Prenatal Health Investment Decisions: Does the Child's Sex Matter?

Aparna Lhila[1]
Department of Economics
Cornell University

Kosali Simon[2]
Department of Policy Analysis and Management
Cornell University and NBER

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Abstract:

We test whether parents invest differently in the prenatal health of U.S.-born boys versus girls using birth certificate data from 1989-2001 on maternal prenatal behaviors (e.g. smoking, weight gain, and prenatal care use) and child health outcomes at birth (e.g. birth weight). Ultrasound receipt proxies for knowing fetal gender, enabling us to separate out child sex-related biological differences from investment differences in sons' and daughters' health. Knowledge of child gender does not appear to drive prenatal health investments in the U.S., both in the population as a whole and among first generation immigrants from India and China.

Summary:

Individuals combine medical care and other market goods with their own time to invest in their own health, but children are a special case as they rely on their parents to act as agents on their behalf. This is especially so in the case of prenatal health investments. In this paper, we seek to answer the question: Do parents allocate resources differently in improving the prenatal health of US born boys versus girls when the sex of the child is known in advance? We pay special attention to the prenatal health investment decisions of first-generation immigrant parents who were born in countries with demonstrated son preference. This paper contributes to the literature in three ways – first, previous studies have focused on parental *post*-natal investments in child well-being, whereas we study gender preference with regard to *pre*natal health investments, a relationship that has not been studied to date. Second, we add to the relatively small body of literature on gender preference in U.S. Finally, we study the persistence of gender preference among immigrant children, a question that to our knowledge has not been studied despite the preponderance of evidence on son preference from certain countries. Data from the 1989-2001 U.S. Natality Detail Files, which contains information on the universe of live births in the U.S., and the 1988 National Maternal and Infant Health Survey are used to compare the prenatal investment decisions of mothers who have an ultrasound and eventually have a girl versus a boy. Information on mothers who do not have an ultrasound is used to control for common differences in prenatal investment behavior that may arise due to fetal gender. We find that knowing fetal gender is female is not systematically associated with any differences in prenatal health investments among children born in the US. Perhaps more striking is that Indian and Chinese immigrant mothers also do not exhibit son preference in their prenatal investment decisions.

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[1] Aparna Lhila is a Ph.D. candidate in the Department of Economics at Cornell University, Ithaca NY 14853, and is the corresponding author (al243@cornell.edu)
[2] Kosali I. Simon is an Assistant Professor in the Policy Analysis and Management Department, Cornell University and a Faculty Research Fellow at the National Bureau of Economic Research.
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Introduction

Individuals combine medical care and other market goods with their own time to invest in their own health (Grossman, 1972). Children, however, are unable to invest in their own health, and parents act as agents who make intra-household resource allocation decisions regarding the health of their children.[3] In this paper we study one class of health investment decisions, i.e. prenatal health investments that impact maternal health, but may ultimately be viewed as investments in the health of the unborn child. Prior to the prenatal health investment decisions, parents make the choice to either terminate the pregnancy or carry the pregnancy to term (Grossman and Joyce, 1990). This paper focuses on the set of investment choices that parents make after deciding to carry the pregnancy to term, and seeks to answer the question: Do parents in the U.S. who choose to give birth allocate resources differently in improving the prenatal health of their sons and daughters when the sex of the child is known in advance? We pay special attention to the prenatal health investment decisions of first-generation immigrant parents who were born in countries with demonstrated son preference.

Gender biased investments in child health are well documented in the development literature, especially with regard to parents in South and Southeast Asia (eg Sen, 1992; 2003). That American parents have preferences regarding the sex-mix of their children with regard to fertility stopping rules is well documented (eg Angrist and Evans, 1998), and a recent paper by Dahl and Moretti (2004) provides evidence that American parents' decisions regarding marriage and divorce are also guided by their preference for

[3] Currie (2004) provides a review of the economic motivation for studying factors that affect child health and examples of recent research.

sons.[4] These decisions are inherently resource allocation decisions that are likely to affect the well-being of girls and boys differently. Similarly, prenatal health investment decisions, if guided by son preference, may adversely impact the health of girls and place them at a greater disadvantage compared to boys at birth. For the U.S., it may be especially policy relevant to test for gender preference among immigrant mothers because they give birth to approximately 20% of U.S. children born every year.[5] This paper provides an empirical estimate of the magnitude of the effect of knowing fetal gender in advance on prenatal health investments and child health, which can serve as a guide for whether targeted prenatal policy intervention is warranted in cases where such disparities may exist.

No U.S. or international research, to our knowledge, has studied whether parents are guided by gender preference in their prenatal health investment decisions. In this paper we test whether parents/mothers[6] who are likely to know the child's gender during pregnancy (as a result of having an ultrasound) invest differentially in the health of boys versus girls by actions such as avoiding prenatal smoking and drinking, adequacy of prenatal weight gain and the frequency and adequacy of prenatal care. We use data from the 1989-2001 Natality Detail Files and are able to overcome a common hurdle faced by many studies of gender bias in parents' health investment decisions. Most existing studies are unable to separate out differences that occur due to biological reasons (e.g. boys may have systematically different unobservable underlying health conditions and thus may be taken to see a physician at a different rate than a girl, even controlling for

[4] There are other studies suggesting that this phenomenon may be lessening over time (e.g. Pollard and Morgan, 2002). Neither that study nor Dahl and Moretti (2004) considers immigrants separately.
[5] Authors' calculations from Natality Detail data 1989-2001
[6] We will use the term 'mother' in the rest of the text, although we will return to discuss the role played by fathers vs. mothers in the decisions we study.

other characteristics) from the differential investment decision. We are able to control for behavioral differences that may arise due to biological differences between a female and male fetus by using the method developed in Dahl and Moretti (2004). The gender difference in the prenatal behavior of mothers who did not have an ultrasound (and hence did not know the sex of the child in advance) are used to separate out the natural difference from the investment difference that is driven by preferences regarding the sex of the child.

We choose to focus on mothers' prenatal investment decisions, because prenatal health behaviors are potentially modifiable decisions that have utility consequences for mothers, and are important in influencing birth outcomes and shaping the long-term health of their children. There is a debate among public health researchers on the relative importance of genetics versus prenatal care. However, the investments and behaviors considered in this paper have utility consequences, such as the time and money costs of prenatal health care visits, the social and psychological costs of tobacco and alcohol abstention, or difficulties of attaining suggested weight gain goals. These costs and benefits give rise to demand functions for child health inputs which will vary across women, perhaps systematically related to whether the fetus she carries is a boy or a girl. If U.S. parents do in fact favor sons, we expect to find that after controlling for the effect of biology, knowing that the unborn child is female may, at the margin, have a negative impact on demand for prenatal care and health outcomes at birth. This effect may differ according to socioeconomic and cultural identity; in particular, it may be more pronounced among first generation immigrant mothers who were born in countries with a history of son preference, such as India and China.

