Analyzing the Affect of Post-Secondary Education on Income and Workforce Participation

for Individuals with Autism or Learning Disabilities

By: Ty Tillett (BA/SPA) University Honors in Political Science, Spring 2012

Advisors: Dr. Alison Jacknowitz (SPA, DPAP) & Dr. Kimberly Cowell-Meyers (SPA, GOVT)

Abstract

This research investigates the influence of educational attainment on income and workforce participation for individuals with Autism Spectrum Disorders (ASD) and learning disabilities (LD) compared to individuals without either of these conditions. Although current literature provides an insight into the positive effects of education on a number of variables including personal well being and income, there is a dearth of information highlighting the relationship among individuals with these specific disorders and their eventual outcomes. This study hypothesizes that there is a strong positive correlation between education and income for ASD, LD, and individuals without a disorder, and that the income and work outcome gap between the three groups shrinks as educational attainment grows. The data being analyzed is from the National Health Interview Survey 2007, which includes questions relating to Autism that are not asked in more recent forms of the survey. The results of this study have demonstrated support for the similar affects of education on individuals with ASD, LD, and those without these conditions, as well as a significant decrease in the income and work outcomes gap, which encourages further incentives and initiatives for individuals with ASD and LD to obtain a postsecondary degree.

Introduction

Information released by the United States Census Bureau and the Economics and Statistics Administration indicates that there is a "clear and well-defined relationship between education and earnings...even after considering a collection of other personal and geographic characteristics" (Julian and Kominski 2011, 13). In the past, students with disabilities were often segregated from the general population within the primary and secondary school setting and thus not afforded this educational opportunity, and its translation into a higher income, available to students without special needs. Despite the passage of the Individuals with Disabilities Education Act of 2004 (IDEA), which opened many doors for students with disabilities and enabled equal access to education, little emphasis is placed on higher education for students with specific conditions such as Autism Spectrum Disorders (ASD) and learning disabilities (LD). While the general population may view high school as a throughway to the ultimate goal of post-secondary education, students with ASD and LD are left with the bare minimum that IDEA established as mandated. As was the case before IDEA was passed, students with special needs, including ASD and LD, no matter their personal skill level are held back by the weight of their designation as a special needs student. Zafft, Hart, and Zimbrich note that involvement in postsecondary education "holds the promise of breaking the pattern of low expectations for students with significant disabilities" (Zafft 2004, 51). While the emphasis by many researchers has been on the actual attainment of higher education, a lack of literature exists on the eventual outcomes of education for students with disabilities in comparison to that of the general population. The overall impact of these combined issues results in a lower chance of post-secondary educational attainment by individuals with ASD and LD with a loss in possible wages associated with the unattained education. This issue is not simply going away. One in 88 children born today will be

diagnosed with an Autism Spectrum Disorder (CDC 2012, 1). Additionally, 7.66% of children have a learning disability with a 17.1% increase in developmental disabilities in the past 12 years (Boyle et al., 2011, 1036). If systemic issues such as education are not addressed now, a much larger portion of the population who has either ASD or LD will be at risk of low wages, unemployment or underemployment, and dependency on federal and state programs, which could otherwise be avoided if addressed early.

This study addresses two primary research questions. Are individuals with a LD or ASD significantly more likely to participate in the workforce versus non-autistic, non-learning disabled individuals as educational attainment increases? Additionally, do individuals with a LD or ASD see a significant increase over non-autistic, non-learning disabled individuals in income as educational attainment increases?

Hypothesis

This study predicts that education and income and work outcomes have a strong positive relationship regardless of an individual's disability status. In addition, I hypothesize that the gap in income and workforce participation between non-autistic, non-LD (NANLD) and those with autism or LD decreases with higher levels of education. The null hypothesis is that education has no influence on income and that there is no work outcome gap between levels of educational attainment when comparing the NANLD group to either the Autistic or LD. The alternative hypothesis is that the influence that education has on income and work outcomes is positive and that the income and work outcome gap between NANLD and those with Autism or LD decreases with each additional level of educational attainment.

The Background

Education has become a mainstay of life for all Americans, so much so that the difference between varying educational levels in terms of income can literally stretch into millions of dollars (Julian and Kominski 2011, 13). No matter the physical or mental capacity, the United States has guaranteed the opportunity for all individuals to acquire an adequate education through the secondary level. The Individuals with Disabilities Education Act (IDEA) of 1990, its reauthorization in 1997, and the subsequent reauthorization in 2004 that incorporated IDEA into the No Child Left Behind Act (NCLB), sought to grant equal access to education and provide safeguards and special education services to students with disabilities. The implementation of IDEA has created new possibilities for all students with disabilities. The successful implementation of the Americans with Disabilities Act in 1990 followed by IDEA provided the groundwork to develop societal changes that have encouraged increased participation in postsecondary education (PSE) by students with ASD (Stodden and Mruzek 2010). Rather than in the past where individuals with developmental disabilities were taught in institutions rather than in the school setting, provisions of IDEA encourage the co-mingling of students with and without disabilities as well as enabling a pathway to post-secondary education for students with disabilities. Despite these accomplishments, a number of issues involving individuals with ASD are still prevalent in society.

Barriers

Structural and societal barriers still exist within the system. Rojewski found that between 25-35% of boys in 8th and 10th grade with a learning disability seek to attain an occupation with high-prestige while between 50-60% of boys without a learning disability in the same categories

aspire to a high-prestige position (Rojewski 1996, 110). This indicates a decreased emphasis on the scope of individual potential in favor of limiting options to more "realistic" occupations, either done by the students, the parents, or teachers. Additionally, the idea that individuals with learning, cognitive, or intellectual disabilities "do not belong in college" among other attitudinal reservations, have been cited as a major barrier within the system (Hart et al. 2004). While these findings should be considered in any initiative brought forth to combat the inequality, it should be noted that Hart et al. (2004) found that a third of respondents indicated funding to be another barrier to postsecondary education for individuals with developmental disabilities like ASD. With the constriction of both federal and state budgets due to shortfalls, supplementary programs are often cut first in an attempt to save money. Experimental programs like those that seek to place special needs students on college campuses are often among the first programs cut in favor of well-established programs with a long track record of success.

