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Education: Where It Pays

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EDUCATION: WHERE IT PAYS

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This thesis, submitted by Nathan William Orwick in partial fulfillment of the requirements for the Degree of Master of Science in Applied Economics from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done, and is hereby approved.

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This thesis is being submitted by the appointed advisory committee as having met all of the requirements of the Graduate School at the University of North Dakota and is hereby approved.

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Title   Education: Where it Pays

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Nathan William Orwick
April 11, 2013

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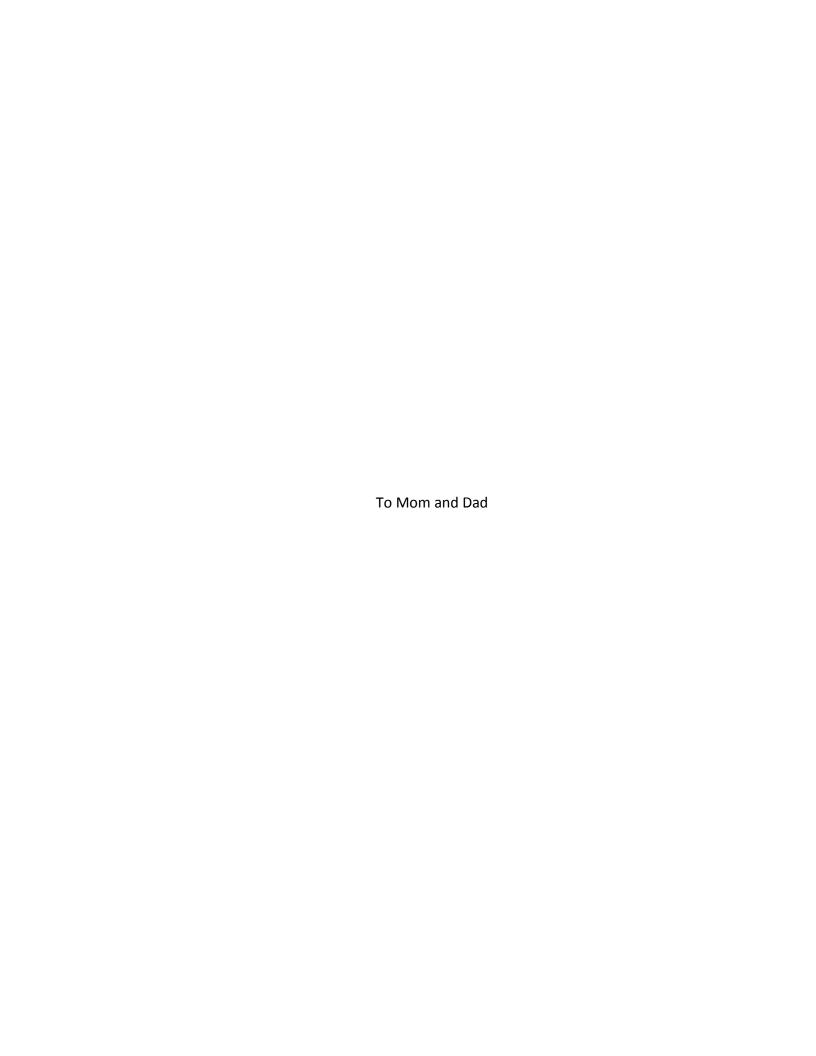
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To Mom and Dad

ABSTRACT

Post-secondary education is one of the most important decisions a student is faced with when leaving high school. There have been numerous studies as to whether the additional education is worthy of one's time and attention but what has not been addressed where is important. If one plans to live in a certain area it would be extremely beneficial to know whether your education is going to benefit one's financial situation or not. Utilizing incomes as the dependent variable and Ordinary Least Squares as the econometric method, this paper concludes having advanced degrees in the metropolitan areas are very beneficial whereas it is much less impactful in micropolitan areas. It also suggests the lack of an advanced degree will generate a negative impact on one's income but when taking into consideration the inherent effects of the micropolitan area, there is a small premium to be obtained.