This paper contributes to the literature in three ways – first, previous studies have focused on parental *post*-natal investments in child well-being, whereas we study gender preference with regard to *pre*natal health investments, a relationship that has not been studied to date. Second, we add to the relatively small body of literature on gender preference in U.S. Finally, we study the persistence of gender preference among immigrant mothers, a question that to our knowledge has not been studied despite the preponderance of evidence on son preference in mothers' country of birth.[7]

In the next section we discuss the previous literature relating to parental gender preference to place our contribution in context. We then present the theoretical framework underlying our analysis along with a description of the various measures of prenatal investments examined in this paper in Section II. Section III describes the method used to identify the effect of gender preference on mothers' prenatal investment decisions and demand for prenatal care. Section IV introduces the data, the limitations it poses on our analysis and our solutions to those problems. Section V presents the results of our difference-in-differences estimation, and Section VI concludes.

I. Prior literature

Parental investment decisions into the health and well-being of their children, both prenatally and postnatally are preceded by parents' decision to terminate unwanted pregnancies. When abortion costs are low, parents choose to terminate unwanted pregnancies which would have otherwise resulted in babies born in the lower tail of the prenatal health investment and birth outcome distribution (Grossman and Joyce 1990; Joyce and Grossman 1990; Joyce, Kaestner and Korenman 2000). This paper addresses a

[7] A recent exception of which we became aware after writing this paper is Abrevaya (2005) who finds evidence consistent with gender influencing the abortion decisions of certain immigrant groups. We use data only on live births in our analysis.

particular form of wantedness, i.e. a pregnancy may be unwanted if parents do not desire a child of that sex. Unlike the existing literature on unwantedness, we assume that there may be a variety of costs related to abortion (particularly at the stage of pregnancy when gender is discerned) such that not all unwanted pregnancies result in abortions and that parents may invest differently in the prenatal health of their sons and daughters when they know the sex of the child in advance. The development and family economics literatures provide evidence of gender biased investments into the post-natal health and well-being of children.

A large body of literature documents gender preference in developing countries, where it generally takes the form of preference for boys. Son preference affects the distribution of household resources and fertility, which are investments in child well-being. Female fetuses are less likely to be carried to term, and daughters who are born are more likely to be in poorer health and face a higher risk of mortality during childhood, compared to sons. The higher rate of female mortality in the first five years of life has been attributed to parents choosing to invest resources, such as food, nutrients and medical care in sons (D'Souza and Chen 1980, (B.) Miller 1981, Bardhan 1982, Rosenzweig and Scultz 1982, Kynch and Sen 1983). In addition to affecting the probability of mortality, daughters who survive are likely to be in poorer health as measured by anthropometric indicators like height-for-age and weight-for-height (Sen and Sengupta 1983, Sen 1984, Behrman 1988). Researchers also find that the extent of discrimination against daughters may differ with birth order so that higher order girls are less likely to receive high quality nutrition and medical care (Chen, Huq and D'Souza 1981, Das Gupta 1987).

Parents' desire to invest in the health of their sons may also drive parents' fertility and marriage decisions. In Egypt the probability of using contraception increased with the number of sons in the household (Aly and Shields 1991). Among Indian households in South Africa, the duration between two children was higher following the birth of a son, and the spacing between the second and third child increased as the number of sons in the household increased (Gangadharan and Maitra 2003). In polygamous societies, the probability of having a second wife is strongly and negatively correlated with the number of sons from the first wife (Mace 1996).

Whereas the impact of gender-biased investments have been studied extensively in the developing country context, studies of gender preference in developed countries, especially U.S. are relatively recent and sparse. In an empirical study of parental investment in children's education in the U.S., Behrman, Pollak and Taubman (1986) find that parents exhibit equal concern or slightly favor girls. However, marital stability and expenditure on housing is likely to be higher among parents who have a son versus a daughter (Lundberg and Rose 2002). Dahl and Moretti (2004) study the effect of gender composition of children on parents' probability of divorce, marriage, shotgun marriage and fertility stopping rule. They find that parents with girls are more likely to be divorced or separated, mothers who have daughters only are more likely to have never been married, and parents with two daughters are more likely to have another child than parents with two sons. Their evidence suggests that unmarried parents are more likely to get married prior to the birth of the child if they know in advance that the baby is male. Similarly, Lundberg and Rose (2003) find that unmarried mothers of boys are more likely to marry the biological father, and sooner, than mothers of girls.

A question this literature brings up is the source of the gender bias. In the U.S., fathers have largely been implicated as the source of son preference. Fathers prefer to invest in the health of their sons compared to mothers who have a greater impact on the health of their daughters (Thomas 1994). Fathers spend more time with their sons (Yeung et al. 2001, Bryant and Zick 1996), are more likely to be involved in the caretaking of the son than their daughter (Lundberg, McLanahan and Rose 2005), and spend more time with their children overall when they have a son (Barnett and Baruch 1987; Harris and Morgan 1991). In addition to revealed behavioral differences, analysis of stated preferences also suggest that fathers favor boys. Dahl and Moretti (2004) present results from a Gallup poll where 48% of fathers report wanting a boy, compared to 19% who report wanting a girl. On the other hand, 30% of mothers report wanting a son and 35% prefer to have a daughter. Disentangling the role of mothers and fathers in determining prenatal health investments is beyond the scope of this paper, but we take a step towards examining the role of fathers' preferences by conducting our analysis for married and unmarried mothers separately. Although mothers' marital status does not perfectly capture the impact of fathers on prenatal health investment decisions, it is plausible that spouses exert greater influence on prenatal health investment decisions than unmarried partners.

The research evidence so far on gender preference in parental behavior and investment decisions suggests the plausibility that knowing the gender of the child in advance may alter mothers' behavior during pregnancy, prenatal investments, and maternal demand for prenatal care. We focus on prenatal decisions, lifestyle choices and investment behavior which are known to impact health in-utero and at birth, which in turn have long-term consequences for health, educational attainment and earning capacity in adulthood. The Barker Hypothesis suggests that maternal nutrition and lifestyle affect embryonic development and has long-lasting health effects, such as hypertension, stroke, type-2 diabetes and heart disease (Barker, 1997). Furthermore, epidemiological studies show that exposure to certain factors, such as restricted nutrient intake and smoking, affect the health of the fetus, causing low birth weight (LBW) and leading to poor lung development and respiratory illnesses in adulthood (Maritz et al. 2005). Improving mothers' prenatal care use in conjunction with altering mothers' prenatal health habits such as tobacco, alcohol and drug use, and improving maternal health are likely to reduce the incidence of LBW infants (Warner, 1995). Mothers' pre-pregnancy weight, prenatal weight gain and tobacco use are identified as the three most important risk factors associated with low birth weight (Shiono and Behrman, 1995), and decreasing prenatal tobacco use is likely to increase birth weight (Evans and Ringel, 1999). Smoking and alcohol use during pregnancy are associated with low birth weight and APGAR scores (Okah et al. 2005, Haddow et al. 1988, Streissguth et al. 1981), and continuity of care and prenatal care visits are significantly associated with adequate maternal weight gain and higher birth weight (Boss and Timbrook 2001). Higher levels of maternal anxiety and depression during pregnancy have been linked to lower APGAR scores (less than 8) at both the first and fifth minute after birth (Berle et al. 2005).

