuals was due in large to the fact that those who were involved in music also happened to have higher ability, went to school longer, and possessed other characteristics that favored them in the labor market.

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I. Introduction

The goal of any working individual should be to accumulate the optimal level of their human capital so that they can maximize the earnings they can achieve in life. The goal of any education system should be to provide all students the proper resources to build the necessary knowledge to be a productive member of society, while also providing avenues for students to develop their emotional and social intelligence as well. Extra-Curricular activities are such an avenue. Any school or university should provide diverse opportunities for their diverse student bodies to join and excel with. High school athletics, student groups like student government or student council, and various music programs, can benefit students in a variety of ways, both socially and academically. The value of extra curriculars has long been viewed as a way to help a student get their mind off their studies, allow students to have fun, provide opportunities to meet other likeminded students, and other subjective measures, but what is the long-term benefit of these activities? Is there, if any, objective, quantifiable benefits to participation in these activities, and if so, how can this be measured? The following study will attempt to find this empirical benefit by focusing on participation in one type of school activity, high school music programs, and the effects of the participation on a student's earnings 15 years later.

Participation in music programs in high school can include the various bands, chorales, and theater opportunities a school can provide. Being a part of such a club provides a student with a sense of belonging, gives them something to look forward to at school, and provides a place to meet other students and build relationships. It is also well known that participation in music programs has a benefit students' cognitively as well. Music participation increases a students' creative thinking ability, emotional intelligence, and both language and reasoning skills according to the University of Rochester Medical Center. In addition, some research has shown improved cognitive ability and physical coordination in students who were involved with music. With all these benefits, it would be assumed that a school would put music programs into the forefront of their programming, but this unfortunately is not the case, and is

the root cause of the economic problem this study is aiming to outline. Many schools around the country commonly face budgetary constrictions, and because of these constrictions, various programs are cut or defunded. Music programs are commonly one of the first programs to be targeted. Academic programs can't be cut, and athletic programs often receive far more support, making them much harder to adjust. This oftentimes leaves music programs as the only option to save money. The defunding of high school music programs around the country has led to another problem, a decline in total participation in music programs. From 1991 to 2010, the proportion of all 8th grade students who participated in music programs fell from 55% to 46% (ChildTrends, 2018). In addition to this, older students are far less likely to be involved with music programs than younger students, resulting from poor retention rates and lack of interest.

A school that cuts their music programs are bringing about a disservice for all its students. This study will analyze empirically if, in addition to the many social and cognitive benefits of music programs, there is also economic benefits to these programs later in life, and this will be measured in terms of labor market outcomes and possible casual effects on a students' productivity. If a positive effect is found, this study will serve as another example of why music programs are beneficial to students and will reiterate that schools should support the retention of them.

The benefits mentioned above could positively contribute to the human capital formation described in Becker's Theory of Human Capital. Human capital consists of all the activities a person has accumulated which can create economic value, or in other terms, to become more productive. The idea of human capital, productivity, and how they played into income was originally created by economist Gary Becker. Becker said that a person could invest into themselves by attending school or working jobs, and that the knowledge and skills gained from this investment would bring a return on investment in the future in terms of earnings, hours worked, or employability. Later, Becker's theory was then specified into an empirical model by Joseph Mincer in the 1950s and 60s, which said that investing in building human capital is the key factor in determining earnings differentials (Rosen, 1992).

In theory, the model should imply that students who participated in music are more academically, emotionally, and socially skilled, and this should improve both their productivity, which in turn would benefit their life earnings. The aim of this analysis will be to determine if there is any relationship with between music involvement on future earnings, and if so, if the relationship is due to human capital theory, signaling theory, or another factor.

II. Survey of Literature

This paper proposes that those who were involved in music programs end up better off in life. To explain why this could be possible, we can observe past literature that proposes two main theories: The Human Capital Theory and Signaling Theory. Economist Gary Becker presented Human Capital Theory with his publication *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, explaining how schooling and work experience increased an individual's productivity and that productivity was essentially an investment into oneself for the future. Joseph Mincer further expanded on this theory and created an empirical model based on Becker's work. In 1958, Mincer published *Investment in Human Capital and Personal Income Distribution,* in which he presented his earnings equation based on years of schooling and years of experience. Mincer confirmed Becker's theory that earnings were positively affected by the extent of human capital accumulated by an individual. By pursuing more years of school, i.e. going to college or postgraduate study, an individual was learning more skills which make them more employable. Similarly, experience in the workforce also was building important knowledge and skills needed for employment (Rosen, 1992). Economists would later begin to expand on these initial models and wonder about if it was schooling and work experience that contributed to productivity, or were other factors present as well. Did the quality of the schooling, the grades received in school, the way time was utilized while in school, the connections made in school, etc. have statistically significant impacts on human capital accumulation and labor market outcomes? It would not

be until decades later when economists would begin to look at the impact of activities outside of the traditional curriculum on human capital accumulation. These studies would begin to look at the possible unobservable impacts of soft skill intelligence and the possible implications of developing such skills.

