Nutritional Deficits and the Quantity-Quality Trade-off: Evidence from an Exogenous Fertility Shock in Low-Income Urban Settings in the Philippines

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This paper examines whether increased fertility affects early-life nutritional outcomes in low-income urban households. I exploit a natural experiment created by a 1990 policy in Manila, Philippines, which banned modern contraceptives from city-run health facilities. Using a difference-in-differences framework and nationally representative data from the Philippine Demographic and Health Surveys, I estimate the reduced-form impact of the policy on child height-for-age and weight-for-height. [Will add more after data analysis]
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I. Introduction

The trade-off between child quantity and child quality is a foundational concept in the economics of the family. First articulated by Becker (1960) and extended in subsequent models of household behavior (Becker and Lewis, 1973; Becker and Tomes, 1976), this framework posits that parents allocate finite resources—both financial and non-financial—across children. An increase in fertility reduces the resources available per child and, under binding constraints, may lead to lower investments in health, education, and other forms of human capital. This mechanism has served as an explanatory model for changes in fertility behavior and the evolution of population structures in low- and middle-income countries.

Empirical investigations of the quantity–quality trade-off have focused primarily on educational outcomes. Studies in both high-income and low-income settings have examined the effects of fertility on school enrollment, grade progression, test scores, and completed years of schooling (Rosenzweig and Wolpin, 1980; Black, Devereux and Salvanes, 2005; Angrist, Lavy and Schlosser, 2010). These

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outcomes serve as accessible proxies for long-run human capital accumulation, but they represent only one dimension of child quality. Other outcomes, such as nutritional status, are early-onset or biologically constrained. They also tend to be less responsive to remediation later in life. A child who suffers from chronic malnutrition may exhibit permanently reduced cognitive capacity and face limits in physical development that affect long-run productivity regardless of subsequent educational access (Hoddinott et al., 2013; Grantham-McGregor et al., 2007).

The exclusion of nutritional outcomes from much of the empirical literature leaves an important dimension of the trade-off untested. Nutritional investments in early childhood are essential to early childhood development and long-term outcomes (Victora et al., 2008; Hoddinott et al., 2013). They shape brain development, immune system functioning, and physical stature, and they have been shown to predict later-life earnings and health outcomes across a wide range of settings (Grantham-McGregor et al., 2007; Alderman, Hoddinott and Kinsey, 2006). The biological irreversibility of early-life nutritional deficits further distinguishes them from other forms of investment. Educational deficits may be partially remediable; nutritional failures often are not. A credible estimate of the trade-off between fertility and child quality must account for nutrition if it aims to assess the full set of consequences associated with fertility shocks.

This study addresses this gap by examining the nutritional effects of a localized, exogenous increase in fertility in the Philippines. In 1990, the mayor of Manila implemented an executive policy that prohibited the provision of modern contraceptives in all city-run health facilities. The order removed access to pills, condoms, intrauterine devices, and related public health materials and instructed healthcare providers to offer only natural family planning methods. This policy remained in place for nearly a decade and affected only the jurisdiction of the Manila city government. The national government did not implement a comparable restriction, and surrounding cities within Metro Manila continued to provide access to modern contraceptives. The policy thus created a spatial and temporal discontinuity in contraceptive access that was uncorrelated with underlying fertility preferences or concurrent shifts in household income or governance. As a result, the Manila ban serves as a quasi-experimental source of variation in fertility exposure among poor urban households.

I use this natural experiment to estimate the causal effect of increased fertility on child nutrition. The analysis relies on nationally representative data from multiple waves of the Philippine Demographic and Health Survey (DHS), which provide data on household structure and maternal characteristics, as well as measurements of child anthropometry. The outcomes of interest are height-for-age and weight-for-height z-scores, which serve as standardized indicators of chronic and acute malnutrition, respectively. These outcomes are widely used in the global health and development literature and capture nutritional deprivation over both long and short time horizons (Victora et al., 2008). The empirical strategy follows a difference-in-differences design that compares child outcomes

in Manila and comparable urban areas before and after the onset of the policy.

The identification strategy rests on two key assumptions. First, in the absence of the contraceptive ban, nutritional trends in Manila would have evolved in parallel with those in comparison cities. Second, any other policy or economic shocks affecting Manila during the study period must not coincide precisely with the timing and scope of the contraceptive policy. I test these assumptions using falsification checks, placebo comparisons, and robustness specifications that include city-specific time trends, maternal fixed effects, and controls for baseline demographic differences.

The analysis proceeds in three stages. I first replicate existing work (**?**) to confirm that the contraceptive ban led to an increase in fertility among affected women. I then estimate reduced-form effects of policy exposure on nutritional outcomes for children under five years of age. Finally, I examine heterogeneity in effects across subsamples defined by maternal education, household wealth, and access to prenatal care. These dimensions serve as proxies for household resource availability and capacity to buffer the nutritional consequences of fertility increases.

This research contributes to the literature in several respects. It introduces new evidence on the nutritional consequences of fertility shocks in an urban developing-country context. It expands the measurement of child quality beyond educational outcomes to include biological indicators. It also adds to the limited body of work that uses plausibly exogenous variation in reproductive health policy to study downstream effects on human capital. More broadly, the findings underscore the potential for local family planning restrictions to generate unintended consequences for child well-being in settings characterized by poverty, food insecurity, and institutional fragility.

II. Review of Related Literature

A. Theoretical Background

The quantity–quality (Q–Q) trade-off is a core idea in the economics of fertility. It formalizes the constraint that when parents face a fixed income, they must allocate limited resources between the number of children they have and the amount invested in each child's development. In this framework, "quality" refers to any investment that raises a child's human capital—such as nutrition, education, healthcare—while "quantity" refers simply to the number of children. Because these investments are resource-intensive, increasing one often comes at the expense of the other.

Becker's foundational model (Becker, 1960) formalizes this as a constrained optimization problem. A household maximizes utility over the number of children n, child quality q, and consumption c:

$$\max_{n,q,c} \quad U(n, q, c)$$

subject to the budget constraint:

$$I = c + n(p_n + p_q q),$$

where I is household income, p_n is the fixed cost per child (e.g., food, shelter), and p_q is the marginal cost of investing in child quality. The budget constraint makes the trade-off explicit: increasing n reduces how much can be spent on q, and vice versa.

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Mathematical Appendix