CHAPTER I

INTRODUCTION

In preparing for one's future a number of questions arise as to what careers and opportunities, including the location they wish to inhabit, to consider. Numerous paths can be taken to the same destination; however, certain obstacles can only be overcome by some type of investment, such as education. It is one of life's biggest decisions as to what to pursue after high school, as it will likely be the determining factor to what one's future beholds.

Obviously since the decision to attend post-secondary schooling is such a big decision it has been fiercely studied and debated. Jennifer Cheeseman Day and Eric C. Newburger (2002) published *The Big Payoff: Educational Attainment and Synthetic Estimates of Work-Life Earnings*, claiming one's synthetic 40-year earnings would increase $1 million by obtaining a bachelor's degree as opposed to only having a high school diploma. Synthetic earnings are to be viewed in "present value" in 1999 dollars and are such a significant figure that many students may incorporate it into their decision making. In fact, it has been used as a benchmark as to what to expect from a bachelor's degree, as reiterated by Sandy Baum and Jennifer Ma (2007) which was

published by the College Board. However, Charles Miller, formerly head of the

Commission on the Future of Higher Education, wrote in a public letter to the College

Board president, Gaston Caperton, accusing the College Board of misrepresenting data

and making unrealistic assumptions to intentionally mislead and promote exaggerated

expected returns to education. Once using more realistic assumptions, such as not

every student finishes a bachelor's degree in four short years, the present value deflates

to $279,893. Still, this monetary increase is no value to be scoffed at as it does increase

earnings significantly even if it is much lower than previously reported.

In addition to the deflation to an individual's income there are other

socioeconomic ripples stem from misleading the potential student, as pointed out by

Charles Murray in *Real Education: Four Simple Truths for Bringing America's Schools

Back to Reality.* In this publication, Murray states not all students are meant to be in

college pursuing a college degree. If society pushes students into a college setting, away

from what they are truly talented in, it not only disservices the child but also floods the

post-secondary education system. This would essentially drive down the value a degree

possesses as well as potentially not providing the academically gifted students both the

attention and resources they need and deserve.

Clearly education does increase earnings significantly but we still have an

important unanswered question. Where can we maximize our returns on the additional

education we have has obtained? First, we need to be able to show some type of

statistically significant difference of income levels between two different populations,

represented by comparing large populations to small populations. What will be explored is whether or not the population size of an individual's work environment affects that individual's livelihood and to what degree will benefit them most. Simply put, does it pay more to have a higher education in a large or small area? This is an important question as, when planning for one's future, it would be very beneficial to be aware of whether the education will be relevant and worth the opportunity costs of the investment. If we are able to state advanced degrees do not contribute enough to one's earnings in a certain area they will be able make a more informed decision to still pursue it if they wish.

CHAPTER II

THE MODEL

In addressing this question we will need to have a complete definition as to what

we are comparing. Thankfully, the Census has a clear definition of two types of

populations are observed, being metropolitan and micropolitan areas. As defined by

the Census Bureau a micropolitan must be populated by at least one urban cluster

containing at least 10,000 but no greater than 50,000 people, whereas a metropolitan

area must contain more than 50,000 people in one urbanized area.

The dependent variable utilized to determine whether education is relevant in a

certain area is the total pre-tax personal income from the previous year. This type of

variable, being on an individual basis, will allow us to circumvent any nasty household

effects that plague studies with inflated incomes due to more than one source of

income. It is also important to note we are working with pre-tax income. This means

that incomes collected by the individuals in the data with extremely high incomes will be

more pronounced as no tax was taken from them. Likewise no taxes were given to the

individuals with extremely low incomes as there are no redistribution effects. While the

redistribution of income is a worthy topic to discuss, it does not

pertain to this study because the varieties of tax collections, even between similar areas, differ quite substantially. Therefore pre-tax income is the best fit, giving us the most consistent results. TABLE – 1 shows the summary statistics of the modern era (2005-2011) distinguishing the obvious differences in income between the metropolitan and micropolitan areas.