Since Becker and Mincer first began to examine investments into human capital in the 1950s and 1960s, much research has been performed on the potential effects of participation in extracurricular activities on productivity. Although it is known that these activities benefit academic abilities, it is not entirely known if participation in extracurriculars like music programs also improves overall productivity and professional success. As a result, more recent studies have shifted focus from the effect of extracurricular activity on academic performance to their benefits on labor market outcomes in later life. Many of these studies have been built upon the Mincer equation as mentioned above and typically use time allocation models as theoretical models to explain how extracurricular participation can increase or decrease human capital and cause earnings to be lower (Long and Caudill, 1991), (Barron, Ewing, and Waddell, 2000). There is not much research on how music programs affect human capital. However, there is extensive literature on the benefits of participation in athletic programs in both high school and on a collegiate level. The benefits of athletics, like music programs, has also been questioned in recent years and is more commonly stereotyped as more of a distraction than a benefit. There are typically two arguments presented within the research - those who believe athletics are detrimental to students because time spent on athletics can take away time spent on studying or homework, and those who argue that sports can increase productivity human capital acquisition by developing important skills, healthier habits, and motivation needed in the labor force.

One of the first studies done on athletic participation and labor outcomes was conducted by Long and Caudill in 1991. Their paper, *The Impact of Participation in Intercollegiate Athletics on Income and Graduation,* analyzed effect of participation in athletics in college on individual income levels ten years after the freshmen year of college, along with the probability of graduation. In addition to the usual prediction of Becker's theory on time allocation, the authors argue that there can be both positive and negative signaling within the workforce due to athletic participation. This study found a significant

relationship between athlete and income, and that athletes' incomes were about 4% higher, and was still higher even if variables like whether the individual had a driver's license were omitted. The authors concluded that the results supported that athletic program participation increased human capital, as opposed to signaling. This conclusion only applied for men however, as women's participation in athletics did not have a significant impact on later income.

Following Long and Caudill's study, other researchers examined the impact from investing in human capital earlier by participating in high school athletics as opposed to college. Barron, Ewing, and Waddell would be some of the first to explore these impacts with their 2000 study. Barron, Ewing, and Waddell based their research on both the Becker human capital theory and the two-period time allocation model, demonstrating how time spent on athletics could be considered both leisure time and time spent building human capital. The authors assumed for the study that there is no productivity accumulated from participation alone, but that participation acts as a signal of certain individual traits. Barron, Ewing, and Waddell identified four different traits individuals could possess as to why a student would play a sport, and then attempted to estimate which of these traits was the strongest driver of participation. The dominant traits then helped explain the cause of the possible correlation between athletic participation and earnings. The empirical results showed that high participation in athletics increased educational attainment and success, and that participation in athletics essentially serves as a signal that individuals placed lower value on leisure time and/or had higher overall ability. The legacy of this study was that it was the first to examine both discounting rates of those who participated in athletics and the possibly that participation acted as a signal of other factors that increased productivity as opposed to increasing it itself. This study was constrained by its lack of data on women.

To overcome this limitation, Dr. Deborah Anderson analyzed the impact of high school athletic participation on labor outcomes, broken down by different gender and race. In addition, Anderson's study would also analyze if there were any differences between team sports like basketball or football versus individual sports like golf or wrestling. The results of Anderson's models found that white males benefitted the most from sport participation in terms of later earnings and found that teams sports tended

to be more beneficial than individual sports, and this effect was largest again with white males (Anderson, 2001).

In 2001, a study performed by Mark Gius expanded on previous research by looking at not only high school athletic participation, but also participation in National Honor Society. Gius believed that National Honor Society should have similar productivity impacts as participation in athletics. This was one of the first studies to look at an extracurricular activity other than athletics. The results of the analysis confirmed the hypothesis, as wages were higher for students who participated in athletic programs versus those who did not, and the wage difference was even greater for those who participated in National Honor Society versus those who did not. After testing for heterogeneity however, the impact from NHS participation was no longer significant, perhaps pointing to strong reverse causality between having strong leadership skills and drive and the probability of joining an extra-curricular like National Honor Society, which only accepts high quality candidates.

