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Quantity-Quality Tradeoffs in Family Size, Health and Crime

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QUANTITY-QUALITY TRADEOFFS IN FAMILY SIZE, HEALTH AND CRIME

by

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B.A., Southern Illinois University Carbondale, 2017

A Research Paper

Submitted in Partial Fulfillment of the Requirements for the
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RESEARCH PAPER APPROVAL

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Approved by:

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TITLE: QUANTITY-QUALITY TRADEOFFS IN FAMILY SIZE, HEALTH AND CRIME

MAJOR PROFESSOR: Dr. Zsolt Becsi

This paper presents further representation of Gary Becker's proposed quantity-quality tradeoff among children. As opposed to previous studies done in the United States, this study looks at health and crime measures as proxies for a child's quality at the state level for the years 1990, 2000, and 2010. It models child quality both in the presence and absence of family income using an ordinary least squares model. Results suggest that while the average number of children per family increases, these children are subject to poorer health and increased juvenile criminal activity.

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CHAPTER 1

INTRODUCTION

In Gary Becker's paper "An Economic Analysis of Fertility" from 1960, argued that the quality of children is directly related to the amount of money spent on them, their cost. Additionally, this cost of children was related to the quantity of children a family chose to have. Ergo, Becker summarized that the quality of children and the quantity of children were closely related. Later, Becker and Lewis (1973) elaborated on why the quantity and quality of children were closely related. They concluded that income elasticity of demand for quality of children is high while quantity elasticity is low and negative.

These contributions to family economics opened the door for further quantity-quality tradeoff analyses, most of which use education as a proxy for child quality in the United States. Other countries, such as China and Columbia, have incorporated some measure of health to further proxy a child's quality.

In this study, we move away from the traditional quantity-quality tradeoff story through education measures and instead explore quantity-quality tradeoff through health and crime proxies in the United States. In addition, opposed to using household level data, we look at state level data. We apply an ordinary least squares model to analyze multiple measures of health and crime among children. Ultimately our results are conclusive with Becker's theory and previous studies findings.

This paper is organized as follows: in Chapter 2 we present a literature review, Chapter 3 examines the data and econometric model used in this study, Chapter 4 presents our findings, and Chapter 5 concludes our results.

CHAPTER 2

LITERATURE REVIEW

Blake (1981) takes a look at the performance of children in single child households in terms of education and other social factors as compared to children who grew up with siblings in the United States. Blake (1981) concluded that fewer children leads to the children from smaller families to be better off than children of large families. For instance, they tend to be intellectually superior and tend to achieve higher educational and occupational status.

Another study which examined children's quantity-quality tradeoffs in the United States was Hanushek (1992) who looked at the effect sibling size had on academic achievement and how parents allocated time spent among children. In addition, Hanushek (1992) analyzed how teachers effect a student's performance. Hanushek (1992) found a negative relationship between a student's achievement and family size. So as a family grew larger, the children of that family exhibited less academic achievement. Pong (1997) applied the quantity-quality trade off analysis to Malaysia and Lee (2008) applied a variation of this analysis to urban Turkey also corroborated this negative relationship between number of siblings and academic achievement.

More recently, Zhong (2017) applied the quantity-quality tradeoff of children in China through education as a measure of children's quality. Zhong (2017) also employed measures of health as an additional way to evaluate the quality of children and found a significant negative correlation between sibling size and health. However, he was not able to conclude a significant relationship for education measures. Furthermore, Baez (2008) also employs children's health as a measure of quality for children in Columbia and finds that a child's health is poorer when there are more siblings within a family.

This study will examine the quantity-quality tradeoffs of children in the United States during the years of 1990, 2000, and 2010. Similar to Zhong (2018) and Baez (2008) we will be

incorporating measures of health as way of gauging child quality. However, we will also use juvenile crime rates to instrument child quality. To the best of our knowledge, this will be the first study which measures the quality of children in the United States through health and crime factors. We expect to find that as the quantity of children per family increases that the quality of children will decrease.

CHAPTER 3

METHODOLOGY

3.1 Data

This study uses state level data from the United States Census from 1990, 2000, and 2010. The US Census Bureau created measures for the average number of children per family and the average number of children per family with children for 1990 and 2000 by dividing the total number of children¹ per state by the total number of families (with children) per state and the District of Columbia. In order to replicate this for 2010, we used the *American Fact Finder* from the Census Bureau to procure these same measures and calculate our average number of children per family (with children) for 2010. From the National Center for Education Statistics, we were able to procure data on median household income (in 2009 dollars) for the fifty states and the District of Columbia for 1990, 2000, and 2009.