In addition to prenatal investment behavior, we study the impact of knowing fetal gender on birth outcomes as this may capture impacts on child health through avenues on which we do not have data, e.g. domestic violence or second hand exposure to smoke. Weight at birth has long-term health consequences, and is perhaps the most widely studied infant health outcome. Low birth weight babies are more likely to be stunted and underweight because of impaired immune systems which compromises their ability to fight infections and absorb necessary nutrients (Osmani and Sen 2003). LBW infants have lower educational attainment and worse health status and increasing weight at birth increases the height, educational attainment and earnings into adulthood (Behrman, Rosenzweig and Taubman 1994, Currie and Hyson 1999, Behrman and Rosenzweig, 2004). Furthermore, being born small-for-gestational age is associated with insulin resistance, hypertension, increased cardio-vascular morbidity and mortality in adulthood (Boguszewski et al 2004).

Although APGAR scores are not significant predictors of long-term health, they are indicative of the prenatal and perinatal experiences of the infant. APGAR scores, which range between 0 and 10, rate infant health based on five criteria – heart rate, respiration, muscle tone, reflex and color, and are measured one and five minutes after birth. A score below 7 is indicative of problems experienced during labor or delivery, and a score below 4 requires physicians to take immediate steps to stabilize the infant. Thus APGAR scores capture the neonatal adaptation of the infant and are strong predictors of mortality within the first year of life.

II. Theoretical Framework

We assume that children enter parents' utility functions, and that parents are concerned with and derive utility from the general welfare of their children, including their health (Becker, 1981). But the marginal utility gained from improvements in the health of the sons may be different from the utility gained from an increment in the health of the daughters because sons and daughters may enter parents' utility functions in different ways. Consider a utility maximization decision where parents decide the optimal prenatal investment, I, in the health of a child:

$$\begin{aligned} &Max[U\{X, G, H(I) \mid e, c\}] \\ &s.t. W = P_X X + P_I I \end{aligned} \qquad (1)$$

Where I denotes prenatal investments such as use of prenatal care, X stands for all other market goods that provide utility to parents, G stands for the gender of the child (boy or girl), e and c represent economic and cultural conditions, respectively, that pertain to whether a boy or girl would provide more utility to parents, and H denotes child health at birth, which could enter the utility function interacted with the child's gender. Parents maximize their utility, with respect to prenatal investments, I, and are subject to the budget constraint where W represents full income, P_X is the price of the composite market good, X, and P_I is the pecuniary and non-pecuniary cost of prenatal investment.

For cultural and economic reasons, parental gender preference may take the form of son preference, daughter preference, or a preference for a balanced sex composition. Parents may prefer sons as the costs associated with raising daughters (c and e in the utility maximization problem) are traditionally higher in countries such as India, Pakistan, Bangladesh and Sri Lanka that practice the custom of transferring a dowry from the bride's parents to the groom's parents at the time of marriage (e.g. Bloch and Rao, 2002). Additionally, daughters in many societies are likely to leave the parents' home upon marriage, whereas sons bring wives into the parent's house and provide old-age economic security to parents. This is especially important in countries where the government makes no provision for post-retirement income. The returns on human capital investment are expected to be higher for sons than for daughters in terms of future earnings because women on average have less labor market attachment than men, and because parents may perceive gender discrimination in labor markets. There are also important cultural differentials; for example, in some countries a son is desirable because only a son can perform the religious rites upon a parent's death. The value of a first born son also increases if policy restricts the number of children per family- an important possible effect of China's one child policy. On the other hand, parents may prefer to have daughters for equally plausible reasons. For instance, daughters are more likely to provide emotional support to parents and are more likely to fulfill the role of caregivers to elderly parents. In some cultures (eg. India) "giving a daughter away" in marriage is considered to be the highest honor. A daughter may also be favored in countries that reverse the dowry system and use a 'bride price' instead. Finally, parents may prefer to have a balanced sex composition when traditional gender roles are replaced by shared roles, and when girls and boys are substitutable (Pollard and Morgan 2002). A combination of these factors may affect parental gender preference and drive resource-constrained parents to invest differentially in the health of their sons and daughters in this simple utility maximization framework.

Our research question relates only to live births, but we must consider whether the fact that not all conceptions result in live births affects our hypotheses. If parents were to perfectly plan the gender of their children and abort pregnancies that result in children of unwanted sex, there would be no reason to expect differential prenatal investment between girls and boys who are born. Even though this is unlikely to be true, the possibility of selective abortion of all unwanted pregnancies implies that we expect narrower prenatal health investment differential relative to a context in which abortions were not possible. We also rely on the assumption that prenatal health investments (such as smoking cessation decisions) are not viewed as trivial. Given the fact that a substantial fraction of women do not adhere to ideal prenatal care routines (as seen in Appendix Tables 1 and 2) despite a preponderance of information on their health consequences, we consider this evidence that prenatal health investments involve non-trivial costs.

The degree to which we should expect son preference among immigrants from countries with demonstrated son preference is unclear for several reasons. One, there may be selective migration, and mothers who immigrate may not be predisposed to son preference even in their country of origin. Alternatively, the new environment they enter may not provide conditions that drive son preference- i.e. resource constraints, political constraints (such as the one child policy) or cultural considerations, and assimilation into the new environment may change c and e in Equation 1. For instance, Malays of Indian and Chinese descent do not display son preference in their fertility decision, and are instead motivated by the desire for a balanced sex composition (Lhila, 2005).

One particular feature of the potential for prenatal gender bias is that parents would not know the gender of their child in advance unless they actively sought the answer from technology, and a prenatal investment differential can only occur when parents know the sex of the baby in advance. When parents favor boys, knowing that fetal gender is female could induce parents to invest differently in the pregnancy, or cause depression or anxiety which may lead to fewer prenatal care visits, inadequate weight gain, alcohol or tobacco use during pregnancy. These factors together may adversely affect the child's weight and APGAR scores at birth. This paper presents estimates from reduced form equations of health production and input demand functions.