More recently, Gorry (2016) also analyzed the effects of high school sports participation on educational and labor market outcomes in his study *Heterogeneous Effects of Sports Participation on Education and Labor Market Outcomes*. Gorry builds his theoretical model based on the Becker human capital model and differentiates between for individual and team sports, following Dr. Anderson's study in 2001. The empirical modelling is estimated using a quantile regression, like the study by Barron, Ewing, and Waddell. Although graduation rates were found to be positively affected by athletic participation, the research found no significant relationship between sport participation and labor market success after controlling for heterogeneity. In addition, Gorry found that team athletics had a larger impact on earnings than individual sports, as was in Anderson's study. Concurring with other results from previous studies, (Barron, Ewing, and Waddell, 2000; Anderson, 2001), athletic participation by itself was not impacting employability but was acting as a signal of underlying individual characteristics that made the students more employable.

Overall, past research into the effects of participation in athletics has shown is more likely a signal of already present traits than a form of building human capital. However, these analyses can be difficult, and

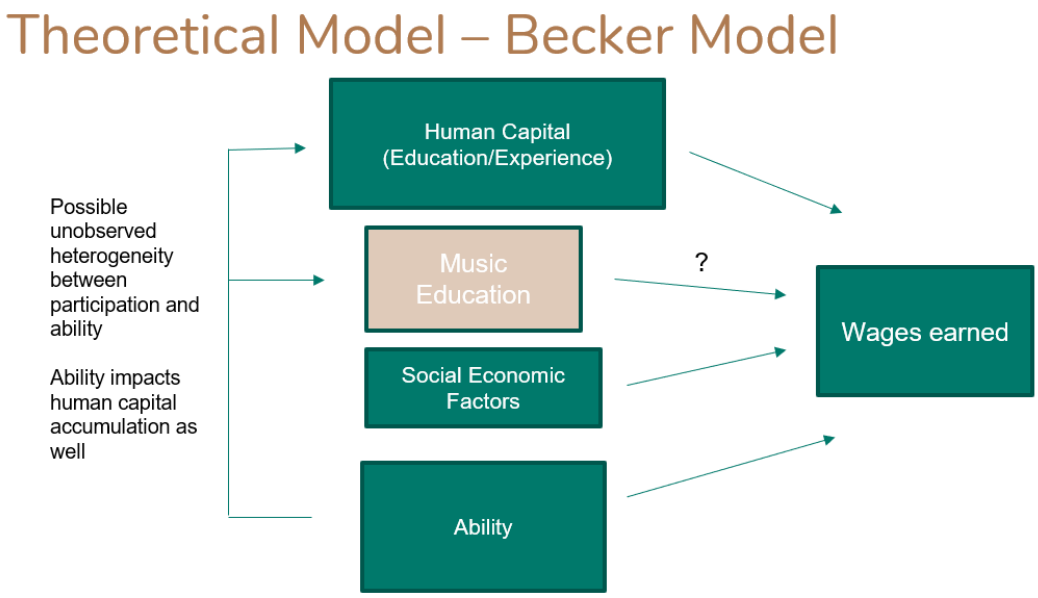
this could be due to a problem each study faced, the problem of endogeneity with the variables. Endogeneity is when a variable on the right-hand side of the regression equation is correlated with the error term. This typically can be due to reverse causality or unobserved heterogeneity. Many economists have theorized that the decision to participate in any extracurriculars, in particular athletics, could be related to how you discount the future, how much ability you have, how well you can manage time, etc., all of which are skills that increase productivity and wages. It would then beg the question if these skills are causing the positive correlations with earnings, or if it was the participation itself. After adjusting for this econometric problem, most studies found much smaller or statistically insignificant effects of participation in high school sports (or NHS in Guis study) on later earnings. Many of the studies then concluded that athletic participation in high school just acts as a signal of underlying individual traits that make a candidate more productive and therefore more appealing for a job. Some of these traits may include being more driven, being a stronger leader, having better social ability, or being overall more efficient. The only studies to find any significant relationship between involvement and earnings after adjusting for endogeneity was (Guis, 2001) and (Long and Caudill, 1991).

This analysis will not focus on athletic program or honorary participation but will instead focus on the impact of participation of other another ECA that has not been researched to this capacity: participation in music programs like orchestra, drama, and choir. It is known from past literature that there is a correlation between music education and various cognitive abilities. Those involved in music early in life were found to score better on math and history tests, better spatial-temporal ability, better memory, and higher growing IQs (Hallam, 2010), but other possible empirical benefits have largely gone untested, and that will be the aim of this analysis.

III. Theoretical Model

This study will be based on the Becker Model of Human Capital but will also include music education as an additional factor on productivity. Below is a flow chart representation of the relationship between earnings and the various factors that can affect earnings based on the human capital theory.