Lagging Behind

Students with disabilities lag behind those without disabilities in terms of PSE attendance. 78% of the general population of high school graduates attends a PSE program within five years versus 37% of students with disabilities (Blackorby and Wagner 1996, 408). Programs have been created to mitigate pressures of adjustment to PSE for students with disabilities including dual-enrollment, which allows students to take classes at PSE institutions while completing their high school education (Hart et al. 2004), mandatory transition planning requirements for high school students (Stodden and Mruzek 2010), and postsecondary support services like tutors and accommodations above and beyond the minimums directed by law (Mull, Sitlington, and Alper 2001). The need for these types of programs has continued to increase, with

ASD identification prevalence increasing on average 57% in a sample group of 10 states in a study done by the Centers for Disease Control and Prevention between 2002 and 2006 with a national average of 1 in 110 children in the US being diagnosed with an ASD (Rice December 18, 2009). During the same four year period, vocational rehabilitation (VR) services saw an increase of 121.4% of individuals with ASD, despite seeing an overall decrease in VR services by 4.1% (Cimera and Cowan 2009). As the prevalence of ASD continues to rise and the gap between students with disabilities partaking in PSE continues to exist at such a significant level, accommodations will be needed for these individuals and incentives should be developed for attaining PSE acceptance.

Economic Impact

In the United States, People with ASD work fewer hours for significantly lower wages (Cimera and Cowan 2009, 285) and have a "lifetime per capita incremental cost of \$3.2 million" (Ganz 2007, 343). With such a small percentage of the ASD community attaining PSE, it is difficult for them to obtain higher paying jobs to recoup these losses. This is a result of a system that delegates individuals with learning disabilities (LD) and ASD to entry-level positions because of a lack of training or only the foundation of PSE from vocational or technical schools (Adelman and Vogel 1993).

A strong positive correlation has been shown over the years between PSE and employment outcomes, including income. While the literature is still emerging on the subject and it has not had conclusive evidence, some studies have shown a positive relationship between PSE and employment outcomes for individuals with intellectual disabilities (ID) and ASD (Migliore 2009, 1). Migliore also found in his study that individuals with ID were "26% more

likely to exit [a vocational rehabilitation] program with employment and they earned a 73% higher weekly income" than those without ID (Migliore 2009, 1). These studies point to an association between an increase in economic resources for the ASD community, which is currently plagued with massive unemployment and an overall large cost to society and PSE (Cimera and Cowan 2009; Ganz 2007; Knapp, Romeo, and Beecham 2009).

Weaknesses in Existing Literature

The weakness of the existing literature on PSE and students with ASD is simply the dearth of current information (Hart, Grigal, and Weir 2010). If the prevalence of ASDs continues to rise at the rate mentioned previously in this article, it is expected that quantitative and qualitative studies will begin to emerge at a greater rate. A wealth of studies have been done on the impact of PSE on students with a disability in general or some sort of LD, which is a broad subset within the disability community (Blackorby and Wagner 1996; Hart et al. 2004; Madaus 2006; Migliore 2009; Mull, Sitlington, and Alper 2001; Rojewski 1996; Stodden and Mruzek 2010). This expansive look does not take into account disparities between disabilities that exist such as the difference between someone with a high functioning ASD and someone who is designated as completely and totally disabled. Additionally, there is a large set of literature on the economic impact of ASDs and the employment, wages, and overall income of people diagnosed with an ASD (Cimera and Cowan 2009; Ganz 2007; Knapp, Romeo, and Beecham 2009; Mawhood and Howlin 1999; Montes and Halterman 2008). While many of these pieces cite the impact of ASDs on overall income, the emphasis of current literature in terms of PSE and future employment focuses primarily on the mandatory compliance by PSE institutions with laws requiring accommodations (Hart, Grigal, and Weir 2010; Hart et al. 2004; Neubert 2004;

Stodden and Mruzek 2010; Zafft 2004) rather than the influence of the education on future earnings.

Policy Examples

A number of federal programs currently exist for all individuals with a low income in terms of education. Low-income individuals are provided with Pell Grants worth up to \$5500 per year and federal subsidized and unsubsidized loans that far exceed that amount to enable these individuals to attend PSE institutions that they otherwise would not be able to. There are also federal grant programs that provide financial assistance to students who plan on becoming teachers in low-income areas, and to students whose parents died as a result of military service in Iraq or Afghanistan, both of which do not take financial resources into consideration (US Department of Education 2011). These are all examples of federal programs that provide assistance to low-income individuals within the educational sphere that can be used as models of incentivizing higher education for individuals with disabilities if a disparity exists.

There are also a number of federal programs directed at individuals with disabilities. Supplemental Security Income provides on average \$516.60 a month to individuals who are considered to be either blind or disabled who meet additional income and disability requirements (U.S. Social Security Administration 2011). Medicare, in addition to providing health insurance to individuals 65 years old or older, offers health insurance to younger individuals with a disability who meet certain criteria. These federally backed programs are provided to close a gap that is seen between the disability community and the general population and can once again be used as models of delivery of service to individuals with specific disabilities such as ASD.

State funded initiatives, such as Pennsylvania's Adult Autism Waiver, have also been undertaken to bring individuals with ASD into the general community to increase their ability to care for themselves, reach employment goals, and increase the quality-of-life for the person with ASD and their families (Pennyslvania Bureau of Autism Services 2011). While a federally backed program would set a national standard and make adjustments to this national issue, a state initiative like the Pennsylvania Adult Autism Waiver may be able to deliver possible solutions (e.g. money, support, services) in a more efficient way.

It should be noted that there are currently no federal grants exclusively for students with disabilities to attend an institution of higher learning. The rise in the rate of individuals with ASDs, coupled with the growing necessity of PSE in society dictates that without an increase in federal awareness, recognition, and funding for PSE opportunities for people with ASDs, the income gap between individuals with ASDs and the general population will continue to rise.

Source of Data

My study focused on cross-sectional data from the 2007 National Health Interview Survey (NHIS), conducted by the National Center for Health Statistics, a division of the Centers for Disease Control and Prevention of the Department of Health and Human Services. The National Health Survey Act of 1956 established the NHIS, with the inaugural survey beginning in July 1957. The Act launched a continuing survey that is conducted on a yearly basis and updated every 10-15 years, that is meant to ascertain statistical information on the prevalence and effects of illness and disability in the US and their economic impacts on the country. Additionally, supplements play an important role in the survey to test new questions or areas of potential growth of the survey. These supplements are developed on a yearly basis and are only

addressed when asking questions to specific sub-samples within the overall survey. The supplements obtain information on specific issues, diseases, or illnesses that are not currently part of the NHIS survey but may become part of the general survey when the next overhaul is undertaken.