Additionally, we use the Kessner and Kotelchuck indices to address the adequacy of prenatal care utilized by the mother. What follows is a brief description of each prenatal input and what constitutes medically satisfactory inputs into the infant health production function.

The number of prenatal care visits is one way of characterizing the continuity of care received by the mother. The American College of Obstetricians and Gynecologists (ACOG) recommends a schedule of doctor visits that is applicable to most normal pregnancies. The ideal number of prenatal care visits, however, may vary with certain characteristics, including the length of gestation and the presence of medical risk factors such as the previous birth being greater than 4000 grams, maternal health and age at the time of pregnancy. The overall adequacy of prenatal care use is measured by the Kessner Adequacy of Prenatal Care Index which uses the number of prenatal care visits and the trimester of prenatal care initiation to rate prenatal care utilization either adequate, intermediate or inadequate. The Kessner Index has been criticized for placing too much emphasis on the timing of initiation, and not taking sufficient account of the number of visits in relation to the length of gestation. Kotelchuck (1994) suggests an alternate measure of adequacy of prenatal care which rates adequacy into four categories -- inadequate, intermediate, adequate and adequate plus, based on whether prenatal care visits follow the recommendations for uncomplicated pregnancies made by ACOG. Kotelchuck Index adjusts for length of gestation and places less emphasis on timing of initiation. The Kessner Index is judged by medical professionals and recorded in our data, and the Kotelchuck Index is constructed using information available in the data. The recommended weight gain during pregnancy depends on the pre-pregnancy weight of the mother. It is generally recommended that a woman of normal weight gain 25-30 pounds, whereas women who start their pregnancy overweight should gain 15-20 pounds and underweight women ought to gain 28-40 pounds during the course of pregnancy. As discussed earlier, each of these inputs along with nutrient intake and maternal smoking and alcohol use during pregnancy impact the health status of the child in-utero and at birth.

III. Method

Gender preference can impact prenatal investments only when mothers know the gender of the child in advance. There are four prenatal tests that, as a byproduct, can also determine fetal gender if the mother so wishes. These are obstetric ultrasound imaging, amniocentesis, chorionic villus sampling (CVS) and percutaneous umbilical blood sampling (PUBS). Whether these methods are used depends on the level of risk associated with the pregnancy and are primarily used for diagnosing fetal health and abnormalities. None of these methods are used for the explicit purpose of sex determination in the U.S., however undergoing one of these procedures greatly increases the likelihood of knowing fetal gender. In an ultrasound test, sound waves are used to view the anatomy and internal organs of the fetus and can determine gestational age, identify a multiple pregnancy, monitor fetal growth and check for birth defects. Ultrasounds, the most pervasive method, are performed on 68% of mothers, and are typically performed in the 18th or 20th week of the pregnancy, and can reveal the sex of the child with 95-100% accuracy by the 16th week. Amniocentesis, a more invasive procedure typically performed in the 15th-17th week of gestation, removes a small amount of amniotic fluid to test for genetic abnormalities and fetal health, and is likely to determine fetal gender with greater accuracy than ultrasounds. This procedure carries a risk of miscarriage (0.5%) and has been linked to an increased risk of developing health problems for the baby. Thus high-risk pregnancies, i.e. women older than 35 and those who have a family history of genetic defects are more likely to receive amniocentesis. CVS relies on extracting a sample of the placenta and PUBS withdraws blood from the baby to test for genetic problems or abnormalities. Partly due to the risk of miscarriage associated with each of these procedures, the rate of CVS and PUBS use is low.

If there were no biological differences in outcomes under consideration between boys and girls, one way to proceed would be to judge the differences between those who have a girl and those who do not. Variation in ultrasound receipt allows us to differentiate any biological differences due to fetal gender from behavioral responses to learning the gender. Women who do not have an ultrasound cannot display any preferential behavior, thus, we use these mothers to control for biological differences that may be present. This method is similar to that used by Dahl and Moretti (2004) and compares the behavior of women who had ultrasounds and eventually had a girl, to women who had an ultrasound and eventually had a boy, after controlling for differences in outcomes between girls and boys among those who did not have an ultrasound.

Mechanically speaking, our method of estimation is to regress each of the outcomes of interest -- birth weight, 1 and 5 minute APGAR scores, number of prenatal visits, prenatal weight gain, alcohol and tobacco use during pregnancy and the adequacy of prenatal care based on the Kessner and Kotelchuck indices, on FEMALE, an indicator of child gender, ULTRAS that indicates that the mother received an ultrasound during her pregnancy, and the interaction of the two. Our key parameter is the coefficient on the interaction between gender and ultrasound. Evidence in support of girl preferences that translate into differential prenatal investment and outcomes at birth would be indicated by a positive value on this coefficient. One outcome that we know cannot be affected by gender preference is timing of the 1st prenatal visit (as the mother can only find out the gender through technology that would have to be used during a prenatal visit). In addition, an ultrasound cannot ascertain fetal gender in the first trimester. We include whether or not the mother had a prenatal visit in the first trimester as a dependent variable which serves as an anti-test to check for potential data inconsistencies. We expect to find no significant relationship between our interaction term and the probability of a first trimester prenatal visit.

The identification of the gender preference effect rests on the assumption that ultrasound receipt is not correlated with unobserved factors, specifically gender preference. There are observable socioeconomic differences between mothers who receive ultrasounds and those who do not. Women who receive ultrasounds tend to belong to higher socioeconomic groups and are more likely to be married (Martin et al., 2002). Our analysis controls for observable characteristics such as mothers' age, race, ethnicity, education and presence of medical risk factors that differentiate mothers who receive ultrasounds from those who do not. If unobservable characteristics, especially gender preference drives parents to seek ultrasounds, then our estimates may potentially be biased towards finding an effect of son preference. In developing countries, such as India, parents often seek early ultrasounds for the explicit purpose of sex determination. In the U.S. consumer directed ultrasound prescriptions are possible, but less likely because ultrasounds are usually prescribed by physicians based on the presence of complications and medical risks factors associated with the pregnancy and insurance package generosity.

