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Family, Neighborhoods, and Health

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ECONOMICS AT UPPSALA UNIVERSITY

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Dissertation presented at Uppsala University to be publicly examined in Hörsal 2, Ekonomikum, Kyrkogårdsgatan 10, Uppsala, Friday, 15 September 2017 at 10:15 for the degree of Doctor of Philosophy. The examination will be conducted in English. Faculty examiner: Professor Erik Plug (University of Amsterdam).

Abstract

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Essay 1: We use data from a large sample of adoptees born in Sweden to decompose the intergenerational persistence in health inequality across generations into one pre-birth component, measured by the biological parents' longevity, and one post-birth component, measured by the adopting parents' longevity. We find that most of the health inequality is transmitted via pre-birth factors. In the second part of the paper, we study the background to why children of parents with better educational attainments have better health by decomposing the association into one component attributed to the education of the biological parents and one to the adopting ones. We find that the association can mostly be attributed to the adopting parents, suggesting that parental resources per se, rather than pre-birth (genetic) differences, make up the parental education gradient in child health.

Essay 2: There are large differences in health across neighborhoods in Sweden. To try to answer if there is a causal link between neighborhood conditions in childhood and youth health, I apply two different empirical strategies. First, I use population wide data on families living in different areas in Sweden, and estimate the effects of childhood neighborhood on youth health using data on families that move across the country. Since the choice of moving and where to live is endogenous, I exploit the timing of moves and estimate the effect of siblings' different exposure time to neighborhoods. The second approach utilizes a governmental policy that assigned refugees to their initial neighborhood in Sweden, potentially offering exogenous variation in neighborhoods and allowing me to study the effect of different neighborhoods on youth health. The findings from the two strategies together imply that there are significant neighborhood effects on youth health, but that the effects are contemporaneous and there is no evidence of exposure time effects.

Essay 3: Previous research has shown that birth order affects outcomes such as educational achievements, IQ and earnings. The mechanisms behind these effects are still largely unknown. We examine birth order effects on health, and whether health at young age could be a transmission channel for birth order effects observed later in life. Our results show that firstborn children have worse health at birth. This disadvantage is reversed in early age and later-born siblings are more likely to be hospitalized for injuries and avoidable conditions. In adolescence and as young adults, younger siblings are more likely to be of poor mental health and to be admitted to hospital for alcohol induced health conditions. We also test for reverse causality by estimating fertility responses to the health of existing children. Overall our results suggest that birth order effects are due to differential parental investment because parents' time and resources are limited.

Essay 4: We study the short-, medium- and long-term consequences of health at birth using administrative data from Sweden for individuals born in the years 1973-1979. We contribute to a better understanding of the consequences of early life health by contrasting the effects of birth weight with two other measures of neonatal health: the length and the head circumference of the newborn. Our findings suggest that the use of birth weight alone might lead to an underestimation of the importance of early health. Furthermore, we find that there is a persistent effect of neonatal health on a variety of human capital measures in adolescence and adulthood.

Keywords: Health, Inequality, Mortality, Intergenerational Mobility, Birth-order, Neighborhoods, Birth, Childhood, Youth, Capabilities, Education

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Stockholm, June 2017
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Contents

Introduction

This thesis consists of four self-contained essays. The four essays all have two common themes which are health and equality of opportunity. Economists are interested in health mainly for two reasons; first health is a key part of our human capital (production input) and secondly health is important in itself as a central measure of wellbeing. From a human capital perspective, early life health is an important predictor for outcomes later in life such as educational attainment, labor market outcomes and adult health (e.g. Currie et al., 2010, and Case et al., 2005). Health is in both cases strongly related to people's capabilities and lifetime opportunities. Or as Angus Deaton writes in his book *The Great Escape (2013)* "Health is the obvious starting point for an enquiry into wellbeing. You need a life to have a *good* life…" (p.24).

The focus of this thesis is primarily on the development of human capabilities in early life. Previous research is pointing towards the importance of early childhood environment for the development of human capabilities (e.g. Currie and Almond, 2011; Cunha and Heckman, 2007). Heckman (2007) summarizes the evidence on the effects of early childhood conditions, and provides a framework for analyzing the origins of human inequality from a developmental perspective. At age *t*, human capability production can be written:

$$\theta_{t+1} = f_t(h, \theta_t, I_t), \quad \text{t=1,2,…,T,}$$

where θ is human capabilities (e.g. health, cognitive, non-cognitive skills), h is parental capabilities (e.g. genes, IQ, education) that are affected by their own parents' investments and genes, and I_t is parental investment in child capabilities. Substituting θ_t repeatedly, the stock of capabilities can be rewritten as a function of all past investments:

$$\theta_{t+1} = m(h, \theta_1, I_1, \dots, I_t),$$

where θ_1 is the genetic and environmental initial conditions received at conception. This model captures some important features of how human capabilities are produced and why investments in early childhood, and even during the fetal period, is key for understanding human inequalities.