The NHIS population consists of non-institutionalized and non-military individuals who currently reside in the United States. The excluded population includes those in nursing homes, correctional institutions, mental institutions, and individuals who are in the military. Of note, the excluded population does include individuals who are labeled as disabled or mentally retarded that reside at long-term care facilities. The lack of inclusion of these types of facilities could possibly lower the number of observations of disabled or those individuals suffering from a more severe form of an ASD.

The survey is conducted as an in person interview with an adult of the household who is knowledgeable of the family's information (adult established as 18 years of age or older). The 2007 study had a household response rate of 87.1% and consisted of 29,266 households, which returned 75,764 persons in 29,915 families, which were weighted based on the 2000 census population estimates (National Center for Health 2009). A household could have consisted of more than one family living in the residence, and was accounted for under the Family level which was provided with the survey. The Person level was derived by asking questions about each individual living in the house hold which accounted for the overall sample size. Within that group, selected individuals were chosen to answer questions related to the Sample Adult level or Sample Child level. For this study, the primary levels of interest were the Person level and the Sample Adult level. For the Sample Adult level, 23,393 adults were interviewed for the 2007 survey. The response rate for the Sample Adult component was 67.8%. The data from the

Sample Adult level was merged with the Person level, which asked more general questions related to each person in a family living in a household that were of interest in this study. Sample sizes for dependent variables ranged based on missing data. For example, there were 12,014 income responses for the Sample Adult level, 8,877 for the work variable, and 21,477 for the hourly pay variable. These missing data points could be the result of a respondent refusing to answer, no answer being ascertained, or simply the interview failing to ask the question.

The NHIS survey takes roughly one hour to complete and is comprised of two parts; the core questions that are asked on a year-to-year basis (roughly 40 minutes long), and the supplemental questions that are generally changed from year-to-year. These supplements are designed to obtain information on subjects that are established as pertinent to national interests and takes roughly 20 minutes of the overall survey. Previous supplements have asked questions pertaining to cancer, complementary and alternative medicine, arthritis, and autism.

Although the 2007 NHIS study is not the most recent, it was chosen because of the supplement questions that were asked during the 2007 survey year. In both the 2008 and 2009 NHIS surveys, the most recent datasets available for analysis, there is a question pertaining to autism for a sample group of children rather than a sample group of adults. Given that this study is interested in observing the effects of education on income for individuals with an ASD versus those without, it is important to analyze strictly adults rather than children who would naturally have a lower income and lower level of education.

Data Analysis

A series of two-sample t-tests were conducted to test the significance of the difference at the 5% significance level between (1) NANLD (non-autistic, non-learning disabled) and autistic,

(2) NANLD and LD individuals and, (3) NANLD versus non-NANLD. I ran three t-tests in order to point out any similarities and differences between being simply learning disabled and being specifically autistic, especially when compared to NANLD. Previous studies such as Cimera & Cowan's (2009) used a similar structure to evaluate individuals without a disability against those with multiple disabilities in terms of vocational rehabilitation and income, but few studies have addressed PSE.

After performing the t-tests, I determined the influence of education on income and work outcomes while holding constant gender, race, martial status, health status, and whether the individual was paid by the hour through the framework of an OLS linear regression. A series of three regressions were conducted to highlight the differences between LD, autism, and NANLD with three different dependent variables concerning income and work outcomes.

Operationalization and Measurement of Concepts

The first dependent variable for this study is income. Income is based on the person level variable of INCOME that is separated into 11 categories ranging from \$1-\$4,999 to \$75,000 and over. To quantify the categorical nature of the INCOME variable associated with the dataset, I generated the variable INCOMESC that took the midpoint of the INCOME categorical values. A detailed breakdown of the midpoint values can be found in Table 1. The final income range of the variable INCOME, "\$75,000 and over," was converted to a conservative value of \$85,000. Although it is reasonable to assume that there are a considerable number of observations where the individual's income is well in excess of \$85,000, this figure represents a careful estimate leading to a weaker relationship between education and income than if the value were closer to the average midpoint range of the other values. This variable is limited in that an individual may

be making a significant amount more than \$85,000, and only a fraction of their income is being evaluated. This could lead to either a larger real gap between groups or a smaller one, which is a distortion of the data. For example, if a large cluster of individuals with a LD made a million dollars per year, the data would of course be faulty. While this is a valid concern, there is no real data suggesting that a significant enough portion of the population identifying as "\$75.000 and over" would be earning enough over \$85,000 to make this study invalid. Although limiting the income variable to values up to \$85,000 is potentially more of a concern for the non-disabled population, the assumption made here is both reasonable and necessary for the purposes of this study. Family income was not considered due to the possible inflation of income because of a spouse, parent, or other family member. This could have skewed the results and does little to highlight individual attainment for people with autism or a learning disability. It is hypothesized that there is a significant pay gap between the means of LD or autism and the NANLD groups. Additionally, it is expected that the when education is accounted for in the regression formulas, the income gap between the groups will decrease with higher levels of educational attainment.

HOURPDA, my second dependent variable, represented a binary response of whether an individual was paid by the hour in their most recent or current job. A one (1) represents an individual paid by the hour and a zero (0) represents an individual that is not paid by the hour. An individual that is paid by the hour can be assumed to be working in a blue-collar position and not on track for promotion into management or the corporate structure. Individuals in a non-salaried position tend to make less money and are generally less educated than individuals in salaried positions. This variable serves as a proxy for work responsibility attainment. It is meant to infer whether an individual is being relegated to more mundane work or is given the ability to advance on into management positions. Although there is an underlying understanding that

hourly paid positions are necessity in society and may not be appropriate to completely eliminate, it is hypothesized that a gap between the LD, autism, and NANLD groups exists when evaluating the means, with LD and autism more likely to be paid by the hour. When education is accounted for in a regression, it is expected that with a higher level of educational attainment, the less likely it will be that an individual will be paid by the hour among all groups and that the gap between the LD or autism groups and the NANLD group will shrink with more education.