Figure 1



This flow chart shows the various factors that can impact the earnings of an individual. The relationships are represented using arrows. The block human capital represents the work and school experience that is explained in Becker's theory of human capital. In addition to these factors, socioeconomic factors like race and gender are included as previous economic research has found that these also impact earnings. White individuals typically earn more than minorities, and men typically earn more than women. Ability is also included separately than the other human capital factors as it is our main variable in question that may be subject to unobserved heterogeneity with the music participation variable. Music education has been found to be related to ability in past research, so it is important to

acknowledge in this model that there is a relationship, identified with the arrow. If the ability variable is not included, this could cause the impact of the music program involvement to be overstated due to the omitted variable bias, anoher econometric problem, since ability also impacts earnings. The music education arrow has a question mark above it, because it is unknown what effect it has on earnings after adjusting for unobserved heterogeneity. From this flow chart, the theoretical model can be written as a function. Earnings is a function of human capital building through education, human capital building through work experience, ability, socioeconomic factors, and finally, music participation.

Three hypotheses, based on what is known about music program benefits and how human capital accumulation affects employability and wages, will be tested based on this model. The first will ask if there is any impact, and the second two will look at which theory, if any, explains the impact. The three different hypotheses will be:

- There will be a significant difference in wages between those who participated in music and those who did not
- If music involvement acts as a signal:
    - Without ability, music variable should be positive and significant. With ability, music variable should become insignificant
- If music involvement supports human capital:
    - The dummy variable for Students who participated in musical programs will be positive and significantly related to hourly wage, after ability proxy is included

IV. Methodology

First, it is important to see if there is any difference in wage between those who in music and those who were not. This can be find by performing t-tests, constrained by those with music experience and those without.

Then, in order to find the empirical effect of participation in music programs, an initial OLS model will be used to find the base relationships that the further estimators can be built upon. This empirical model will be based upon on the Mincer model of earnings, as mentioned in the literature review. The original Mincer empirical model is listed here:

$$ln\ W = \alpha + rS + \beta_1 E + \beta_2 E^2 + \varepsilon$$

Where a = intercept, s = years of schooling and e = years of experience in the workforce. Commonly, the Mincer Equation is expanded on to include socioeconomic factors such as race, gender, and industry of employment. This analysis will build on that model to include each of these variables as well as the music involvement variable. This model will not include the ability proxy, in order to see the effect of ability on the music variable. This will show if there are any signaling effects or not. The initial OLS regression, Model 1, will look thus:

Model 1. $Log(WAGE)_i = \beta_0 + \beta_1 EDUC_i + \beta_2 EXP_i + \beta_3 EXP2_i + \boldsymbol{\beta_4 MUSIC}_i + \beta_5 MALE_i + \beta_6 LATINO_i + \beta_7 BLACK_i + \beta_8 FINANCE_i + \beta_9 ESERVICE_i + \beta_{10} BSERVICE_i + \beta_{11} AGRIC_i + \beta_{12} MINING_i + \beta_{13} ADMIN_i + \beta_{14} SERVICE_i + \beta_{15} MANUF + \beta_{16} TRANSPORT + error\ term_i$

A second OLS regression, Model 2, will be ran, but this time will include the proxy for ability. Adding this variable into the model will reduce possible omitted variable bias and allow us to estimate a more accurate impact of music participation. The second model will look thus:

Model 2. $Log(WAGE)_i = \beta_0 + \beta_1 EDUC_i + \beta_2 EXP_i + \beta_3 EXP2_i + \boldsymbol{\beta_4 MUSIC}_i + \beta_5 MALE_i + \beta_6 LATINO_i + \beta_7 BLACK_i + \beta_8 FINANCE_i + \beta_9 ESERVICE_i + \beta_{10} BSERVICE_i + \beta_{11} AGRIC_i + \beta_{12} MINING_i + \beta_{13} ADMIN_i + \beta_{14} SERVICE_i + \beta_{15} MANUF + \beta_{16} TRANSPORT + \beta_{17} ABILITY + error\ term_i$

If the music variable is found to be significantly related to wages before ability was included, and then after the inclusion of ability is included, the variable is still found to be significant, then it can be argued that the music participation is benefitting students in a way separate from their cognitive ability,

educational experience and work experience like for example, developing stronger soft skills which cannot be directly observed. However, if after ability is included and the music variable becomes insignificantly related to the log of wages, then it can be argued that the participation of music is just signaling that those who were involved had higher ability to begin with and would have gotten higher wages regardless of participation. If there is no significant relationship before and after ability, then there will be no evidence of Signaling theory or human capital theory present.

Two other variations of the OLS model will be ran. The variables used will be identical, but the first model, Model 3, will be ran only on those respondents who were not involved in music. The second model, Model 4, will only be ran on those who were involved with music. Model 3 is listed below.

