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November 2014

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## ABSTRACT

### **Gary Becker on the Quantity and Quality of Children<sup>\*</sup>**

This paper reviews Gary Becker's contributions to the economic analysis of fertility, from his 1960 paper introducing the quantity-quality tradeoff to later work linking the economics of fertility to the theory of economic growth.

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# 1 Laying the Foundations of the Economic Theory of Fertility

Before Gary Becker, fertility choice was widely considered to be outside the realm of economic analysis. Apart from intellectual tradition, one reason for this was that the data on fertility did not immediately suggest an economic mechanism. In industrialized countries, fertility had declined strongly over time, even though family incomes were rising. Similarly, in many studies using cross-sectional data that relationship between family income and fertility had shown to be either flat or declining. To many observers, these observations suggested that the “taste” for children had waned over time and that high-income families placed less value on childbearing than the poor.

Nevertheless, Gary Becker’s seminal paper on the theory of fertility choice (Becker 1960) argued that an economic model that treated children as analogous to consumer durables such as cars or houses could explain the data. His paper departed from earlier theorizing on fertility by demographers and sociologists in two different and equally important ways. First, his analysis assumes that preferences are given. The assumption of given preferences is what puts the “economics” into Becker’s analysis. By ruling out shifts in tastes, Becker’s theory of fertility choice places the spotlight on changes in income and relative prices for explaining trends in fertility. Conversely, the potential role of factors such as religion, culture, and the “relative income” of different generations later emphasized by Richard Easterlin (1978) is left aside.<sup>1</sup>

The second departure from earlier theories is the focus of this essay, namely the concept of a quantity-versus-quality tradeoff in fertility choice. Introducing child quality was what allowed Becker to account for the observed empirical relationships between income and fertility.

Without a quality dimension, from the perspective of standard consumer theory the lack of a strong income effect on fertility appears puzzling. Of course, in principle it is possible that children happen to be an inferior good. However, assuming that children are inferior is unattractive for two separate reasons. First,

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<sup>1</sup>Becker acknowledges that tastes may vary across families, but his 1960 paper is not concerned with explaining such variation. In later work, Becker did pioneer economic analyses of changing tastes; see Stigler and Becker (1977), Becker (1996), and Becker and Mulligan (1997).

inferior goods are usually inferior because there exist close substitutes that are superior; for instance, bus rides tend to be inferior because people buy cars and drive rather than ride the bus as they get richer. In the case of children, it is difficult to think of any close substitute. Second, fertility is not always declining in income; in his paper, Becker points to evidence that the income-fertility relationship switches to positive for very high income levels.

In his 1960 paper, Becker conjectured that parents derive utility from both child quantity (i.e., the number of children) and the quality of children, which can be proxied by the amount spent on each child at given prices. As examples of child quality choices, Becker mentions whether the parents provide “separate bedrooms, send them to nursery school and private colleges, give them dance and music lessons, and so forth.”

The mere fact that there is a quality dimension does not immediately affect the income elasticity of the demand for children; this depends on whether child quality or quantity respond more strongly to income changes. Becker’s argument for a low income elasticity of child quantity and a high income elasticity of child quality rests on an analogy with other consumer durables, such as cars or houses. As households get richer, for the most part they do not buy larger numbers of cars or houses, but instead go for higher quality (a BMW instead of a Chevy, or a house with more bedrooms and bathrooms). On this basis, Becker concludes that the income elasticity for child quality (i.e. spending per child) should be high, whereas the elasticity of quantity (i.e., number of children) should be low.

In addition to household income and the costs of children, Becker also considers knowledge of birth control (or the lack thereof) as a possible determinant of fertility. Even before the spread of modern methods of birth control, couples had ways to limit the number of births, through measures such as delaying the age of marriage, reducing the frequency of sex during marriage, or living abstinent altogether. In his 1960 paper, however, Becker allows for the possibility that not all couples are equally skilled at controlling fertility, and he conjectures that knowledge of birth control is increasing with family income. Becker argues that variation in the knowledge of birth control explains why fertility strongly declines with income at relatively low income levels, whereas the relationship

between income and fertility flattens and eventually turns upward at high income levels. In his theory, the relationship between income and *desired* fertility is generally positive (albeit with a low slope), but the relationship between income and *realized* fertility is initially declining, because lower-income households are less successful at controlling fertility. In the sense that the lack of knowledge of birth control among poorer households is assumed rather than derived from economic incentives, Becker's 1960 paper does not yet go all the way in founding fertility choice in economics.