In all four essays I utilize Swedish register data to study research questions that concerns equality of opportunity related to early childhood investments. The first essay studies the intergenerational transmission of health and mortality using data on Swedish adoptees to decompose pre-birth and

post-birth family influences. The second essay studies the role of childhood neighborhood conditions for youth health. The third essay concerns the inequality in health within families, across birth order. And the final essay studies the consequences of neonatal health, reflecting the fetal environment.

Intergenerational transmission

The dynamic process suggested by Heckman (2007) involves both the individual's genetic background and parental resources in the formation of health. There are several channels through which parental endowments and investments may affect the health outcomes of their children. Genes inherited from previous generations affect health, but parental investments in their children's health may also have long-term effects. Although such processes will inevitably lead to intergenerational persistence in health inequality, little is known about the intergenerational transmission in the population and about the relative contributions of these two channels. This is the question that Mikael Lindahl, Mårten Palme, Emilia Simeonova, and I study in the first essay.

Previous epidemiological research on mortality using data on Danish adoptees has shown a significant association between biological parents and adopted children, but none, or a weak, association with the adopting parents' mortality (see e.g. Petersen et al., 2005, 2008 and Sørensen et al., 1988). In the economics literature, studies have found that there is a genetic transmission of 20-30 percent for chronic health conditions such as asthma, severe headaches, diabetes and hay fever (Thompson, 2014), and that the adopting family influences health behavior such as drinking and smoking (Sacerdote, 2007) but little evidence is found for a nurture effect on BMI and obesity (Sacerdote, 2007, and Classen and Thompson, 2016).

There is a well-documented relationship between parental educational attainment and child health (see e.g. Case et al., 2002), and a strong intergenerational persistence in educational attainment (e.g. Björklund and Salvanes, 2011; Solon, 1999). This gives rise to the question of the origins of health inequality. Using data on Swedish adoptees, we extend the previous epidemiological literature by specifically studying the role of parental resources measured by educational attainment for long-term health outcomes. We study how both longevity and educational attainments of the biological parents – related to genetic factors and in-utero health – and the corresponding characteristics of the adopting parents – related to health formation and family circumstance during childhood and adolescence – affect the child's health and mortality later in life. We follow the methodology suggested by Björklund et al. (2006), and in their analysis applied to the intergenerational transmission of education and earnings.

Our decomposition results show that the intergenerational association in mortality can be fully attributed to pre-birth factors, because the association

between the life expectancy of the biological parents of the children given up for adoption is as strong as for the children raised by their biological parents. There is no significant association between the longevity of the adopting parents and the mortality risk of the adopted children. Analysis on the association between parental education and child health, show a significant positive effect of the adopting parents' educational attainment on child longevity. We find no such correlation between the biological parents' education and adopted children's mortality, suggesting that parental resources per se, rather than pre-birth (genetic) differences, make up the parental education gradient in child health.

Neighborhoods

The second essay concerns the health inequality across neighborhoods. In Sweden, life expectancy differs by approximately 4 years between areas with the highest and lowest longevity (Statistics Sweden, 2016). There are several reasons why neighborhoods might influence the accumulation of health capital. The seminal work by Jencks and Mayer (1990) identifies four potentially important mechanisms: Peer effects, neighborhood role models, monitoring, and community resources. There is a documented a correlation between places and children's life chances (e.g. Jencks and Mayer, 1990; Brooks-Gunn et al., 1993, and Haveman and Wolfe, 1995) and some evidence showing that neighborhoods are related to child and adolescent health (for reviews, see Leventhal and Brooks-Gunn, 2000, and Sampson et al., 2002).

On average, residents living in poor areas have worse health than residents in more affluent areas. This relationship might not be causal since it is likely that there are factors that impact both families' residential location and children's health, such as family background. In other words, we cannot make any causal claims regarding neighborhood effects by simply comparing children growing up in different areas. Previous experimental research has utilized housing mobility programs in the U.S, primarily the Moving to Opportunity (MTO) program, to study neighborhood effects on child health (e.g. Katz et al., 2001; Kling et al., 2007; and Ludwig et al, 2013). The findings suggest positive effects on female youth's physical and mental health, while the results for males generally show that they did not benefit from moving.

This essay utilizes two different methods to try to handle the problem of selection. The first which uses families that move across areas in Sweden, confirms the association between neighborhoods and health found in previous studies. To estimate causal effects of neighborhoods, I estimate neighborhood exposure time effect between siblings (Chetty and Hendren, 2016). However, no statistically significant effects are found for exposure time to neighborhoods using variation between siblings in time spent in neighborhoods during childhood. To investigate if this result arises because there are

no causal effects of neighborhoods on health, or because neighborhoods affect health instantly through contemporaneous environmental effects rather than through exposure time, I make use of a Swedish governmental policy that placed refugee families in their initial neighborhood. The results from the second empirical strategy confirm the findings in the first part of the paper. Together the results from the two parts imply that there are causal neighborhood effects on youth health, but these effects are instant and do not work through neighborhood exposure time.