Model 3, where music = 0. $Log(WAGE)_i = \beta_0 + \beta_1 EDUC_i + \beta_2 EXP_i + \beta_3 EXP2_i + \beta_4 MALE_i + \beta_5 LATINO_i + \beta_6 BLACK_i + \beta_7 FINANCE_i + \beta_8 ESERVICE_i + \beta_9 BSERVICE_i + \beta_{10} AGRIC_i + \beta_{11} MINING_i + \beta_{12} ADMIN_i + \beta_{13} SERVICE_i + \beta_{14} MANUF + \beta_{15} TRANSPORT + \beta_{16} ABILITY + error\ term_i$

And model 4 is as follows:

Model 4, where music = 1. $Log(WAGE)_i = \beta_0 + \beta_1 EDUC_i + \beta_2 EXP_i + \beta_3 EXP2_i + \beta_4 MALE_i + \beta_5 LATINO_i + \beta_6 BLACK_i + \beta_7 FINANCE_i + \beta_8 ESERVICE_i + \beta_9 BSERVICE_i + \beta_{10} AGRIC_i + \beta_{11} MINING_i + \beta_{12} ADMIN_i + \beta_{13} SERVICE_i + \beta_{14} MANUF + \beta_{15} TRANSPORT + \beta_{16} ABILITY + error\ term_i$

These OLS models will be performed to analyze how the coefficients change for the music and non-music individuals. If there is no effect found, an Oaxaca Decomposition will be used to determine where the wage differential is originating from. This will be built from Model 3 and 4 above, as well as the original descriptive statistic results. Xnm is the mean value for those without music experience, Xm is the mean value for those with music experience. Bnm is the coefficient estimate for those without music experience, while Bm is the beta estimate for the musical counterparts. Am is the intercept for music, and Anm is the non-music intercept. The formula will be set up as such:

$$Change\ in\ wage = Bm*(Xm-Xnm) + ((Am - Anm) + Xnm*(Bm - Bnm))$$

Where the first half is the change in wage explained by the difference in skills and abilities for music and non-music respondents, and the second half is the change in wage explained by some residual, typically a discrimination factor.

V. Data

The dataset being used for this analysis will be from the 1979 National Longitudinal Survey of Youth from 1979. The survey was first conducted in 1979 to thousands of high school students, and continues to be followed up every two years, allowing economists and other researchers to look at long term outcomes of various students. In order to see long term effects of music participation, this analysis will gather the control questions from 1979, but long-term data on education, employment, and earnings from 15 years after the original survey, from the 1994 follow up. Questions asked involved educational ability like test scores and grades, demographic information, school information, income, employment history, etc. Some of the data from the survey is numeric, while others are listed variables. Below is a full list of the variables that will be used in the analysis from the 1979 NLSY and any additional variables created for the analysis.

New Variable Name	Variable Description	Year Retrieved
ABILITY	**Percentile of AFQT SCORE**	**1980**
EDUC	**Highest grade completed as of 1994**	**1994**
EXP	**Total number of hours worked every year from 1979 to 1994, if respondent was not enrolled**	**Sum of 1979-1994**
MUSIC	**Participated in Music Programs dummy variable**	**1984**
BLACK	**Respondents were Black dummy variable**	**1979**
MALE	**Respondents were Male dummy variable**	**1979**
WAGE	**Hourly Wage achieved in 1993** ***restrained to above $4.25 and below $100***	**1994**
LATINO	**Respondents were Latino**	**1979**
AGRIC	**Respondents work in agriculture**	**1994**
MINING	**Respondents work in mining industry**	**1994**
FINANCE	**Respondents work in finance/insurance/RE**	**1994**

	industry	
BSERVICE	**Respondents work in business/repair services industry**	**1994**
ESERVICE	**Respondents work in entertainment/recreation services industry**	**1994**
ADMIN	**Respondents work in public administration industry**	**1994**
PSERVICE	**Respondents work in professional/related service industry**	**1994**
TRANSPORT	**Respondents work in transportation and public utilities industry**	**1994**
MANUF	**Respondents work in manufacturing industry**	**1994**
EXP2	**EXP variable squared**	**-**
LNWAGE	**Natural log of the WAGE variable**	**-**

For the OLS model, the first step is to remove all participants who did not attend high school, as these would not be relevant in the analysis. The dependent variable will be the hourly wage, which can be calculated using the NLSY data by dividing total income earned by total hours worked that year. The wage variable will also be restricted to any values above $4.25 an hour, the federal minimum wage in 1994, and below $75 per hour, which anything above is considered an outlier. The variables for participant race and gender will be included and will be converted into dummy variables MALE, BLACK, and LATINO. Those who are white would be counted in the intercept value as they would be the control. The proxy for ability will be measured by the percentile the participants scored into on the AFQT exam that all participants were required to take. Educational attainment (EDUC) will be measured using number of the years of schooling completed by 1994. Work experience will be measured by the taking the total number of hours worked for each year from 1979 to 1993 and summing them all up. This total is then divided by 2200, the average hours worked in a year for a full-time employee, to get the experience into years. Per Becker's theory, work experience only should be considered after human capital accumulation through education has ended. To account for this, if the respondent was considered enrolled in any kind of education at the time, the experience variable was coded to be zero. Finally, the variable in question, MUSIC, will be a dummy variable created from the original variable that identified whether a respondent participated in a performing art in high school, listed as band, drama club, or choir.