The identification of the effect of knowing fetal gender on prenatal health investments also assumes that all mothers who receive ultrasounds know fetal gender precisely. Although ultrasounds determine the sex of the child with 95-100% accuracy, not all mothers who receive an ultrasound find out the sex of the child. Eighty percent of mothers in the U.S. stated a desire to find out the gender of their child in a survey conducted at the University of Alabama (Walker and Conner, 1993). Another study of 1,340 expectant mothers who received an ultrasound in Brigham and Women's Hospital, Boston, MA found that parents who wanted to know the sex of the child and those who did not differed along socioeconomic and demographic characteristics. Mothers and fathers were equally likely (58%) to want to know the sex of the child, however, parents who were planning to move or renovate, not planning to breastfeed, had conceived accidentally, fathers' without a full-time job, lower household income, unwed mothers, mothers less than 22 or greater than 40, without a college degree, non-White and non-Catholic, and had preferences regarding the sex of the child, were more likely to want to know the sex of the child before delivery (Shipp et al. 2004). This indicates that there is measurement error due to the misclassification of some women into the treatment group when they actually belong in the control group. This is likely to attenuate the effect of knowing fetal gender on health investments towards zero. Moreover, this measurement error is unlikely to be random. The extent of measurement error is likely to be greater for groups of mothers who are less likely to want to know the sex of the child. Thus in order to estimate of the size of the bias we conduct our analysis for different sub-groups such as mothers' race, education, marital status and age, as described in Shipp et al. (2004). We return to this point when interpreting our results.

In order to test the validity of our method we execute an additional anti-test. Having an ultrasound and knowing the gender of the child during pregnancy should have no impact on the mothers' post-natal decisions, such as smoking, as all parents know the gender of their child post-natally. Findings to the contrary may cast doubt on our method.

After we present results from our main models applied to the general population, we stratify our analysis in a number of ways to investigate how knowledge of fetal gender impacts prenatal health investments across economic and cultural subgroups as well as by family composition. We test whether son preference persists among first-generation immigrants, and distinguish between first and higher order births, as gender preference may vary with birth order and sibling composition in the household.

IV. Data

The primary data we use to estimate the effect of knowing fetal gender on prenatal investments and health outcomes at birth are the 1989-2001 Natality Detail Files, which contain the universe of live births in the U.S. between 1989 and 2001. These files are a compilation of birth certificate data from all 50 states and the District of Columbia, which provides information on birth outcomes, parental demographic information, medical risk factors associated with the pregnancy, prenatal care utilization, and congenital abnormalities. This analysis uses information on only those pregnancies that resulted in a singleton birth, since the prenatal investments of mothers expecting multiple children and the birth outcomes of twins are likely to sharply differ from singleton births.

Approximately 4 million infants are born in the U.S. every year, which leads to an extraordinarily large sample for our analysis. For computational ease, we restrict our analysis to a 15% random sample of children born between 1989 and 2001, which yields a sample of 7,532,315 live births for our analysis. In order to study the prenatal investment patterns among first generation immigrant mothers we use the universe of mothers who reported being foreign born and identified their race as Chinese or Indian, respectively. The Chinese and Indian[8] immigrant sample contains 308,846 and 155,217 live births respectively. Table Appendix 1 presents the sample means and standard deviations for variables of interest in each of the samples used in this analysis.

The ultrasound information in the Natality Files does not differentiate between ultrasounds performed during pregnancy versus those performed only during labor. To consider whether this affects our results, we draw on the 2001 California Birth Statistical Master File (obtained directly from the California Department of Health Services), which asks whether an ultrasound was one of the procedures performed during labor and delivery. Typically, ultrasounds are performed during delivery if it is a breech birth. We re-run our main specifications on California data using an indicator of whether the ultrasounds occurred during delivery, a point at which it should not influence prenatal investments.

Although the Natality Detail Files are a rich source of information about prenatal care utilization, provides large sample sizes to allow intricate analyses by sub-groups, and lends a great deal of statistical power to our analysis, it provides terse information about some birth outcomes. For instance, mothers report whether she smoked during

[8] Asian Indian was included as a distinct race category in birth certificates beginning in 1992. Thus the Indian immigrant sample spans 1992-2001.

pregnancy, and the average number of cigarettes smoked per day. The question on the birth certificate makes no distinction between tobacco use after mothers find out that they are pregnant versus before. Maternal consumption of alcohol during pregnancy is dealt with in a similar manner in the Natality Files, and is generally considered highly underreported. Furthermore, in order to study weight gain as one of the prenatal choices we must be able to classify weight gain as adequate or inadequate. This classification depends on mothers' pre-pregnancy weight, which is unavailable in the Natality Files. To address these limitations, we augment our gender preference analysis with additional data from the 1988 National Maternal and Infant Health Survey (NMIHS). The NMIHS is a survey of mothers who had a pregnancy in 1988, and is designed to study the factors associated with poor pregnancy outcomes including the number of prenatal care visits, timing of prenatal care initiation, inadequate or excessive prenatal weight gain, maternal alcohol, drug and tobacco use and other pregnancy and delivery complications. The NMIHS yields a sample of 9,953 live births; Appendix Table 2 presents descriptive statistics of the variables of interest. An added advantage of using the NMIHS is that it provides information on household composition, income and source of payment for prenatal care visits. These may be important controls as gender preference with respect to the current pregnancy may depend on the gender composition in the household, and income and health insurance coverage are two factors that are likely to impact maternal demand for prenatal care. The sample of immigrant mothers is too small to conduct a meaningful analysis of gender preference among first generation immigrant mothers using the NMIHS. Finally, the NMIHS asks mothers of their decision to smoke and consume alcohol at the time of the survey. Information on mothers' decision to smoke after the birth of the child is used to conduct our second specification test. Thus data from the Natality Files, CA Statistical Master File, and NMIHS together provide a clearer picture of prenatal investments and birth outcomes in the U.S.

V. Results

The results of our regression analysis are presented in Tables 1a and 1b, which contain the interaction effect of receiving an ultrasound and having a daughter on prenatal investments and birth outcomes, respectively. (The corresponding unconditional means are reported in Appendix Table 3). Regression coefficients on the interaction term derived from Ordinary Least Squares estimation are reported whenever the outcome is a continuous variable; the interaction effects, calculated using the method described in Ai and Norton (2003), are reported from probit models when the outcome is a binary measure. The regressions control for maternal demographics, marital status and presence of medical risk factors, and are the causal estimates of the effect of knowing fetal gender is female on prenatal health investment (Table 1a) and birth outcomes (Table 1b). In Table 1a, Column 1 indicates the effect of knowing fetal gender is female on the prenatal health investments in our sample, and the remaining columns present results separately by birth order and mothers' marital status. Results by maternal age and race are presented in Appendix Table 4a. The coefficients on the interaction term are close to zero and statistically insignificant in almost all cases, suggesting that knowing that fetal gender is female is not a statistically significant determinant of prenatal care use, probability of tobacco use, the number of cigarettes smoked during pregnancy or the adequacy of prenatal care use. In some instances, coefficients are statistically significantly different from zero, but the magnitudes are still very small. For example, prenatal weight gain is .0969 lbs lower when knowingly expecting a daughter, but this is very little relative to a mean of weight gain that is 30.7 lbs. The statistical significance of this set of results should be interpreted with caution given that we estimate a number of outcomes, and a statistically significant finding for one of our outcomes could be random. The Bonferroni adjustment would reduce the statistical significance level of our analysis and could render these results statistically insignificant (R. Miller, 1981). It is important to note, however, that the magnitude of these results are consistent with the other findings, and that knowing fetal gender is female has a negligible impact on prenatal weight gain.