EVERWRK indicates a binary response to work status. This dependent variable indicates if a person has ever worked in their life. As was the case with the other binary response variable, one (1) indicates a person that has worked in their life and zero (0) represents a person who has not. This variable is being used to highlight workforce participation among LD and autism while demonstrating any disparities when compared to the NANLD subgroup. It is hypothesized that individuals with LD or autism will be less likely to participate in the workforce than NANLD, but that the gap will decrease when higher levels of education are attained.

The primary independent variable for this study is the level of educational attainment. Given the variable EDUC1 provided by the NHIS 2007 study, I generated a group of categorical variables based on education attained that were mutually exclusive and exhaustive. The observations of "*never attended/kindergarten only*" through "12th grade but no diploma" were assigned to the variable LTHS. High school graduates, those with some college but no degree, and GED recipients made up the variable HIGHSCHOOL. Individuals with an Associates degree fell into the ASSOCIATE variable. Those with a Bachelor's degree were coded as BACH. Finally, those with a Master's, Professional, and/or Doctoral degree were defined as GRADD. These groupings make logical sense in that they each represent major societal milestones in educational attainment and a safe assumption can be made that the relative distinction and increase in income for higher level PSE degrees (i.e., Master's, Professional, Doctoral) is not significant enough to separate further.

The relatively small number of observations associated with the autism variable (AUTISM, n=26) encouraged the inclusion of a variable defined as "Nervous System Condition Status" (NERVCON, n=554), which serves as a proxy for learning disability. The NERVCON variable was derived from the combination of LD variable of the person level and the LD variable of the sample adult level.¹ While I concede that not all individuals who have a LD may identify as having a "nervous system condition," individuals who have a LD, according to definitions from the Interagency Committee on Learning Disabilities and The National Joint Committee on Learning Disabilities, have a nervous system condition (Visser, 2000).² With a functional limitation being the main source of interest in both nervous condition status and LD, NERVCON serves as an appropriate proxy. This variable addresses the primary research focus on highlighting a disparity that impacts a community that does not have a cognitive issue, but purely a functional one. In all situations that either LACHRC23 was defined as "chronic" and/or ALCHRC23 was defined as "chronic", the ultimate distinction for NERVCON was "chronic." If both variables indicated "not chronic," NERVCON was identified as "not chronic." Although a number of variables could have served as a proxy for disability in general, they were excluded because individuals who defined themselves in those categories could be suffering from a temporary disability (e.g., broken leg, pregnancy depending on state, etc.), which would not impact PSE attainment and is expected to have little effect on past or current income.

¹ Both variables were defined as "Persons 18+ years limited due to nervous system condition." Keywords used were: functional limitation; nervous system; and sense organs.

² The Interagency Committee on Learning Disabilities Learning states "learning disabilities is a generic term that refers to...disorders manifested by significant difficulties in acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities, or of social skills. These disorders are intrinsic to the individual and presumed to be **due to central nervous system dysfunction**." The National Joint Committee on Learning Disabilities also states that LD is "…presumed to be **due to central nervous system dysfunction**, and may occur across the life span."

An additional variable that is important to take under consideration is whether the individual lives with a significant other.³ The added assistance of a caretaker in the home environment serves as an emotional and physical support for individuals with a disability. This variable was defined from marital status in which an individual had a significant other or spouse present in the home. If a married couple were separated or did not live in the same household, they were coded as not having "significant others." The physical presence of the other individual was required to be coded as a significant other. To view a further breakdown of how variables were calculated, please see Table 1.

Another important independent variable of interest is SEX. The gender of an individual has long been an issue in income disparity in the United States and I hypothesize that the issue is consistent across disability status. While the affect may not be as large when compared to individuals without either autism or a LD, the issue is believed to continue to be a factor in overall income. This study took into consideration the influence that gender has on an individual's income. Additional consideration was given to the race variable, WHITE, and the dummy variable for health status (positive or negative), HEALTHSTAT, but were limited in usage for regressions involving the autism subset due to sample size limitations.

Findings

Results from Initial Tests of Significance

The t-test statistics illustrated a decrease in income of \$6713.85, a 19% decrease, in average income for an individual with a LD versus an individual without a LD or autism (Table

³ SIGOTHER is defined as living with a significant other. See Table 1.

1).⁴ This translates to <u>individuals with a LD making 81 cents on the dollar in comparison to</u> <u>NANLD</u>. Although not statistically significant at the 5% level, autism also saw an average decrease in income of over 40% or roughly 60 cents on the dollar in comparison to NANLD, a decrease of \$14280.12. These initial findings with respect to income indicated a strong disparity between the general population and the LD and autism observation groups, which necessitated interest in other employment-related dependent variables.

	INCOMESC	Difference from NANLD	Ν	T-Score (p-value)
Mean NANLD*	35391.01		11867	-3.4417
(Standard Deviation)	(24605.8)			(0.0004)
Mean LD	28677.16	-6713.85	138	-3.1316
(Standard Deviation)	(25004.01)			(.0011)
Mean Autism	21110.89	-14280.12	9	1.5425
(Standard Deviation)	(27616.52)			(0.0807)

Table 1: Summary of statistics for income based on LD & Autism status

To determine the type of job at which an individual works, the next dependent variable of interest was HOURPDA, representing if an individual is paid by the hour at their current or most recent job. On par with hypothesized behavior, individuals with autism and LD were on average 18.1% and 12.8% more likely to be paid by the hour than non-autistic, non-LD (NANLD) individuals (Table 2). These preliminary findings point to an inequity of hiring individuals with autism or LD into full-time salaried positions that build a way towards advancement and promotions within the corporate structure. The outcomes highlighted in Table 3 point towards the regulation of autistic and LD individuals to manual labor and blue-collar jobs that are traditionally not as well paid as white-collar positions.

⁴ Calculated by dividing the absolute value of the difference between LD and NANLD by the value of NANLD. The same calculation was used to derive the percentage difference for Autism as well with Autism substituted for LD.