For our first measure of quality, we look at two ways for assessing health: infant mortality and health insurance. To measure infant mortality, we use the Center for Disease Control's infant mortality rate² for 2000 and 2010, however, we were not able to obtain an infant mortality measure for 1990. The US Census Bureau contains data on the percentage of children³ with health insurance by state for 1990, 2000, and 2010 which is what we will measure health insurance. We select the percentage of children with health insurance as a measure of health because it is believed that people with health insurance at the very least will have annual wellness visits with a healthcare professional and therefore could be considered healthier as they should be screened for potential risks and ailments. In addition, in 2000 the federal government began "...nationwide outreach and education efforts to help inform parents of uninsured children

¹ Total Number of Children specifically looks at own children under 18 years old

² Per 1000 live births

³ Again, "children" is defined as being under 18 years old

about public health options” (Kaiserfamilyfoundation.files.wordpress.com, 2007). As well as in 2010, healthcare in the United States became legally required. Therefore, children without health insurance could be a result of having too many children in a family and not enough resources to supply health insurance to all children.

Our final measure of child quality is through juvenile arrest rates⁴, which we procured from the Office of Juvenile Justice and Delinquency Prevention for 2002 and 2010⁵. Due to holes in the data, we chose 2002 arrest rates to assess the average number of children per family (with children) of 2000. The Office of Juvenile Justice and Delinquency Prevention categorizes juvenile crime into four categories: violent crime, property crime, drug abuse, and weapons.

Table 1 below presents descriptive statistics on our variables for the three different years. While the average number of children per family (with children) has stayed relatively consistent over the years, there appears to have been a decline in infant mortality rates and a rise in the percentage of children with health insurance. Altogether juvenile crime has also declined from 2000 to 2010. States which tend to have higher crime rates would be Illinois, Wisconsin and Nebraska. While states with lower crime rates tend to be Vermont, West Virginia, Alabama, and Maine. Connecticut, Rhode Island, and Hawaii are among the states with the highest percentage of children with health insurance.

⁴ For every 100,000 persons under 18 years old

⁵ Both datasets are missing the District of Columbia

Table 1- Descriptive Statistics

1990					
	<i>Obs.</i>	<i>Mean</i>	<i>Std. Dev</i>	<i>Min</i>	<i>Max</i>
<i>Average Number of Children per Family</i>	51	0.92	0.12	0.69	1.46
<i>Average Number of Children per Family with Children</i>	51	1.87	0.12	1.69	2.46
<i>Median Income</i>	51	48,660.76	9,201.45	33,631	69,682
<i>Percentage of Children with Health Insurance</i>	51	87.72	4.87	78.0	96.2
2000					
	<i>Obs.</i>	<i>Mean</i>	<i>Std. Dev</i>	<i>Min</i>	<i>Max</i>
<i>Average Number of Children per Family</i>	51	0.89	0.09	0.72	1.24
<i>Average Number of Children per Family with Children</i>	51	1.86	0.08	1.71	2.21
<i>Median Income</i>	51	53,225.29	8,092.21	38,227	70,989
<i>Infant Mortality</i>	51	7.34	1.51	5.0	13.5
<i>Percentage of Children with Health Insurance</i>	51	89.59	4.04	77.0	96.2
<i>Violent Crime</i>	50	242.7	141.50	47	898
<i>Property Crime</i>	50	1604.6	547.38	541	3207
<i>Drug Abuse</i>	50	558.76	329.21	122	2541
<i>Weapons</i>	50	90.98	65.97	15	384
2010					
	<i>Obs.</i>	<i>Mean</i>	<i>Std. Dev</i>	<i>Min</i>	<i>Max</i>
<i>Average Number of Children per Family</i>	51	0.82	0.08	0.67	1.19
<i>Average Number of Children per Family with Children</i>	51	1.87	0.09	1.75	2.26
<i>Median Income</i>	51	50,445.10	8,465.21	36,600	69,300
<i>Infant Mortality</i>	51	6.53	1.29	4.24	9.89
<i>Percentage of Children with Health Insurance</i>	51	91.28	3.53	82.5	97.8
<i>Violent Crime</i>	50	205.26	136.78	55	815
<i>Property Crime</i>	50	1227.12	396.49	346	1920
<i>Drug Abuse</i>	50	523.2	258.59	85	1591
<i>Weapons</i>	50	80	52.25	8	275