## 2 Refining the Theory

The next steps in Becker's research program on fertility further sharpened the focus on the quantity-quality tradeoff. In Becker and Lewis (1973), lack of knowledge of birth control is no longer mentioned as an explanatory factor, and instead the relationship between child quantity and quality is placed front and center and made more precise. The main argument in Becker and Lewis is that even if child quantity and quality enter separately in utility, they are still closely connected through the household's budget constraint. Child quality is modeled as goods spending on each child. This implies that if child quality increases (more spending per child), increasing quantity (more children) becomes more expensive. Conversely, if quantity increases, increasing quality also becomes more costly, because the spending on quality accrues for each child. While this tradeoff was implicit in Becker's original vision, the 1960 paper did not contain formal analysis and thus did not focus on this issue.<sup>2</sup>

An important implication of the tradeoff between quantity and quality through the budget constraint is that the income elasticity of fertility can be negative even if, viewed in isolation, both the quantity and quality of children are normal goods. If child quality is normal, a rise in income will increase quality. The rise in child quality, in turn, increases the shadow price of child quantity. The net effect on child quantity is therefore a combination of the direct income effect (positive if child quantity is a normal good) and a negative substitution effect. Thus,

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<sup>2</sup>Willis (1973) also provides a formal analysis of the quantity-quality tradeoff, published in the same issue of the *Journal of Political Economy* as Becker and Lewis (1973).

the theory can generate a negative income-fertility relationship without having to rely on variations in knowledge of birth control.

Building on ideas from Becker's "Theory of Social Interactions" (Becker 1974), Becker and Tomes (1976) extend the Becker-Lewis model by allowing child quality to depend not just on parental inputs, but also on "endowments," which can take the form of inherited ability, public investments in children, and other factors. One consequence of the presence of endowments is that the income elasticity of child quality tends to be higher at low income levels, since for low-income parents the endowment represents a larger fraction of total child quality. Becker and Tomes show that this feature can generate a U-shape relationship between income and fertility, even if the income elasticities with respect to child quantity and total child quality (the sum of endowment and parental investment) are equal and constant. Becker and Tomes also discuss the predictions of the theory if child endowments depend on parental income, and they consider the impact of economic growth on fertility. While this is done within a static model, the analysis anticipates later work on the quantity-quality tradeoff in the context of explicitly dynamic, intergenerational models of fertility choice.<sup>3</sup>

### **3 Linking Fertility Choice to Economic Growth**

For the first 25 years after Becker's seminal 1960 paper, the economics of fertility was, for the most part, a self-contained area of research: economics was used to analyze fertility, but the results had only limited impact on other areas of economic research. This changed substantially once Gary Becker, in joint work with Robert Barro, linked the economic theory of fertility to the theory of economic growth. Becker and Barro (1988) analyze fertility within an explicit intergenerational model in which altruistic parents derive utility from the number of their children and the children's utility.<sup>4</sup> Thus, child quality is no longer an abstract good related to spending on children, but consists of the children's wellbeing itself. Moreover, the children are themselves altruistic towards their own children, which induces in parents a form of "dynastic utility" that depends on the

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<sup>3</sup>Becker provides expanded discussions of the Becker-Lewis and Becker-Tomes models in his "Treatise on the Family" (Becker 1981).

<sup>4</sup>A simplified version of the model is discussed in Becker and Barro (1986).



children's utility, the grandchildren's utility, and so on.<sup>5</sup> The theory (which is carried out in a small-open-economy setting) implies that fertility should be positively related to interest rates. Intuitively, the substitution effect generated by a higher interest rate induces the dynasty to increase the consumption of later generations (children, grandchildren etc.) relative to that of the parents. This shift in the consumption path of the dynasty increases the utility that parents derive from the wellbeing of their children, and hence increases desired fertility.<sup>6</sup> Barro and Becker use their framework to account for the fall and rise of fertility during the Great Depression and the post-war baby boom in the United States, and in Barro and Becker (1989) they further extend the analysis by incorporating general equilibrium.<sup>7</sup>

The ultimate impact of the economics on fertility on the theory of economic growth is in large part due to Becker, Murphy, and Tamura (1990), which links the dynastic Barro-Becker fertility model with one of the other central topics of Becker's research, namely human capital. The authors model a closed economy with endogenous fertility where human capital is the engine of growth, as in Lucas (1988). People's productivity has two components, innate ability (such as raw physical strength) and acquired human capital. Even though the technology for accumulating acquired human capital is linear, the presence of innate ability implies that the rate of return to investing in acquired human capital increases in the stock of human capital. Intuitively, at low levels of human capital, acquired human capital accounts for a small fraction of earnings, so that a given percentage increase in acquired human capital increases earnings by a small amount. Becker, Murphy, and Tamura show that the economy exhibits two steady states, one in which income per capita stagnates and fertility is high, and one in which there is sustained growth in income per capita and fertility is low. Thus, the model provides a joint explanation for the demographic and economic differences between pre-industrial, Malthusian economies (characterized by stagnation, a low return

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<sup>5</sup>Becker first analyzed intergenerational linkages in human capital in Becker and Tomes (1986), but without considering endogenous fertility.