	HOURPDA**	Difference from NANLD	Ν	T-Score (p-value)
Mean HOURPDA	.6049018		20972	3.7276
(Standard Deviation)	(.4888834)			(0.0001)
Mean LD	.6822811	.0773793	491	-3.6290
(Standard Deviation)	(.4660644)			(<0.0002)
Mean Autism	.7142857	.1093839	14	-0.8598
(Standard Deviation)	(.4688072)			(0.2027)

Table 2: Summary of statistics for if paid by the hour in most recent job based on LD & Autism status

With lower pay and fewer opportunities for advancement through the corporate structure, the question of whether individuals with LD or autism entered the job market at all lingered. A 31.8% decrease in workforce participation in the prior year among individuals who were identified as autistic versus NANLD and a surprising 55.5% decrease among LD points to a underrepresented population of LD and autism in the workplace (Table 4). What this also indicates is a large proportion of each disability community is without jobs when it is plausible to believe that not all of these individuals are completely unable to work. While this may have been the case with the year in question, EVERWRK which indicates if an individual has ever worked, presented a rosier picture, with a larger percentage of workforce participation, 87.5% versus 83.1%, among LD over NANLD (Table 3). With that said, a statistically significant smaller portion of the autism community, 33.3%, had ever participated in the workforce.

	EVERWRK**	Difference from NANLD	Ν	T-Score (p-value)
Mean EVERWRK (Standard Deviation)	.8307255		8436	1.3757 (0.0848)
Mean LD (Standard Deviation)	.8747045 (.3314457)	.043979	423	2.7030 (0.0036)
Mean Autism (Standard Deviation)	.3333333 (.4850713)	4973922	18	4.3686 (<0.0002)

Table 3: Summary of statistics for if an individual has ever worked for pay based on LD & Autism status

Multivariate Regression Results

A multivariate approach was used to more appropriately measure the strength of the relationship between education and employment outcomes by LD and autism status. While controlling for education level, gender, race, marital status, health status, and whether the individual was paid by the hour, the findings showed a strong positive correlation between education level and income, with statistically significant figures coming from Bachelor's and graduate level degrees. For both LD and NANLD, more education equaled, on average, higher pay. While LD pay lagged behind NANLD with a high school diploma, Associates degree, and Bachelor's degree, a 44.1% increase in average income was seen at the graduate education level versus Bachelor's degree among LD individuals (with a coefficient of 31838.35) in comparison to a 25% average increase among NANLD (coefficient of 25424.85) (Graph 1). Notably, an 81.6% increase in income can be seen going from a high school diploma to a Bachelor's degree for LD versus a 62.5% increase for NANLD. This indicates a possible belief among employers that an individual with more education has the ability to overcome their disability enough to contribute to the professional office environment.





With further insight into the type of jobs individuals with LD, autism, and NANLD are working needed, the paid by the hour variable, HOURPDA, was utilized in a multivariate regression. Controlling for education level, marital status, gender, race, health status, and age, many of the same conclusions from the income dependent variable were once again reached. In fact, the coefficients for each of the primary independent variables of interest having to do with education between LD and NANLD were virtually identical, being never more than 3% apart from its counterpart (Table 4). As education increased for both NANLD and LD, the likelihood

of being paid by the hour decreased at a statistically significant rate. This signals the possibility of an individual with LD is able to move out of the typical blue-collar jobs and into management positions with the assistance of higher degrees. The hypothesis supports findings of the income variable that the higher the level the education, the higher the income for an individual regardless of their disability status. It also highlights the closing of the gap between people without autism or a learning disability and those with autism or a learning disability.

Table 4: Regression Results Investigating the Influence of Disability Status on Being Paid by the Hour

	Non-Autistic, Non-Learning Disabled	Learning Disabled	Autistic
	Coefficient	Coefficient	Coefficient
	<u>(Std. Error)</u>	<u>(Std. Error)</u>	<u>(Std. Error)</u>
High School	0921 ^{**}	1033 ⁺	.2283
Degree	(.0088)	(.0531)	(.2628)
Associate's Degree	1463 ^{**}	1737 [*]	.8946
	(.0125)	(.0712)	(.4529)
Bachelor's Degree	4352**	4124 ^{**}	7262 ⁺
	(.0106)	(.0752)	(.3421)
Graduate Degree	5864 ^{**}	5815 ^{**}	9461 [*]
	(.0127)	(.0847)	(.2658)
Significant Other	0518 ^{**}	0087	6554 ⁺
Present	(.0062)	(.0399)	(.2849)
Gender: Male	0711 ^{**}	1099**	.3119
	(.0061)	(.0410)	(.1953)
Race: White	0605** (.0073)	.0190 (.0474)	
Health Status	0605 ^{**}	0764 ⁺	.0802
	(.0095)	(.0402)	(.2134)
Age	0036 ^{**}	0039**	.0034
	(.0001)	(.0012)	(.0047)
R ² _{adjusted}	0.1899	0.1637	0.7090
Sample Size	20765	484	14

Note: The regression with the dependent variable Autism had the variable Race: White omitted due to collinearity.

Omitted group is less than a high school degree.

* Significant at the 5% level ** Significant at the 1% level + Significant at the 10% level

While evaluating the variable concerning if individuals had ever worked, a 31.6% decrease in workforce participation was seen for LD with a high school diploma versus NANLD with a high school diploma (Graph 2). Interestingly enough, the difference leveled off at a Bachelor's degree with only an 8.2% decrease and a 6.3% decrease among those with a graduate degree. It appears as though once an individual with a learning disability reaches the milestone of a Bachelor's degree, the impact that their disability status has on their "un-hirability" diminishes. This could also be the effect of personality traits. It can be assumed that an individual who completes a rigorous Bachelor's degree program is more driven to "beat" their disability, although this is obviously not necessarily universal. Although not the case with NANLD, a steady increase in workforce participation with additional education is seen among LD.

Graph 2:

Difference in Likelihood of Ever Worked Compared to Those with a High School Degree



One aside that should be made is the impact of having a significant other had on participation in the workforce among individuals with LD. Although it was a negative coefficient for individuals without a disability, the value turned statistically significant and positive for those with a learning disability. This relationship indicates the impact that a caretaker can have on a person with a disability. Purely their presence in the home environment, with likely encouragement, pushes individuals to participate in the workforce.