VI. Initial Statistics and Results

Table 1

Descriptive Statistics – Means				
	Those who were not involved in music programs	Those who were involved in music programs	Difference	T-Test Value of Difference
Log of wage	**2.4090**	**2.4919**	**0.0829**	**-4.56****
Hourly wage in 1994, on average	$12.66	$13.86	$1.20	-4.43**
Educational attainment on average	13.28 years	14.50 years	1.21 years	-14.73**
Percentile of score on AFQT exam on average	42.55	54.26	11.71	-11.53**
Work Experience as of 1994, on average	10.69 years	10.30 years	-0.39 years	3.23**
Male	0.55	0.39	-0.16	8.73**
Black	0.27	0.26	-0.01	0.68
Latino	0.19	0.11	-0.07	5.64**

* Most of the industry variables did not come back to have significant differences by who was and wasn't involved with music, so they were not included in table 1

The descriptive statistics are shown above in Figure 2, organized by whether a respondent was involved in music programs or if they were not. The most important findings were that there was a significant difference in wages of those with and without music experience. Music respondents made about 8.29% more than the non-music respondents. 4,362 total samples were used in the model. Those with music experience also had a significant advantage with ability and educational attainment but worked fewer total years. In addition, those who did music were mostly women and mostly white. These

results supported the prior literature that those involved with music performed better in school and had higher cognitive ability. T-tests were performed for each of the variables. There was also a strongly significant difference in educational attainment and ability. The next step will be to perform an OLS regression to find if any of the relationships are found to be significant.

Table 2

OLS Regression Results – With and Without Ability Variable					
Without Ability			**With Ability**		
Variable	**Coefficient**	**T-Value**	**Variable**	**Coefficient**	**T-Value**
Intercept	0.774	13.88**	Intercept	0.90	16.09**
MUSIC	**0.01**	**0.53**	***MUSIC***	**-0.00**	**-0.22**
EDUC	0.08	25.79**	*EDUC*	0.06	16.08**
EXP	0.06	8.30**	*EXP*	0.06	8.28**
EXP2	-0.002	-4.63**	*EXP2*	-0.001	-5.06**
ABILITY	-	-	*ABILITY*	0.004	11.45**
MALE	0.14	10.03**	*MALE*	0.14	10.30**
LATINO	-0.01	-0.77	*LATINO*	0.04	2.31*
BLACK	-0.12	-7.69**	*BLACK*	-0.02	-1.56
ESERVICE	-0.13	-1.56	*ESERVICE*	-0.12	-1.52
BSERVICE	0.05	1.96*	*BSERVICE*	-0.05	1.82
AGRIC	-0.20	-3.89**	*AGRIC*	-0.18	-3.46**
MINING	-0.07	-0.71	*MINING*	-0.04	-0.40
ADMIN	0.14	4.95**	*ADMIN*	0.13	4.68**
PSERVICE	0.01	0.39	*PSERVICE*	0.01	0.69
FINANCE	0.14	5.03**	*FINANCE*	0.13	4.85**
MANUF	0.10	5.42**	*MANUF*	0.10	5.49**
TRANSPORT	0.21	8.11**	*TRANSPORT*	0.20	7.90**
R^2	0.2606		R^2	0.2823	
F-Value	97.18		F-Value	101.90	
N	4362		N	4362	

*,** = statistically significant at 95%, 99%

The results of the initial OLS without the Ability proxy showed a model with an R^2 of 0.26. The only variables in the OLS to not be found to be statistically significant with at least 95% confidence at the regression were mining, latino, pservice, eservice, and the music dummy variable. Some results support past economic research and intuition, like that work experience and educational attainment, along with gender and race, are significant to determining hourly wage. The results showed that males made more than females, black individuals made less than whites. Some industries, like financial, were positively related to wages, while others like agriculture and eservice, were negatively related. It would be expected that music would be significant at least without ability included, but the variable for music involvement

was insignificant with a t-value of only 0.49. Based on this regression, participation in music programs in high school appears to have no effect on labor market outcomes in later life.