TABLE – 1

Income Summary Statistics in the Modern Era (2005-2011)

Variable	Metropolitan		Micropolitan	
	Mean	Standard Dev.	Mean	Standard Dev.
No Degree	13699.88	21432.18	13305.57	19731.86
High School	28777.22	56122.32	25342.73	28453.54
Bachelor's	56122.32	65369.31	44582.30	47614.17
Master's	71283.05	75042.42	53240.65	48211
Professional	121836.50	127159.9	94215.00	100468.9
Doctoral	94676.02	87991.35	78323.00	69549.13

One could point out that income is and should not be the factor in deciding whether or not post-secondary schooling is relevant, which is certainly viable, however, it is statistically important to have a level of prosperity which we can measure, and which is easily obtained when using incomes. It is nearly impossible and quite impractical to measure the benefits one procures from the sheer satisfaction of what their degree, or lack of, has given them. Therefore, we will assume that the highest

returns to one's education will be the pre-tax individual income that was mentioned previously.

The selection of six main levels of educational attainment are as follows; having no degree, a high school degree, a bachelor's degree, a master's degree, a professional degree, or a doctoral degree the determent factors to income.   A select few other socioeconomic factors will also be observed to view the discrepancies between the two areas, namely being an African American, a naturalized citizen, as well if the language being used in the home is something other than English. These were chosen to show some other socioeconomic factors rather than just focusing on educational attainments. There is definitely something to be said for how a simple attribute one cannot control, such as being African American, will change what amount of income earned. All variables mentioned are in dummy variable form, meaning if the statement holds true, such as having a master's degree, then the value for the variable is 1 otherwise it equals 0.

In order to pull out the effects of simply living in a metropolitan area in addition to having a degree, or lack thereof, some interactive variables were created by multiplying our metropolitan variable with each educational attainment level. Finally the model is shown by EQUATION – 1. While it is interesting to see the incomes rise, usually with each additional educational attainment, it is not the focus of this paper. What we are looking for specifically are the educational contributions of living live in a metropolitan area.

EQUATION – 1

$$Total\ Income = \beta_0 + \beta_1 \cdot nodegree + \beta_2 \cdot metronodegree + \beta_3 \cdot highschool + \beta_4 \cdot metrohighschool + \beta_5 \cdot bachelor + \beta_6 \cdot metrobachelor + \beta_7 \cdot master + \beta_8 \cdot metromaster + \beta_9 \cdot professional + \beta_{10} \cdot metroprofessional + \beta_{11} \cdot doctoral + \beta_{12} \cdot metrodoctoral + \beta_{13} \cdot black + \beta_{14} \cdot metroblack + \beta_{15} \cdot language + \beta_{16} \cdot metrolanguage + \beta_{19} \cdot natural + \beta_{20} \cdot metronatural + \beta_{21} \cdot metro$$

The interactive variables do just that as they pull out the income differentials, whether they are positive or negative. Interpreting the coefficients is fairly straight forward, if one obtains a master's degree and lives in a metropolitan area they are expected to make the summation of the constant term, master's variable, the master's interactive variable, and the metropolitan dummy coefficients. One might argue by simply living in a metropolitan area the income will inherently be larger due to higher living expenses; however, the model presented accounts and controls for this phenomenon by including the metropolitan dummy variable.

Additionally, we can observe how education, among the other socioeconomic variables, affects income in micropolitan areas by simply repeating the process of the interactive variable creation. EQUATION – 2 will test to see how education on incomes within smaller areas.