Table 1b and Appendix Table 4b present the effect of knowing fetal gender in advance on birth outcomes, by birth order, mothers' marital status, age and race. Overall, the results are similar to Table 1a in that estimates are close to zero and statistically insignificant. However, there are statistically significant differences in a few instances. For example, the coefficient on the birth weight regression shows a statistically significant reduction of 3.1 grams on the interaction of having a girl and having an ultrasound, and this applies regardless of marital status, age and race. Substantively the magnitude of the interaction effect on birth weight is small, as the average birth weight in the U.S. is 3,329 grams and the standard deviation is 615 grams. Receiving an ultrasound and having a daughter is not a statistically significant determinant of APGAR scores. In sum, although some coefficients are statistically significantly different from zero in our analysis where samples are often in the millions of observations, the magnitudes are very close to zero and do not point to any systematic bias in care shown by expected gender of the child.

The measurement error due to systematic misclassification is likely to impact the coefficient for demographic groups who are less likely to want to know the sex of the child, i.e. mothers 23-39 years, White and married. The effect of knowing fetal gender on prenatal health investments are likely to be attenuated towards zero among these groups of mothers. Results in Tables 1a, 1b and Appendix Tables 4a and 4b show that the coefficients on the interaction term appear to be the same for all sub-groups, suggesting that our findings are not driven by measurement error.

As the NMIHS contains richer information than the Natality data, we now turn to results using this data set to consider the impact of gender preference on additional measures of prenatal health investments and birth outcomes in Table 2. Overall, the results here too do not point to systematic differences by knowing fetal gender. Expecting a daughter does not appear to be a statistically significant determinant of prenatal care use or the adequacy of weight gain, regardless of the marital status and the gender composition in the household. As before, there are some instances in which the estimates are statistically significantly different from zero. Knowing fetal gender is female is associated with a statistically significant gain in maternal weight, a decrease in the probability of quitting smoking, and a decrease in 5 minute APGAR scores overall and among married mothers. The magnitude of these effects are relatively small; although having an ultrasound and eventually having a daughter appears to reduce the probability of quitting smoking by 9.7% among all mothers, and by 14.3% among married mothers. Since stress has been associated with tobacco use, and both stress and tobacco use negatively impact APGAR scores, these results would have been interpreted as suggesting that perhaps mothers who know that they are going to have a daughter are more likely to feel anxious and hence less likely to quit prenatal tobacco use and have lower APGAR scores. The question about quitting smoking asks respondent if they quit smoking for at least one week after the pregnancy was confirmed. How the respondents interpreted this question is ambiguous as it could be interpreted as smoking behavior the week immediately after pregnancy was confirmed (at which point fetal gender is unlikely to be known), or at any point during the pregnancy regardless of knowing fetal gender. Since ideally we would like to know mothers' smoking decision after she ascertained the sex of the child, and this question is ambiguous about the timing of the quitting decision, this result should be interpreted cautiously.

Evidence from the development literature leads us to expect son preference among immigrants, even if they are not present for American mothers in general. The effect of knowing fetal gender on prenatal health investments and birth outcomes are presented, overall and by birth order in Tables 3 and 4 for Indian and Chinese immigrant mothers, respectively. The coefficients on the interaction term are presented for all children, first births and higher order births. The analysis is further broken down by mothers' educational attainment and the results are presented in Appendix Tables 5 and 6 for Indian and Chinese immigrant mothers, respectively. Knowledge that fetal gender is female does not appear to be a statistically significant determinant of prenatal health investments among first-generation immigrants from India and China, regardless of mothers' educational attainment. These results are surprising because India and China have a long history of son preference although there are several plausible explanations for these results.

As stated earlier, we conduct three tests to check for data inconsistencies and to test the validity of our method. Appendix Table 7 contains the results of the first anti-test where we look at whether the mothers smoke after the birth of the child, and test whether there is a boy versus girl difference in smoking rates between ultrasound and non-ultrasound mothers. The gender difference in the probability of smoking after the birth of the child is qualitatively and statistically similar for mothers who had an ultrasound and those who did not. The magnitude of the difference in differences is close to zero as expected, which lends credence to the method used in this analysis. Appendix Table 8 contains the results of our second anti-test relating to first trimester prenatal care. We report the regression coefficients on the interaction of ultrasound receipt and having a daughter for each of the sub groups of analysis. It is heartening to note that our analysis passes the anti-test, i.e. no effect of knowing the sex of the child in advance on whether prenatal care was initiated in the first trimester[9]. This is reassuring because gender cannot generally be discerned prior to the 16th week, and a large or statistically significant coefficient on the interaction term would cast doubt on the method and the interpretation of our findings.

The results of our specification check are reported in Appendix Table 9. As mentioned in our data section, the Natality Detail File do not provide information on the timing of ultrasound receipt. We report the regression coefficients on the interaction of ultrasound receipt during labor/delivery and having a daughter using our California data. It is reassuring that the coefficient on the interaction term is zero. These results suggest that receiving an ultrasound during labor and hence determining fetal gender during labor

[9] Results (not reported) reveal that the analyses using the Indian and Chinese immigrant samples also pass the anti-test.

has no impact on the number of prenatal care visits, the likelihood of low birth weight and very low birth weight. The only exception is the effect on birth weight, which implies that determining the sex of the child during labor has a positive and statistically significant impact on birth weight. However, the magnitude of this effect is negligible, since the mean birth weight is 3,320 grams.

In summary, there is little or no evidence of gender preference playing a role in maternal decision-making regarding prenatal investments after mothers decide to carry the pregnancy to term. This is somewhat surprising as gender preference has been shown to affect many other facets of family decision-making. In order to investigate whether parents invest differentially in the health of sons after birth we present unconditional means of some measures of post-natal investments that are available in the NMIHS. Appendix Table 10 reveals that with the exception of obtaining food stamps and the length of breastfeeding, there are no statistically significant differences in the post-natal investments of mothers who have sons versus those who have daughters. Since these are unconditional means we cannot take this as evidence of daughter preference, as mothers may choose to breastfeed daughters longer and obtain food stamps simply because girls tend to be lighter at birth. The average number of well-child visits, intensity of breastfeeding and insurance take-up among mothers are qualitatively and statistically the same for girls and boys.