The second OLS model includes the Ability variable and sees a change in the variables that are statistically significant at 95%, as well as an increase in the estimating power of the model with a r-squared of 0.28. The coefficients generated for educational attainment, work experience, gender, and ability are consistent with past literature in terms of sign and statistical significance but are lower than would be expected. The OLS shows a return on education at about 6%, which is on the lower than the typical spectrum commonly determined in Mincer Models. Males are shown to have an 14% greater wage than females. Blacks make about 2% less than whites while Latinos make about 4% more. Both work experience and the squared version variables are highly significant. An additional year of work experience increases wage by 6%. The music involvement variable becomes more insignificant in this model, showing no evidence of human capital theory or signaling theory.

The OLS regression showed no significant effect from music involvement on earnings, despite the statistically significant difference on wage of 8.29%. To explore what could be causing this difference, we ran two more regressions, Model 3 and Model 4.

Table 3

OLS Regression Results – Constrained by Music =0,1					
Model 3, Music = 0			**Model 4, Music = 1**		
Variable	**Coefficient**	**T-Value**	**Variable**	**Coefficient**	**T-Value**
Intercept	0.948	15.02**	Intercept	0.729	5.61**
EDUC	0.058	13.54**	*EDUC*	0.064	8.73**
EXP	0.059	7.49**	*EXP*	0.064	3.37**
EXP2	-0.001	-4.70**	*EXP2*	-0.002	-1.84*
ABILITY	0.004	9.84**	*ABILITY*	0.004	5.80**
MALE	0.136	8.55**	*MALE*	0.167	5.62**
LATINO	0.032	1.55	*LATINO*	0.088	1.90
BLACK	-0.041	-2.08**	*BLACK*	0.022	0.56
ESERVICE	-0.112	-1.22	*ESERVICE*	-0.158	-0.89
BSERVICE	0.0244	0.76	*BSERVICE*	0.134	2.38*
AGRIC	-0.181	-3.29**	*AGRIC*	-0.159	-1.03
MINING	-0.080	-0.70	*MINING*	0.134	0.61
ADMIN	0.133	4.06**	*ADMIN*	0.153	2.64*

PSERVICE	0.015	0.67	*PSERVICE*	0.017	0.41
FINANCE	0.119	3.70**	*FINANCE*	0.175	3.15**
MANUF	0.105	4.78**	*MANUF*	0.118	2.45*
TRANSPORT	0.206	7.03**	*TRANSPORT*	0.210	3.71**
R^2	0.2752		R^2	0.2881	
F-Value	81.32		F-Value	25.68	
N	3386		N	977	

The results show that there were no significant changes in the coefficients between music and non-music respondents. This can rule out that musical attainment is having a large impact on any specific coefficient. To test for possible multicollinearity between ability, education, and musical participation, a Correlation table was performed as well, with results shown in Table 4.

Table 4 – Correlation Results

	MUSIC	EDUCATIONAL ATTAINMENT	ABILITY
MUSIC	1.00	0.226 (<.0001)	0.174 (<.0001)

Top value represents correlation, () represents p-value

In the correlation test, the music variable was performed in relation to the main variables in the Mincer Equation: work experience, schooling experience, and the proxy for cognitive ability. The results of the proc correlation show that although some intuitions about music education and its correlations with ability and educational attainment are correct, the correlations are relatively small and show no major evidence for multicollinearity.

The results of the Oaxaca Decomposition Model are presented in Table 5 (next page).

Table 5 – Oaxaca Decomposition Method

Variable	Xnm	Xm	Bnm	Bm	Bm*(Xm-Xnm)	Xnm(Bm -Bnm)
INTERCEPT			0.94854	0.72937		-0.21917
EDUC	13.28323	14.50051	0.0578	0.06439	0.0784	0.08754
EXP	10.69172	10.30062	0.05866	0.06374	-0.0249	0.05431
EXP2	126.85381	116.79931	-0.00167	-0.00166	0.0167	0.00127
ABILITY	42.55139	54.26203	0.00363	0.00388	0.0454	0.01064
MALE	0.54962	0.39406	0.13623	0.1665	-0.0259	0.01664
BLACK	0.27082	0.25998	-0.04171	0.02152	-0.0002	0.01712
LATINO	0.18576	0.11668	0.03199	0.08787	-0.0061	0.01038
FINANCE	0.06468	0.087	0.1189	0.17522	0.0039	0.00364
ESERVICE	0.0065	0.00614	-0.11182	-0.15795	0.0001	-0.00030
BSERVICE	0.06852	0.08291	0.02357	0.13418	0.0019	0.00758
AGRIC	0.0189	0.00819	-0.18069	-0.15977	0.0017	0.00040
MINING	0.00413	0.00409	-0.08013	0.13365	0.0000	0.00088
ADMIN	0.06172	0.07779	0.13337	0.15282	0.0025	0.00120
PSERVICE	0.19787	0.29478	0.01506	0.01671	0.0016	0.00033
MANUF	0.20053	0.12999	0.10496	0.11801	-0.0083	0.00262
TRANSPORT	0.07856	0.08291	0.20683	0.21012	0.0009	0.00026
		Difference due to Characteristics			0.0876	
		Difference due to treatment			-0.00467	
		Total Difference in Wage (%)			0.08298	