⁶ District of Columbia was removed when estimating crime measures

3.2 Econometric Model

To estimate the effect of family size on children's health and arrest rates we employ an ordinary least squares model (OLS). In our first model, we regress the different measures of quality on just the average number of children (per family):

$$QUAL = \beta_0 + \beta_1 NC + \varepsilon \quad (1)$$

where *QUAL* are the different measures of quality and *NC* are the different measures of family size. We will estimate this model for 1990, 2000, 2010, and a pooled estimation. Due to missing data for 1990, this estimation will consist of only one measure of quality: health, using the percentage of children with health insurance. As a result of this limitation, our pooled estimation will exclude 1990 when estimating infant mortality and crime measures.

In our second model we incorporate median family income into the first model. We obtain the following:

$$QUAL = \beta_0 + \beta_1 NC + \beta_2 MI + \varepsilon \quad (2)$$

once again, *QUAL* are the different measures of quality, *NC* are the different measures of family size and *MI* is the median family income. As before, we estimate this for 1990, 2000, 2010, and we pool these years. We face the same limitations with the 1990 decade as before.

CHAPTER 4

EMPIRICAL RESULTS

The results of Equation 1 and Equation 2 for 1990 are presented in Table 2. For 1990, there ceases to exist a quantity quality tradeoff when measuring children's quality by health insurance coverage. However, this is only significant when income is incorporated in the regression. Increasing family size by one child led to a higher increase in the percentage of children with health insurance for both average number of children per family and average number of children per family with children.

Table 2– Regression⁷ Results for 1990

Without Median Income	
	<i>Percentage of Children with Health Insurance</i>
<i>Average Number of Children per Family</i>	4.876 (0.39)
<i>Average Number of Children per Family with Children</i>	8.814 (0.1162)
With Median Income	
	<i>Percentage of Children with Health Insurance</i>
<i>Average Number of Children per Family</i>	6.802 (0.003)
<i>Average Number of Children per Family with Children</i>	10.68 (0.0009)

⁷ p-values are in parentheses

Table 3 presents the results for Equations 1 and 2 for 2000. We find that an increasing family size has a negative effect on infant mortality when using it as a proxy of health of children. This is significant regardless of the presence of income and for both, average number of children per family and average number of children per family with children. Changing our proxy of health to the percentage of children with health insurance yields the same negatively significant relationship with family size. Furthermore, we see a positive and significant

relationship between property crime and family size with and without the incorporation of income. Therefore, as a family increases their size by one child, juvenile property crime also increases. This supports the quantity-quality tradeoff argument as increasing juvenile arrest rates is not a positive externality for society.

Table 3– Regression⁸ Results for 2000

Without Median Income						
	<i>Infant Mortality</i>	<i>Percentage of Children with Health Insurance</i>	<i>Violent Crime</i>	<i>Property Crime</i>	<i>Drug Abuse</i>	<i>Weapons</i>
<i>Average Number of Children per Family</i>	-7.455 (0.002)	-9.862 (0.14)	-59.59 (0.81)	2901.3 (0.001)	647.06 (0.25)	86.19 (0.44)
<i>Average Number of Children per Family with Children</i>	-7.297 (0.004)	-7.708 (0.28)	-37.77 (0.88)	3401.1 (0.0001)	676.5 (0.24)	71.32 (0.54)
With Median Income						
	<i>Infant Mortality</i>	<i>Percentage of Children with Health Insurance</i>	<i>Violent Crime</i>	<i>Property Crime</i>	<i>Drug Abuse</i>	<i>Weapons</i>
<i>Average Number of Children per Family</i>	-5.895 (0.0008)	-14.46 (0.03)	-219.6 (0.10)	3172 (0.002)	385.8 (0.17)	21.82 (0.14)
<i>Average Number of Children per Family with Children</i>	-5.953 (0.0009)	-10.84 (0.082)	-153.1 (0.12)	3567 (0.0005)	472.4 (0.15)	21.39 (0.14)

⁸ p-values are in parentheses

In Table 4 we summarize the results of Equations 1 and 2 for 2010. As in 2000, we find a similar negative and significant relationship for both our health proxies. Property crime also remains positive and significant in 2010, however there is a change in the significance among drug abuse. In 2010, drug abuse is significantly positively related with family size in the presence of income and in the absence of income.