Importance

This research highlights a section of literature on the subject of PSE attainment and income for individuals with LD and ASD that has not been explored to a reasonable extent. Although studies have explored the relationship of PSE attainment as various measures of success, my study will exclusively measure the strength of the relationship between education and income for NANLD against that of individuals with ASD and LD. If a statistically significant difference cannot be ascertained from the data between the study groups of ASD, LD, and NANLD, policy initiatives will be discussed to incentivize PSE and encourage participation among the disability group(s) that lags behind. If a statistically significant difference can be found, we must search further into why this is so. Is it due to societal norms? Is it due to ineffective accommodations in the workplace? Is it due to the physical and mental limitations of the individuals with these disabilities? Although these questions cannot be directly answered through this specific research study, the groundwork for future literature on the subject and possible solutions to problems mentioned in this study will be outlined and explored through a conceptual framework.

Limitations

The results of this investigation must be considered in light of some limitations of sample size and variable definition. For sample size, while there were 554 total observations for the LD variable, the autism variable was lacking with only 26 total observations. The small number of observations could be the result of a number of factors including unwillingness to identify as autistic, errors in sampling, errors in reporting by individuals being asked the question, or the data could be completely correct. Another possibility could be an undiagnosed condition status. With autism prevalence on the rise in recent years with an influx of attention to the condition, older generations may not have received a proper diagnosis and may not have had the attention that the current generation has. This trend can be identified with the Sample Child level of the 2007 NHIS data, which identifies more observations for the autism variable (N=58) out of a smaller pool of total observations for that level (N=9,417). While these numbers are still not in line with current literature, it is evidence that diagnosis issues with older generations may be hindering results. One possible solution for further research would be to focus on datasets and other means that are specifically directed at the autistic population, although no current datasets currently exist.

A second possible limitation is the definition of the LD variable. As previously mentioned, the definition was derived from variables relating to nervous condition status that served as a proxy for a learning disability. The interviewers were instructed to embrace keywords and use their best judgment when assessing this question, which included those that identified as having a functional limitation; nervous system; or issue with sense organs. With the guidance of LD definitions from the Interagency Committee on Learning Disabilities and The National Joint Committee on Learning Disabilities, I accepted the variable as an appropriate

proxy for the study. With that said, a variation among interviewers and interviewees among what a true nervous condition status is could have swayed the results to be either more or less extreme based purely on who was asking the question or how it was asked. Further investigation into the sample size revealed that at the Sample Child level there existed a question that specifically asked if the child had a learning disability. This question actually yielded a similar observation size (N=557) from a smaller total pool of data (N=9,417). Although this insinuates an underrepresented pool of observations at the Sample Adult level, there is simply no way to know the extent of the issue without a specific question related to LD for adults being asked.

Finally, questions arise over the use of one year of data. With the autism variable appearing in one supplement of one year of the survey, 2007, there were limitations in seeing a long-term relationship between educational attainment, income, and work outcomes. If the autism variable is eventually fully implemented into the NHIS and the LD variable is expanded into the Sample Adult level, a better sense of outcomes for individuals with autism or LD will be seen. By evaluating a single year of the NHIS, there is a risk that the results could be a result of the situation in that specific year and not necessarily a comment of the state of those with either autism or LD. One might believe that just because these were the results for 2007, it does not mean that they were the same results for 2000-2006 or any other period of time. With that said, the results of this study do fall in line with conventional beliefs, although there is encouragement for future research in trends over time.

Discussion

With the growing prevalence of both Autism and learning disabilities, there exists a need to accommodate and encourage educational institutions and the workplace to adapt to the

changing demographics. One in 88 children born today will be diagnosed with an Autism Spectrum Disorder (CDC 2012, 1). Additionally, 7.66% of children have a learning disability with a 17.1% increase in developmental disabilities in the past 12 years (Boyle et al., 2011, 1036). As these children grow up, they will be expected to go to college, enter the workforce, or both. To build a smart, efficient workforce, the United States needs to build and expand programs that encourage individuals with learning disabilities to obtain some form of postsecondary education. This initiative can take place on the federal, state, or even local level. Expanding the federal Pell grant program to encompass students with ASD or LD, creating a state based scholarship program, or even implementing college preview courses through high schools will open the door to individuals with ASD or LD. With costs associated with selfaccommodations, grants and scholarship programs that are aimed specifically at these groups will assist in offsetting the growing cost of education. As previously mentioned a number of programs currently exist to assist students with special needs in their transition to the postsecondary setting (Stodden and Mruzek 2010; Hart et al. 2004; Mull, Sitlington, and Alper 2001). While these programs have been successful, they continue to be a rare occurance. Further expansion of postsecondary transition programs for the autistic and learning disabled, particularly on a statewide scale, would open up opportunities for advancement among sectors of the population that have historically been neglected or simply not prepared for further educational opportunities. Since a 4-year Bachelor's degree program may not be necessary for all careers, attention should also be given to community colleges that tend to provide additional emphasis on job placement and partnerships with local businesses. Although in this study there was not as significant an increase of income for individuals with a LD going from no high school diploma to an associates versus a Bachelor's, the increase was still evident and the benefit was

clear. Initiatives such as these will open the door financially and give students with ASD or LD the opportunity to attain a postsecondary education and not be left behind because of their difficulty adjusting or any additional special needs.

As autism and learning disability prevalence continues to grow, work environments must learn to adapt to employee needs. The federal government has implemented a number of tax incentives for businesses to hire individuals with disabilities. The Work Opportunity Credit, for example, "provides...a tax credit up to 40 percent of the first \$6,000 of first-year wages of a new employee" (IRS 2012). Programs such as the Work Opportunity Credit give people with special needs the chance to show that they are capable of completing required tasks and can contribute in the workplace environment. Other tax incentives like the Disabled Access Credit provide small businesses with the resources to enable access to the businesses services for persons with disabilities. Coupled with the Americans with Disabilities Act workplace accessibility requirements, the business environment has become friendlier to individuals with special needs. While these programs provide moderate help with physical accessibility and job opportunities, increased employee training of disability support mechanisms and different types of learning disabilities and special needs should be incorporated into human resource departments. Eliminating discrimination in the workplace among employers and co-workers should already be a part of employee training, but additional resources that assist co-workers in understanding the impact of specific conditions would help employees with special needs better adapt to the work environment. Understanding why a person with autism, for example, may appear standoffish or possibly rude in the workplace, when in reality they are simply just uncomfortable in social setting, could mitigate office tension and open a proper dialog between co-workers.