<sup>6</sup>The prediction of a positive link between real interest rates and fertility was shown to line up with cross-country fertility differences by Manuelli and Seshadri (2009).

<sup>7</sup>See Jones and Schoonbroodt (2014) for a recent expanded analysis of the implications of the Barro-Becker model for the interaction between economic and demographic cycles.

to human capital, and high birth rates), and growing, industrial economies with low population growth.

The Becker-Murphy-Tamura model placed endogenous fertility, and the quantity-quality tradeoff in particular, at the center of perhaps the most important question in economics, namely why some countries are rich and others are poor. The two regimes that characterize the least and most advanced economies, Malthusian stagnation and sustained growth, arise as separate equilibria in a single framework.

To be sure, the Becker-Murphy-Tamura model had limitations. For example, the stagnation steady state is not truly Malthusian in the sense that there is no income-population feedback, and the model offered no explanation for how countries manage to transition from stagnation to growth, as all now industrialized countries did during the past 200 years. However, these questions were addressed by the large literature on unified growth theory that was motivated, at least in large part, by Becker, Murphy, and Tamura (1990).<sup>8</sup> In unified growth models (see Galor 2005 for a survey), endogenous fertility is a crucial element to account for the phase of Malthusian stagnation, and in most theories Becker's quantity-quality tradeoff is a key element to account for the joint demographic transition and economic takeoff that characterizes successful economies.

## 4 The Quantity-Quality Model After 50 Years

The quantity-quality model has been the dominant theoretical framework in the economics of fertility over the past 50 years. It remains to be seen which role the quantity-quality tradeoff will play in fertility research in the next 50 years. Recently, a number of studies have cast doubt on the empirical relevance of the tradeoff in industrialized countries. Studies using twin births to identify exogenous variation in family size using data from Norway and Israel have found little or no impact of family size on education (Black, Devereux, and Salvanes 2005, Angrist, Lavy, and Schlosser 2010). In contrast, similar studies using data from

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<sup>8</sup>See Galor and Weil (2000) for the seminal paper in this literature. In Becker, Murphy, and Tamura (1990), a transition to growth is possible if a series of large shocks displaces the economy from the stagnation steady state; see the discussion in Becker (1992).

developing countries have found evidence in support of the quantity-quality tradeoff (Rosenzweig and Wolpin 1980, Rosenzweig and Zhang 2009).<sup>9</sup>

Taking account of institutional differences between rich and poor countries, the contrasting findings are perhaps not surprising. In most industrialized countries schooling is now publicly provided at little or no cost to parents. Moreover, child-labor restrictions ensure that the opportunity cost of children's time is low. In such a setting, it appears natural that the expense of having an additional child does not induce parents to pull children out of school at an earlier age. In developing countries, however, there is less provision of high-quality public education, and child labor is still common. These features imply a high opportunity cost of education, and we would expect the quantity-quality tradeoff to be central in shaping fertility and education choices.<sup>10</sup> Consistent with this interpretation, contemporary research on fertility in industrialized countries has often focused on aspects other than the quantity-quality dimension, such as the opportunity cost of female time and more generally the fertility-female employment tradeoff.<sup>11</sup> In contrast, the quantity-quality tradeoff continues to be a central element in studies focusing on developing countries that are still undergoing the demographic transition.

## 5 Conclusion

Gary Becker's work has pioneered the economic approach to explaining fertility behavior, and his research has been instrumental in elevating the economics of fertility from a specialty topic to an integral part of labor economics, the economics of education and human capital, and the theory of economic growth.

On a personal note, I was lucky enough to have Gary Becker as one of my thesis

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<sup>9</sup>Using a different methodology based on a natural experiment of disease eradication, Bleakley and Lange (2009) find evidence in favor of the quantity-quality tradeoff in the American South in the first decades of the twentieth century. Given that the American South was a fairly poor agricultural economy at the time, the result is consistent with the general theme of a stronger tradeoff in developing-country settings.

<sup>10</sup>In line with this intuition, de la Croix and Doepke (2009) develop a quantity-quality fertility model with a choice of public versus private schooling, and show that the quantity-quality tradeoff is operative only for parents with children in private schools. The authors find support for the predicted relationships between income, fertility, and schooling choices in U.S. census data.

<sup>11</sup>See for example Adda, Dustmann, and Stevens (2011) and Doepke, Hazan, and Maoz (2014).

advisers at the University of Chicago, and I will be forever grateful for his advice and support. Most of my work to this day consists of incorporating Gary's ideas and innovations into macroeconomic settings, and the work that grew out of my dissertation research (de la Croix and Doepke 2003, Doepke 2004, Doepke 2005, all of which revolves around the quantity-quality tradeoff) benefited tremendously from his feedback. Moreover, seeing Gary dissect economic research on any topic in the "Workshop on Applications of Economics" at the University of Chicago every Monday afternoon was an unforgettable privilege. He will be greatly missed.

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