A possible explanation for our result that the child's gender does not impact prenatal health investments is that in studies that find gender preference in the U.S., son preference has largely been attributed to fathers. Prenatal choices and investment decisions, however, are to a larger extent made by mothers relative to joint decisions like marriage. Prenatal health care investments are also likely to involve shorter term costs than investments in other areas such as marriage and divorce. This is one plausible explanation why we fail to see any strong evidence of gender preference in prenatal health investments while it exists for marriage. A second plausible explanation that we do not investigate here is selective abortion by parents who have a gender preference and find out the gender of the child. As discussed above, we are more likely to find an effect of gender preference on prenatal health investments if strong gender preference influences who finds out the gender of their child, but it does not lead to selective abortion. The existence of non trivial costs related to abortions after the stage at which gender is discernible suggests that not all unwanted births may be aborted. To the extent that selective abortion does occur (consistent with evidence for immigrants in Abrevaya, 2005), we are less likely to find an effect of gender preference on prenatal health investments among children who are carried to term.

The lack of gender preference among immigrant women is surprising because of the home-country findings. One possible explanation is that women who choose to immigrate to the U.S. are innately different from their counterparts in India and China. Malays of Indian and Chinese descent do not display son preference in their birth spacing decision, and are instead motivated by a desire for a balanced sex composition in the household (Lhila, 2005). Research on immigrants from India in South Africa however suggests that immigration to other countries are not likely to happen in a selective fashion, as Indians in South Africa display son preference in their birth spacing decision (Gangadharan and Maitra, 2003). Another possibility is that government policies such as the one child policy may be fostering gender preferences in the home country, and when such restrictions are relaxed, gender neutrality may be the norm. This could also apply to other government policies such as old age pensions- Indian immigrant mothers in the U.S. need not worry about the economic ramifications, such as old age security, of having girls versus boys, and these factors may help mitigate gender preference among immigrant mothers. Nevertheless, the study of immigrants provides an interesting laboratory in which to explore the possible causes of gender bias displayed in home countries and the extent to which it is affected by public policy.

VI. Conclusion

Parents invest in their own health and allocate resources that impact child well-being. Parental preferences regarding the gender of the child have been shown to impact parents' investment decisions in both developing countries and in the U.S. In this paper we study whether mothers in the U.S. invest differentially in the prenatal health of their children, an outcome that has not been studied before, when the sex of the child is known in advance. Prenatal health investments are measured by maternal choices during pregnancy such as number of prenatal care visits, adequacy of weight gain, alcohol consumption and tobacco use during pregnancy, the inputs that are known to affect infant health. Furthermore, we test whether gender preference persists among first-generation immigrants who were born in India and China, two countries with a documented history of son preference.

Using the 1989-2001 Natality Detail Files and 1988 National Maternal and Infant Health Survey, we estimate the effect of gender preference on prenatal health investments. Since having an ultrasound increases the chances of knowing the gender of the child, we compare the behavior of women who had ultrasounds and eventually had a girl, to women who had an ultrasound and eventually had a boy. Although there are large effects of child gender on parental investment in marriage and time use, we do not find it accompanies differences in health investments as we measure it here. We conjecture but cannot prove definitively why this may be so. For one, we study outcomes that are more a result of mother's actions than father's actions, and previous literature has shown that gender preferences are likely to be instigated by fathers. The lack of result for Chinese and Indian first generation women is particularly striking. It is also possible that these gender preferences in these countries are due to father than mothers, and that gender preference could manifest itself in abortions, thus not affecting the health of children who are born. It could also be that those who immigrate to the U.S. from these countries are atypical and do not exhibit gender preference, or that they have assimilated and changed their cultural outlook and utility function weights on child gender in such a way that has led to an erosion of the gender bias.

Although this analysis is limited by the lack of unambiguous information on parents' knowledge of fetal gender, it serves as a starting point for estimating the effect of knowing fetal gender in advance on prenatal health investments, a relationship that has not been studied to date. The evidence thus far suggests that the gender preference effect found in parental marriage behavior in the U.S. does not extend to prenatal health investments. Among parents who choose to have the baby, knowing the sex of the child in advance does not affect parents prenatal health investments and birth outcomes measured in these ways.

Table 1a: Effect of Knowing Fetal Gender on Prenatal Health Investments, by Birth Order and Mothers' Marital Status, 1989-2001 Natality Detail Files

OLS coefficient or probit interaction effects of ULTRASOUND*FEMALE (standard errors in parentheses)

	All	First Births	Higher Order Births	Married Mothers	Unmarried Mothers
Number of prenatal care visits	0.0122**	0.0034	0.0160**	0.0122*	0.0080
	(0.0060)	(0.0093)	(0.0080)	(0.0069)	(0.0120)
Prenatal weight gain (pounds)	-0.0969***	-0.1008***	-0.0928***	-0.0951***	-0.0972**
	(0.0226)	(0.0359)	(0.0291)	(0.0259)	(0.0448)
Probability of inadequate weight gain	-0.0020***	-0.0019*	-0.0018**	-0.0019**	-0.0018
(<15 lb OR >40 lb)	(0.0007)	(0.0011)	(0.0009)	(0.0009)	(0.0013)
Probability of prenatal tobacco use	-0.0003	-0.0008	0.0001	-0.0001	-0.0014
	(0.0006)	(0.0008)	(0.0008)	(0.0006)	(0.0012)
Number of Cigarettes/day	-0.0056	-0.0148	0.0028	0.0073	-0.0359**
	(0.0084)	(0.0110)	(0.0120)	(0.0092)	(0.0173)
Probability of inadequate/intermediate	-0.0003	0.0019**	-0.0017*	-0.0002	-0.0007
PNC (Kessner Index)	(0.0007)	(0.0010)	(0.0009)	(0.0007)	(0.0014)
Probability of inadequate/intermediate	-0.0006	-0.0006	-0.0005	-0.0014	0.0010
PNC (Kotelchuck Index)	(0.0007)	(0.0011)	(0.0009)	(0.0008)	(0.0013)

Notes:

1. ***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level
2. Controls include birth order, twin status, maternal age, race, ethnicity and education categories, foreign-born indicator, urban/rural status, region of residence, presence of pregnancy risk factors and year of birth.
3. The analysis uses a 15% random sample of the 1989-2001 Natality Detail Files
4. Each pair of point estimates and standard errors are obtained from a separate regression; interaction effects are derived using the method described in Ai and Norton (2003)

Table 1b: Effect of Knowing Fetal Gender on Birth Outcomes, by Birth Order and Mothers' Marital Status, 1989-2001 Natality Detail Files

OLS coefficient or probit interaction effects of ULTRASOUND*FEMALE (standard errors in parentheses)