EQUATION – 2

$$Total\ Income = \beta_0 + \beta_1 \cdot nodegree + \beta_2 \cdot micronodegree + \beta_3 \cdot highschool + \beta_4 \cdot microhighschool + \beta_5 \cdot bachelor + \beta_6 \cdot microbachelor + \beta_7 \cdot master + \beta_8 \cdot micromaster + \beta_9 \cdot professional + \beta_{10} \cdot microprofessional + \beta_{11} \cdot doctoral + \beta_{12} \cdot microdoctoral + \beta_{13} \cdot black + \beta_{14} \cdot microblack + \beta_{15} \cdot language + \beta_{16} \cdot microlanguage + \beta_{19} \cdot natural + \beta_{20} \cdot micronatural + \beta_{21} \cdot micro$$

While presenting both sides of the coin may seem monotonous, it is important to keep in mind interpreting the results will be a little tricky when observing just one type of area. By looking into both areas using both equations, we are able to solidify the results that are obtained.

Finally, the last issue addressed is whether the results obtained are consistent through time. Therefore, to control for time, the regressions utilized will consist of two different time periods. First, we will observe the latter years, being 2005-2011. Unfortunately, the data collected did not contribute years 2009 and 2010; however, this should not be a concern as there are more than sufficient observations for the remaining years to be significantly relevant.   Next we will control for the data corresponding with the year 1990, giving two fairly different economic eras to observe. Comparing the relative results will allow us to determine whether the results collected will stay consistent through time.

CHAPTER III

RESULTS

As the coefficients show for the metropolitan results each additional level of

education provides an additional amount of income, excluding the doctoral degree. This

is not only true for the "base" amount of income but also the interactive variables. It is

also important to notice how the variables representing little education yield not only a

negative impact on income with their "base" variables, but the interactive variables also

have the same type of contribution. TABLE – 2 report the "base" coefficients and

significance levels and TABLE – 3 expresses the effect the area has on what educational

benefits one will obtain. These both refer to the modern era (2005-2011) to control for

any type of time inconsistencies.

TABLE – 2

Base Estimates Within the Metropolitan Area for the Modern Era (2005-2011)

Dependent Variable: Pre-Tax Income			
			Number of Observations = 8,983,027
Variable	Coefficient	Standard Error	t-statistic
***Metro	6296.83	126.9445	49.6
***No Degree	-19443.80	125.8886	-154.45
***High School	-7901.69	113.9328	-69.35

TABLE – 2 Cont.

Variable	Coefficient	Standard Error	t-statistic
***Bachelor's	11176.93	137.0857	81.53
***Master's	19864.14	173.7654	114.32
***Professional	60733.80	299.8753	202.53
***Doctoral	44943.15	380.3063	118.18
***Black	-6670.94	126.5728	-52.7
***Non-English	-3339.36	119.6295	-27.91
***Naturalized	4194.08	244.5382	17.15
***Constant	33709.44	107.6189	313.23
*p<0.1 **p<0.05 ***p<0.01			

As presented all variables come in extremely significant. The lower levels of education suffer not only overall but within the metropolitan areas in particular. These losses are represented by the negative interactive coefficients depicted in TALBE – 3. On the other hand, the advanced degrees have positive coefficients for all "base" variables, which is to be expected. In addition to these findings the interactive variables show significant contributions to income in the metropolitan area. This tends to show there is a premium to be earned with these types of degrees. It is also very interesting that at each additional educational attainment the premium tends to almost double.

TABLE – 3

Interactive Estimates Within the Metropolitan Area for the Modern Era (2005-2011)

Dependent Variable: Pre-Tax Income

		Number of Observations = 8,983,027	
Variable	Coefficient	Standard Error	t-statistic
***No Degree	-2825.64	149.0786	-18.95
***High School	-1179.06	134.4022	-8.77
***Bachelor's	6581.96	157.8493	41.7
***Master's	13146.25	196.947	66.75
***Professional	22653.64	329.8643	68.68
***Doctoral	11775.61	417.899	28.18
***Black	-1602.95	139.2795	-11.51
***Non-English	-5793.65	129.4115	-44.77
***Naturalized	1181.588	254.8991	4.64
*p<0.1 **p<0.05 ***p<0.01			

Next, TABLE – 4 and TABLE – 5 represent the same equations, only controlled for observations from 1990. Clearly the values change. This could be due to number of reasons, especially inflation effects, which are not really that important to this study; however, what are important are the possible changes of significance levels or signs. Clearly the two tables demonstrate neither the significance nor the signs have had any change and, therefore, can be understood as consistent between the time periods for the metropolitan area.