Birth order

The third essay is related to inequalities within families. A vast number of studies in various research disciplines have shown that younger siblings have lower educational achievements, IQ and earnings than their older siblings (e.g. Behman and Taubman, 1986; Black et al., 2005; Barclay 2015; and Black et al., 2015). The mechanisms behind these effects are still debated and previous empirical research has struggled to identify the channels. In this third essay Helena Svaleryd and I study how health differences across birth order develops through childhood and, by studying different sorts of health conditions, we try shed some light on the mechanisms giving rise to the negative birth order effect on later life outcomes.

Several hypotheses about the mechanisms through which the birth order effect works have been suggested, including the resource dilution hypothesis (Blake, 1989), strategic parental behavior (Hotz and Pantano, 2015), sibling influences (Zajonc, 1976) and birth endowments. We find that firstborns are disadvantaged at birth. Firstborn children are more likely to be hospitalized for perinatal conditions and congenital malformations in early childhood. We also find that lower birth order children are more likely to die during infancy.

The disadvantage of older siblings is, however, reversed as the child grows older. The causes for hospitalization suggest that later-born siblings are involved in more risky behavior and have a less healthy life style during adolescence. In particular, later-born siblings are more likely to be admitted to hospital for diagnoses related to poor mental health, alcohol consumption, self-harm and injuries. Our results support the hypothesis that birth order effects are due to lower investment in children with a higher birth order. This is in line with the dilution hypothesis presented in Blake (1989) and the finding in Price (2008) that parents spend more time with earlier-born than later-born siblings.

In this essay we also test for reverse causality by estimating fertility responses to the health of existing children. We conclude that the effects on health are not severely biased; however, the large negative birth order effects on infant mortality are partly due to endogenous fertility responses. Parents'

endogenous fertility response to the health and death of previous children lends further support to the hypothesis that parents are resource constrained.

Fetal environment

The forth essay concerns inequality in the very early period, studying the fetal environment. The importance of newborn health for a variety of outcomes throughout the life cycle has been documented in a vast, interdisciplinary literature (see, e.g. Almond et al., 2017, for the most recent review). The main measure of neonatal health used in this literature is birth weight, which has been shown to be associated in a meaningful way with a variety of outcomes ranging from health to education and wages (see e.g. Almond et al., 2005; Black et al., 2007; Figlio et al., 2014).

Birth weight is relatively easy to measure, widely available in several data sources, and contains little measurement error. However, it mainly captures the uterine environment in the last weeks of gestation, at the time when the fetus gains most of his weight. One active area of research in the fetal origins field focuses on searching for more sensitive and predictive measures of health at birth (Torche and Conley, 2016). Differently from birth weight, birth length and head circumference are longer-term cumulative indicators, reflecting the fetal environment since an earlier period, given that the process of formation of bones and neural synapses starts earlier in gestation. Literature in medicine and epidemiology has documented how birth length and head circumference are differentially associated with prenatal investments, such as smoking, alcohol use, and nutritional supplementation (see e.g. Lindley et al., 2000; Ramakrishnan et al., 2010; Shankaran et al., 2004).

In essay four, Aline Bütikofer, Gabriella Conti, Mårten Palme, Kjell Salvanes and I contrast the effects of birth weight with the length and the head circumference of the newborn to gain a better understanding of early life health. We use administrative data for Sweden on a sample of births between 1973 and 1979 to investigate the short, medium and long-term consequences of neonatal health. We employ a decomposition technique recently proposed by Gelbach (2016), which allows us to shed light on the mechanisms through which birth weight impacts later outcomes. Furthermore, by using information on head circumference at birth to distinguish between different types of growth-restricted newborns, we are able to show the relative importance for health and cognitive outcomes of insults differentially affecting the brain. Overall, the findings in the fourth essay emphasize the importance of not focusing exclusively on birth weight when studying neonatal health.

Concluding remarks

This thesis shows that pre-birth factors affect adult health outcomes. Related to the Heckman model introduced in the first section, the first essay shows that the genetic and initial environment θ_1, is important for long-term health outcomes. That the intrauterine environment and investments before birth have a long-term impact is further supported by the analysis in essay four, showing that different measures of health at birth are strong predictors of later outcomes later in life, even within twin pairs. This thesis also shows that investments and upbringing environments in later periods are central for the development of human capabilities. The first essay finds that the adopting mother's educational attainment is a strong predictor of longevity, and the results in the second essay indicate that neighborhoods have a causal effect on youth health. The third essay shows that even within families, there are large differences in health outcomes depending on the order in which the siblings were born and results indicate that these differences might be related to differential parental investments. The findings in this thesis combined show that there is scope for designing policies that enhance children's equality of opportunity.

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