Overall when pooling all the years, infant mortality and family size continues to have a significantly negative relationship. For the most part, the percentage of children with health insurance proxy remained unchanged in relation to being negative and significant. However, with the absence of median income in the regression, the average number of children per family

with children loses significance. In addition, when violent crime is regressed on family size and income, for the pooled regression, it becomes significant but remains negative. The pooled regression also brings about a significantly positive relationship for weapons.

Table 4– Regression⁹ Results for 2010

Without Median Income						
	<i>Infant Mortality</i>	<i>Percentage of Children with Health Insurance</i>	<i>Violent Crime</i>	<i>Property Crime</i>	<i>Drug Abuse</i>	<i>Weapons</i>
<i>Average Number of Children per Family</i>	-5.689 (0.008)	-16.827 (0.004)	-37.63 (0.88)	1844.1 (0.006)	782.5 (0.08)	125.50 (0.17)
<i>Average Number of Children per Family with Children</i>	-4.222 (0.04)	-14.03 (0.01)	-201.3 (0.38)	2326 (0.0001)	733.9 (0.086)	41.393 (0.64)
With Median Income						
	<i>Infant Mortality</i>	<i>Percentage of Children with Health Insurance</i>	<i>Violent Crime</i>	<i>Property Crime</i>	<i>Drug Abuse</i>	<i>Weapons</i>
<i>Average Number of Children per Family</i>	-5.987 (0.002)	-16.04 (0.001)	-26.66 (0.42)	1833 (0.023)	808.9 (0.051)	130.8 (0.095)
<i>Average Number of Children per Family with Children</i>	-5.00 (0.005)	-12.30 (0.005)	-164.6 (0.33)	2321 (0.0009)	840.3 (0.037)	60.94 (0.21)

⁹ p-values are in parentheses

Table 5—Pooled Regression¹⁰ Results

Without Median Income						
	<i>Infant Mortality¹¹</i>	<i>Percentage of Children with Health Insurance</i>	<i>Violent Crime¹¹</i>	<i>Property Crime¹¹</i>	<i>Drug Abuse¹¹</i>	<i>Weapons¹¹</i>
<i>Average Number of Children per Family</i>	-3.896 (0.014)	-8.275 (0.014)	39.66 (0.80)	2850 (0.0000001)	681.87 (0.04)	113.08 (0.089)
<i>Average Number of Children per Family with Children</i>	-5.795 (0.0006)	-1.172 (0.748)	-131.9 (0.43)	2748.1 (0.000002)	697.8 (0.05)	53.07 (0.46)
With Median Income						
	<i>Infant Mortality¹¹</i>	<i>Percentage of Children with Health Insurance</i>	<i>Violent Crime¹¹</i>	<i>Property Crime¹¹</i>	<i>Drug Abuse¹¹</i>	<i>Weapons¹¹</i>
<i>Average Number of Children per Family</i>	-3.293 (0.004)	-8.623 (0.00001)	-36.47 (0.044)	2896 (0.0000007)	548.6 (0.01)	82.54 (0.01)
<i>Average Number of Children per Family with Children</i>	-5.791 (0.00007)	-.5138 (0.0003)	-137.4 (0.03)	2744 (0.00001)	686.7 (0.006)	50.62 (0.02)

¹⁰ p-values are in parentheses

¹¹ Does not include 1990

CHAPTER 5

CONCLUSION AND FUTURE RESEARCH

As previous studies in the United States have focused on education as a proxy for the quality of a child, this paper follows Zhong (2017) and Baez (2008) by examining health as a measure of quality of the children. We also spin off of Levitt, who argued that decreased crime rates are in part due to women's ability to better control their reproduction, by examining juvenile crime as a proxy for child quality. Overall our results are conclusive with Becker's findings. We find that a quantity-quality tradeoff exists when children's quality is proxied by health and crime factors. Due to data limitations, we aren't able to examine infant mortality and juvenile arrest rates for 1990.

We utilize an OLS model and examine these effects with the absence and presence of family income. Unlike previous studies which examine family size at the household level, our study examines family size at the state level. Therefore, states that tend to have more children per family such as, Utah, Idaho, and Alaska, may have children with poorer health and higher juvenile crime rates than states that tend to have less children such as, West Virginia, Tennessee, and North Carolina. Considering the limitations to data, further research could be conducted through facilitation of more accurate econometric models, such as use of a generalized method of moments model.

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