Although opening the workplace environment in general for individuals with disabilities is not a completed initiative, within the working environment individuals must be enabled to advance through the corporate structure through salaried positions. As was seen in the results of this study, individuals with a disability appear to be relegated to hourly positions rather than moving up into management positions. Increased use and encouragement of affirmative action programs for individuals with autism or learning disabilities could be a possible solution, as it has been for minority groups and women in the past. With the added attention of public scrutiny, we have seen women and minorities begin to crack the glass ceiling, and hopefully individuals with disabilities will be able to follow close behind them.

Bibliography

- Adelman, Pamela B., and Susan A. Vogel. 1993. "Issues in the Employment of Adults with Learning Disabilities." *Learning Disability Quarterly* no. 16 (3):219-232.
- Blackorby, Jose, and Mary Wagner. 1996. "Longitudinal Postschool Outcomes of Youth with Disabilities: Findings from the National Longitudinal Transition Study." *Exceptional Children* no. 62 (5):399-399-413.
- Boyle, Coleen A., Sheree Boulet, Laura A. Schieve, Robin A. Cohen, Stephen J. Blumberg,
 Marshalyn Yeargin-Allsopp, Susanna Visser, and Michael D. Kogan. "Trends in the
 Prevalence of Developmental Disabilities in US Children, 1997–2008." *Pediatrics* 127, no. 6 (2011): 1036.
- CDC. 2012. "Prevalence of Autism Spectrum Disorders Autism and Developmental Disabilities Monitoring Network, 14 Sites, United States, 2008." *Morbidity and Mortality Weekly Report* 61, no. 3 (2012): 1.
- Cimera, Robert Evert, and Richard J. Cowan. 2009. "The Costs of Services and Employment Outcomes Achieved by Adults with Autism in the US." *Autism* no. 13 (3):285-302. doi: 10.1177/1362361309103791.
- DHHS, US. 2007. The 2007 HHS Poverty Guidelines edited by US Department of Health and Human Services.
- Ganz, M. L. 2007. "The Lifetime Distribution of the Incremental Societal Costs of Autism." *Archives of Pediatrics & Adolescent Medicine* no. 161 (4):343.
- Hart, D., J. Mele-McCarthy, R. H. Pasternack, K. Zimbrich, and D. R. Parker. 2004. "Community College: A Pathway to Success for Youth with Learning, Cognitive, and

Intellectual Disabilities in Secondary Settings." *Education and Training in Developmental Disabilities* no. 39 (1):54-66.

- Hart, Debra, Meg Grigal, and Cate Weir. 2010. "Expanding the Paradigm: Postsecondary Education Options for Individuals with Autism Spectrum Disorder and Intellectual Disabilities." *Focus on Autism and Other Developmental Disabilities* no. 25 (3):134-134-150. doi: 10.1177/1088357610373759.
- (IRS) "Tax Benefits for Businesses Who Have Employees with Disabilities." Internal Revenue Service, Last modified February 21, 2012. http://www.irs.gov/businesses/small/article/0,,id=185704,00.html.
- Julian, Tiffany, and Robert Kominski. 2011. Education and Synthetic Work-Life Earnings Estimates. In American Community Survey Reports. US Census Bureau: Economics and Statistics Administration.
- Knapp, Martin, Renée Romeo, and Jennifer Beecham. 2009. "Economic Cost of Autism in the UK." *Autism* no. 13 (3):317-336. doi: 10.1177/1362361309104246.
- Madaus, Joseph W. 2006. "Employment Outcomes of University Graduates with Learning Disabilities." *Learning Disability Quarterly* no. 29 (1):19-31.
- Mawhood, Lynn, and Patricia Howlin. 1999. "The Outcome of a Supported Employment Scheme for High-Functioning Adults with Autism or Asperger Syndrome." *Autism* no. 3 (3):229-254. doi: 10.1177/1362361399003003003.
- Migliore, Alberto. 2009. Postsecondary Education and Employment Outcomes for Youth with Intellectual Disabilities. *Data Note* (21).

- Montes, Guillermo, and Jill S. Halterman. 2008. "Association of Childhood Autism Spectrum Disorders and Loss of Family Income." *Pediatrics* no. 121 (4):e821-e826. doi: 10.1542/peds.2007-1594.
- Mull, Charlotte, Patricia L. Sitlington, and Sandra Alper. 2001. "Postsecondary Education for Students with Learning Disabilities: A Synthesis of the Literature." *Exceptional Children* no. 68 (1):97-97-118.
- National Center for Health, Statistics. 2009. "Data from the National Health Interview Survey. Vital and Health Statistics Series 10."2-5.
- Neubert, Debra A.; Moon, M. Sherril; Grigal, Meg. 2004. "Activities of Students with Significant Disabilities Receiving Services in Postsecondary Settings." *Education and Training in Developmental Disabilities* no. 39 (1):16-25.
- Pennyslvania Bureau of Autism Services. 2011. Adult Autism Waiver General Information Questions. edited by Pennsylvania Department of Public Welfare: Pennsylvania Department of Public Welfare.
- Rice, Catherine. December 18, 2009. Prevalence of Autism Spectrum Disorders --- Autism and Developmental Disabilities Monitoring Network. *Morbidity and Mortality Weekly Report* 58 (10): 1-20, <u>http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5810a1.html</u>.
- Rojewski, Jay W. 1996. "Occupational Aspirations and Early Career-Choice Patterns of
 Adolescents with and without Learning Disabilities." *Learning Disability Quarterly* no. 19 (2):99-116.
- Stodden, Robert A., and Daniel W. Mruzek. 2010. "An Introduction to Postsecondary Education and Employment of Persons with Autism and Developmental Disabilities." *Focus on*

Autism and Other Developmental Disabilities no. 25 (3):131-133. doi:

10.1177/1088357610371637.

U.S. Social Security Administration. 2011. SSI Monthly Statistics, September 2011. edited by Office of Retirement and Disability Policy: U.S. Social Security Administration.

US Department of Education. 2011. Grants. edited by US Department of Education.

- Visser, Roemer. 2000. Texas Center for the Advancement of Literacy and Learning, "Definitions of Learning Disabilities." Last modified April 2000. http://wwwtcall.tamu.edu/research/definit.html.
- Zafft, Cynthia; Hart, Debra; Zimbrich, Karen. 2004. "College Career Connection: A Study of Youth with Intellectual Disabilities and the Impact of Postsecondary Education."
 Education and Training in Developmental Disabilities no. 39 (1):45-53.