The results of the Oaxaca Decomposition Method show that as predicted in the t-test, there should be a difference in wage by about 8.3%. The Oaxaca Decomposition also shows that based on the characteristics of those involved in music alone, they should make 8.76% more than their non-music counterparts. The differences in educational attainment was leading to an 7.84% increase in wage while the differences in ability increased wage by 4.54%. These variables very large shares of this wage differential, meaning the difference in wage is largely due to these characteristics. There was a small penalty present for those involved in music which reduced wages by about 1%. This penalty is

considered “treatment differences” and is largely influenced by the fact that there is a large difference in the intercept value.

VII. Conclusion

In conclusion, there is a difference in labor market outcomes for those involved in music programs in high school. Musical respondents received about an 8.3% higher wage than those who were not involved. These results are shown by the mean t-tests and the Decomposition Method performed. In addition, the descriptive statistics showed that those who participated in music programs worked less hours overall but had higher ability and stayed in school longer. All these differences were found to be statistically significant using the t-test, with educational attainment and ability having strong significant differences. The data also showed women were more likely to be involved in music than men, and whites much more likely to be involved than minorities.

The initial two OLS regressions were performed to examine if there was any evidence of the signaling theory with musical involvement and ability. The music variable, even without ability proxy included, was found to be insignificantly related to wages. With this, we can look back at our original testable hypotheses.

- There will be a significant difference in wages between those who participated in music and those who did not
- If music involvement acts as a signal:
    - Without ability, music variable should be positive and significant. With ability, music variable should become insignificant
- If music involvement supports human capital:

- The dummy variable for Students who participated in musical programs will be positive and significantly related to hourly wage, after ability proxy is included

The results of our descriptive statistics and Decomposition show that there is a significant difference in wages for those who were involved in music. This null hypothesis can be rejected as this was found the be true. However, we fail to reject the second and third hypotheses due to our findings when running the OLS models with and without ability. According to both the Model 1 and Model 2 regressions, the music participation variable was not significant at any confidence level. There was no evidence of signaling theory, as there was no significance to begin with. We fail to reject the third null hypothesis as no definitive conclusions can be made if the music variable is insignificant. There was no significant correlation between music involvement and the ability and educational attainment variables. Model 3 and Model 4 OLS were ran to perform a Fully Interactive Model in order to see if music involvement had a major impact on any specific variables. The results of the model showed that the coefficients for educational attainment and ability increased for those involved with music, but the changes were largely insignificant. Lastly, the Oaxaca Decomposition Model found that the difference in ability and educational attainment, along with other features like the industry associated with the music respondents, were largely influencing the wage gap.

This study has some major limitations that would need to be addressed in future research. One limitation was the data available in the NLSY79, which did not contain a standalone work experience variable, and used negative values to denote those who skipped or didn't answer. Another limitation is that there is not a proper instrumental variable to conduct a more robust analysis like a Two Stage Least Squares test to address the possible unobserved heterogeneity mentioned prior. As shown in the literature review, simple OLS Regressions do not suffice to find the impact of participation of an extracurricular activity on earnings accurately. In the past literature based on athletics participation, a Two Stage Least Squares test would be performed to create a reduced model that could be estimated without any chance of unobserved heterogeneity. The instrumental variable for athletic participation was typically created using variables like number of students in the school, number of peers in athletics, and number of sports

offered. There are not similar variables like this that exist in the NLSY for music participation. Due to a lack of instrumental variables, it would be difficult to conduct such a test. Another future point of research could be to look at earlier ages and how music participation before high school effected wages. It could be that those who participated in high school already gained the benefits in social and cognitive ability at a younger age.

Involvement in music programs undoubtably benefits students in many ways. It builds social ability, leadership and teamwork experience, provides friendship and a sense of belonging. It increases cognitive ability and academic success. The results of this analysis concurred with these results and found that those who were involved in music also went to school longer, possessed more raw ability, and made about 8.29% more than those who did not. However, the initial regressions found that music involvement had no significant impact on wages. There is no evidence of Signaling Theory or Human Capital theory with musical involvement. The wage differential is being driven by the fact that those who participated in music possessed more favorable labor market characteristics like acquiring more education, having higher ability and pursuing more higher paying industries. It is not clear without a stronger estimator like a 2SLS or better data to determine if these skills were increased from music involvement or were already present in those who participated in music to begin with.

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