TABLE – 4

Base Estimates Within the Metropolitan Area in 1990

Dependent Variable: Pre-Tax Income

Number of Observations = 9,240,315

Variable	Coefficient	Standard Error	t-statistic
***Metro	4499.85	61.04084	73.72
***No Degree	-9621.55	54.2379	-177.4
***High School	-3418.15	52.57159	-65.02
***Bachelor's	7441.38	64.34753	152.84
***Master's	13075.50	85.55185	114.32
***Professional	32304.18	131.0862	246.43
***Doctoral	27263.70	192.8936	141.34
***Black	-4073.34	46.29476	-87.99
***Non-English	-2060.93	48.06131	-42.88
***Naturalized	2463.12	104.1257	23.66
***Constant	18955.26	50.13097	378.11

*p<0.1 **p<0.05 ***p<0.01

TABLE – 5

Interactive Estimates Within the Metropolitan Area for 1990

Dependent Variable: Pre-Tax Income

Number of Observations = 9,240,315

Variable	Coefficient	Standard Error	t-statistic
***No Degree	-2315.10	66.57022	-34.78
***High School	-1053.08	64.07454	-16.44
***Bachelor's	2010.97	76.63083	26.24

TABLE – 5 Cont.

Variable	Coefficient	Standard Error	t-statistic
***Master's	4555.57	100.4962	45.33
***Professional	10599.72	150.2166	70.56
***Doctoral	3458.93	219.3999	15.77
***Black	-508.20	53.97021	-9.42
***Non-English	-2408.29	54.05863	-44.55
***Naturalized	1054.206	111.855	9.42
*p<0.1 **p<0.05 ***p<0.01			

The final regressions utilized look at the other side of the coin; the micropolitan areas using EQUATION – 2, once again controlling for the modern era. As one can see by viewing TABLE – 6 and TABLE – 7, there is a very similar, but at the same time, a very different the story to what TABLE – 2 and TABLE – 3 reported. While the "base" coefficients stay pretty consistent it is quite the opposite for the interactive variables. The positive contributions to income due to simply being in the metropolitan areas whist having an advanced degree turn negative. This not only reinforces the results of TABLE – 2 and TABLE – 3 but tells its own story at the same time, which will be elaborated on later. Once again, another regression was performed to test to see if the results through time have stayed consistent. All variables kept the same signs and significance levels while the coefficients of the "base" variables fluctuate slightly.

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TABLE – 6.

Base Estimates Within the Micropolitan Area for the Modern Era (2005-2011)

Dependent Variable: Pre-Tax Income

		Number of Observations = 8,983,027	
Variable	Coefficient	Standard Error	t-statistic
***Micro	-6296.827	126.9445	-49.6
***No Degree	-22269.43	79.85287	-278.88
***High School	-9080.751	71.29696	-127.37
***Bachelor's	17758.21	78.25559	226.93
***Master's	33010.4	92.70227	356.09
***Professional	83387.44	137.4235	606.79
***Doctoral	56718.76	173.2245	327.43
***Black	-8273.884	58.12137	-142.36
***Non-English	-9133.012	49.3569	-185.04
***Naturalized	5375.666	71.93457	74.73
***Constant	40006.26	67.32814	594.2

*p<0.1 **p<0.05 ***p<0.01

TABLE – 7

Interactive Estimates Within the Micropolitan Area for the Modern Era (2005-2011)

Dependent Variable: Pre-Tax Income

		Number of Observations = 9,240,315	
Variable	Coefficient	Standard Error	t-statistic
***No Degree	2825.64	149.0786	18.95
***High School	1179.06	134.4022	8.77
***Bachelor's	-6581.96	157.8493	-41.7
***Master's	-13146.30	196.947	-66.75

TABLE – 7 Cont.