Table 5: *Variables*

Variahle	Variable Description	Definition
LTHS	Less than a high school degree	$1 = Yes = (EDUC \le 12)$ $0 = No = (EDUC \ge 12)$
HIGHSCHOOL	High School degree, GED, or some college	1 = Yes = (EDUC==13) (EDUC==14) (EDUC==15) 0 = No = (EDUC<13) (EDUC>15)
ASSOCIATE	Associates degree only	1 = Yes = (EDUC==16) (EDUC==17) 0 = No = (EDUC<16) (EDUC>17)
ВАСН	Bachelors degree	1 = Yes = (EDUC==18) 0 = No = (EDUC<18) (EDUC>18)
GRADD	Masters, Professional, or PhD	1 = Yes = (EDUC==19) (EDUC==20) (EDUC==21) 0 = No = (EDUC<19)
INCOMESC	Total earnings last year based on midpoint	\$2500 = (INCOME=\$01-\$4,999) \$7499.5 = (INCOME=\$5,000-\$9,999) \$12499.5 = (INCOME=\$10,000-\$14,999) \$17499.5 = (INCOME=\$15,000-\$19,999) \$22499.5 = (INCOME=\$20,000-\$24,999) \$29999.5 = (INCOME=\$25,000-\$24,999) \$39999.5 = (INCOME=\$35,000-\$34,999) \$49999.5 = (INCOME=\$35,000-\$44,999) \$49999.5 = (INCOME=\$45,000-\$54,999) \$59999.5 = (INCOME=\$55,000-\$64,999) \$69999.5 = (INCOME=\$55,000-\$74,999) \$85000 = (INCOME=\$75,000 and over)
AUTISM	Ever told you had Autism?	1 = Yes $0 = No$
NERVCON	Have a nervous system condition that is chronic?	1 = Yes = (LACHRC23==1) (ALCHRC23==1) (LACH RC23==1 & ALCHRC23==2) 0 = No = (LACHRC23==2) (ALCHRC23==2)
HEALTHSTAT	Reported Health Status	1 = Positive = (PHSTAT==1) (PHSTAT==2) (PHSTAT==3) 0 = Negative = (PHSTAT==4) (PHSTAT==5)
SIGOTHER	Lives with a Significant Other	1 = Yes = (MARSTAT==1) (MARSTAT==8) 0= No = (MARSTAT>1) & (MARSTAT<8)

WHITE	"Do you identify as Caucasian?"	1 = Yes = (RACERPI2==1) 0 = No = (RACERPI2>1)
SEX	What is your gender?	1 = Male 0 = Female
EVERWRK	Ever Worked?	1 = Yes $0 = No$
HOURPDA	Paid by the hour at current/most recent/longest held job?	1 = Yes $0 = No$
LACHRC23	Persons 18+ years limited due to nervous system condition (Keywords: functional limitation; nervous system; sense organs) – PERSON LEVEL	1 = Chronic 0 = Not Chronic
ALCHRC23	Persons 18+ years limited due to nervous system condition (Keywords: functional limitation; nervous system; sense organs) – SAMPLE ADULT LEVEL	1 = Chronic 0 = Not Chronic
LIMITWORK	Are you limited in your work due to your condition status?	1 = Yes = (PLAWKLIM==1) (PLAWKLIM==2) 0 = No = (PLAWKLIM==3)
WRKAGE	Are you of working age?	1 = Yes = (AGE < 65) 0 = No = (AGE > 64)
NANLD	Can you be classified as not having a learning disability or autism?	1 = Yes = (AUTISM==0) (NERVCON==0) 2 = No = (AUTISM==1) (NERVCON==1)

	Non-Autistic, Non-Learning Disability	Learning Disability	Autistic
	Coefficient <u>(Std. Error)</u>	Coefficient (Std. Error)	Coefficient (<u>Std. Error)</u>
High School Degree	7157.49 ^{**} (610.60)	3280.61 (6553.00)	
Associate's Degree	14469.24 ^{**} (795.26)	5355.89 (7133.35)	
Bachelor's Degree	19097.45** (710.16)	17803.02 [*] (7555.49)	
Graduate Degree	25424.85** (845.303)	31838.35 ^{**} (8306.25)	-
Significant Other Present	4552.46 ^{**} (384.739)	3996.13 (3861.52)	
Gender: Male	10453.30** (380.35)	3025.03 (3922.03)	
Race: White	1360.51** (452.54)	6261.98 (4558.90)	
Paid Hourly	-13611.36** (423.37)	-8553.14 [*] (4117.15)	
Health Status	4316.03 ^{**} (738.48)	6836.84 (4211.36)	
$\mathbf{R}^2_{adjusted}$	0.3101	0.2427	
Sample Size	11787	137	9

Table 6: Regression Results Investigating the Influence of Disability Status on Income

Notes: Autism was not considered due to a small sample size. Omitted group is less than a high school degree. * Significant at the 5% level ** Significant at the 1% level * Significant at the 10% level

Table 7:

Regression Results Investigating the Influence of Disability Status on the Likelihood of Ever Working

	Non-Autistic, Non-Learning Disabled	Learning Disabled	Autistic
	Coefficient	Coefficient	Coefficient
	(<u>Std. Error)</u>	(<u>Std. Error)</u>	(<u>Std. Error)</u>
High School	.1233**	.0843*	.225
Degree	(.0095)	(.0386)	(.3269)
Associate's Degree	.2168** (.0103)	.1363* (.0591)	
Bachelor's Degree	.1805** (.0145)	.1656** (.0621)	
Graduate Degree	.2204**	.2066**	.825
	(.0185)	(.0745)	(.5356)
Significant Other	0074**	.0854**	
Present	(.0081)	(.0326)	
Gender: Male	.1218	.0277	025
	(.0083)	(.0335)	(.3269)
Race: White	.0407	.0728*	.175
	(.0094)	(.0366)	(.3699)
Health Status	0497**	0625 ⁺	45
	(.0093)	(.0331)	(.3)
R ² adjusted	0.0666	0.0557	0.1250
Sample Size	8304	415	15

Note: Autism had the variables Associate's Degree, Bachelor's Degree, and Significant Other omitted due to collinearity. Omitted group is less than a high school degree.
* Significant at the 5% level
** Significant at the 1% level
* Significant at the 10% level



Average Income Based on Disability Status

Graph 3:





Disability Status