Variable	Coefficient	Standard Error	t-statistic
***Professional	-22653.60	329.8643	-68.68
***Doctoral	-11775.60	417.899	-28.18
***Black	1602.95	139.2795	11.51
***Non-English	5793.65	129.4115	44.77
***Naturalized	-1181.59	254.8991	-4.64
*p<0.1 **p<0.05 ***p<0.01			

CHAPTER IV

DISCUSSION

As previously touched on the interpretation of the coefficients is fairly straight

forward since the data presented is at the individual level. If one would increase their

level of education in a metropolitan area they essentially move to the next bracket. The

marginal effect would be the difference between the actual income obtained from the

bracket and the previous bracket. Taking it even a step further, we can obtain an

Adjusted Income Differential. This is comparing, at each level of education, how much

an individual will make given that each other variables are held constant. If one would

take the difference of the incomes with its respective attainment level we can

determine a spread to show how the incomes change between the areas. Now, it is

important to remember there is the fact that no matter what education level one has,

living in a metropolitan area will automatically have a positive impact on income, which

is again represented by the metro dummy variable. Therefore, adjusting the spread to

correct for this phenomenon can be done by simply subtracting it from the spread just

created, which now will become the Adjusted Income Differential. These values and

calculations have been demonstrated in TABLE – 8. One should notice that

the values that are calculated as the Adjusted Income Differential are in fact, the same

values as the coefficients of the interactive variables within the regressions.

TABLE – 8

Metropolitan Adjusted Income Differential

	No Degree	High School	Bachelor's	Master's	Professional	Doctoral
Metro	17736.84	30925.52	57764.48	73016.65	123393.71	96725.03
Micro	14265.64	25807.74	44885.68	53573.58	94443.23	78652.58
Spread	3471.20	5117.78	12878.80	19443.07	28950.47	18072.44
Increase	6296.83	6296.83	6296.83	6296.83	6296.83	6296.83
Adjusted	-2825.62	-1179.05	6581.97	13146.25	22653.65	11775.61

All tables the presented inherently have the same result. Having an advanced

degree in a metropolitan area is extremely beneficial to one's income. On the other

hand, these same advanced degrees in a micropolitan area are undervalued as they

could be earning vast amounts more elsewhere. Likewise, it can be determined one can

earn a premium living in a micropolitan area with little education; however, the

premium is considerably smaller, only about $1179.06 per year, for the individuals with

only a high school education in a micropolitan area; whereas the premium obtained

from a professional degree in the metropolitan area is a whopping $22,653.64 per year.

Again, this is in addition to the increase that is already included for individuals who live

in the metropolitan areas.

CHAPTER V

CONCLUSION

When thinking about where one wants to spend the rest of their life we now can determine if they should make such a leap and invest in additional education. As discussed education does significantly increase one's income over their lifetime but how much is still yet to be truly determined. While the magical $1 million benchmark is fiercely debated others have failed to determine where education will be most relevant. It certainly is important to know how much an investment will benefit someone but it is equally important as to where it will benefit them the most.

Throughout this study it has been consistently shown having advanced degrees will no doubt increase one's income; however, as to where one will get the highest return on their investment is simply a matter of where you live. Living in a metropolitan area will inherently increase the amount earned by an individual, but when adjusting for this phenomenon, it has been determined individuals with advanced degrees will increase their returns on education substantially. It can also be said that individuals that have obtained no or only a high school degree can earn such returns micropolitan areas, though substantially less.   Also, those who choose to live in the micropolitan area with higher levels of education are losing on potential returns that could be earned in the metropolitan area. Finally, individuals who choose to live in the metropolitan with little

education will find they are overvaluing their lack of education and the inherent

increase does not make up for the additional costs of the area.

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