	All	**First Births**	**Higher Order Births**	**Married Mothers**	**Unmarried Mothers**
Birth Weight (grams)	-3.0604***	-5.2090***	-2.1450*	-3.2355***	-1.3706
	(0.8800)	(1.3896)	(1.1352)	(1.0388)	(1.6422)
Probability of low birthweight (< 2500g)	0.0003	0.0014**	-0.0003	0.0005	0.0003
	(0.0004)	(0.0006)	(0.0004)	(0.0004)	(0.0008)
Probability of very low birthweight (< 1500g)	0.0001	0.0005*	-0.00012	0.0001	0.00002
	(0.0002)	(0.0003)	(0.0002)	(0.0002)	(0.0004)
1 minute APGAR score	-0.0022	-0.0043	-0.0012	-0.0042	0.0040
	(0.0038)	(0.0063)	(0.0048)	(0.0044)	(0.0077)
5 minute APGAR score	-0.0011	-0.0018	-0.0009	-0.0001	-0.0029
	(0.0014)	(0.0023)	(0.0018)	(0.0016)	(0.0028)

Notes:

1. ***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level
2. Controls include birth order, twin status, maternal age, race, ethnicity and education categories, foreign-born indicator, urban/rural status, region of residence, presence of pregnancy risk factors and year of birth.
3. The analysis uses a 15% random sample of the 1989-2001 Natality Detail Files
4. Each pair of point estimates and standard errors are obtained from a separate regression; interaction effects are derived using the method described in Ai and Norton (2003)

Table 2: Effect of Knowing Fetal Gender on Prenatal Health Investments and Birth Outcomes, by Mothers' Marital Status and Household Gender Composition 1988 National Maternal and Infant Health Survey

OLS coefficient or probit interaction effects of ULTRASOUND*FEMALE (standard errors in parentheses)

	All	Married Mothers	Unmarried Mothers	No Sons	No Daughters
Number of prenatal care visits	0.009	-0.039	0.131	0.090	-0.501
	(0.225)	(0.252)	(0.476)	(0.486)	(0.502)
Prenatal weight gain (pounds)	1.594*	1.763*	1.300	-1.639	2.475
	(0.946)	(1.036)	(2.131)	(2.151)	(1.968)
Probability of insufficient weight gain	0.0061	0.004	0.007	0.023	-0.052
(<advised)	(0.034)	(0.039)	(0.064)	(0.080)	(0.076)
Probability of inadequate weight gain (5lb	0.015	0.008	0.004	-0.003	-0.069
less/more than advised)	(0.034)	(0.041)	(0.063)	(0.079)	(0.077)
Probability of quitting tobacco use	-0.097*	-0.143**	-0.004	-0.049	-0.092
	(0.053)	(0.068)	(0.084)	(0.114)	(0.109)
Birthweight	25.075	23.849	35.760	87.086	-29.489
	(27.842)	(32.489)	(52.976)	(67.336)	(57.696)
Probability of low birthweight (< 2500g)	-0.013	-0.008	-0.026	-0.005	-0.019
	(0.009)	(0.008)	(0.020)	(0.018)	(0.018)
Probability of very low birthweight (< 1500g)	-0.003	-0.003	-0.004	-0.005	-0.006
	(0.002)	(0.002)	(0.005)	(0.004)	(0.005)
1 minute APGAR score	-0.045	0.003	-0.182	0.136	-0.100
	(0.077)	(0.090)	(0.143)	(0.166)	(0.160)
5 minute APGAR score	-0.086*	-0.100*	-0.036	0.052	-0.057
	(0.049)	(0.056)	(0.092)	(0.090)	(0.107)

Notes:
1. ***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level
2. Controls include birth order, twin status, maternal age, race, ethnicity, education and household income categories, urban/rural status, region of residence, and source of payment for prenatal care.
3. The analysis is restricted to pregnancies that resulted in a live birth in the 1988 National Maternal and Infant Health Survey.
4. Each pair of point estimates and standard errors are obtained from a separate regression; interaction effects are derived using the method described in Ai and Norton (2003)

Table 3: Effect of Knowing Fetal Gender on Prenatal Health Investments and Birth Outcomes, Indian Immigrant Mothers, 1992-2001 Natality Detail Files

OLS coefficient or probit interaction effects of ULTRASOUND*FEMALE (standard errors in parentheses)

	All Births	**First Births**	**Higher Order Births**
Prenatal Investments			
Number of PNC visits	0.0197	-0.0237	0.0560
	(0.0387)	(0.0557)	(0.0538)
Probability of prenatal tobacco use	0.0010	0.0016	0.0006
	(0.0007)	(0.0010)	(0.0010)
Probability of inadequate weight gain (<15 lb OR >40 lb)	0.0012	-0.0061	0.0082
	(0.0042)	(0.0059)	(0.0059)
Probability of inadequate/intermediate Care (Kotelchuck Index)	-0.0022	-0.0002	-0.0031
	(0.0049)	(0.0068)	(0.0070)
Birth Outcomes			
Birthweight (grams)	-0.4484	0.5269	-0.0627
	(5.5718)	(7.9395)	(7.8315)
Probability of low birthweight (<2500 grams)	0.0003	0.0068	-0.0062
	(0.0029)	(0.0044)	(0.0038)
Probability of very low birthweight (<1500 grams)	0.0018*	0.0007	0.0027*
	(0.0010)	(0.0015)	(0.0014)
1 minute APGAR score	-0.0249	0.0009	-0.0531
	(0.0449)	(0.0694)	(0.0573)
5 minute APGAR score	-0.0047	-0.0002	-0.0074
	(0.0088)	(0.0130)	(0.0120)

Notes:
1. ***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level
2. PNC = prenatal care
3. Controls include birth order, twin status, maternal age, and education categories, urban/rural status, region of residence, presence of pregnancy risk factors and year of birth.
4. The analysis uses the universe of children born to Indian immigrant mothers in the 1992-2001 Natality Detail Files
5. Each pair of point estimates and standard errors are obtained from a separate regression; interaction effects are derived using the method described in Ai and Norton (2003)

Table 4: Effect of Knowing Fetal Gender on Prenatal Health Investments and Birth Outcomes, Chinese Immigrant Mothers, 1989-2001 Natality Detail Files

OLS coefficient or probit interaction effects of ULTRASOUND*FEMALE (standard errors in parentheses)

	All Births	First Births	Higher Order Births
Prenatal Investments			
Number of PNC visits	0.0079	-0.0442	0.0614*
	(0.0244)	(0.0347)	(0.0343)
Probability of prenatal tobacco use	0.0003	0.0005	0.00014
	(0.0009)	(0.0012)	(0.0013)
Probability of inadequate weight gain (<15 lb OR >40 lb)	0.0024	0.0038	0.0010
	(0.0027)	(0.0039)	(0.0038)
Probability of inadequate/intermediate Care (Kotelchuck Index)	0.0006	0.0015	-0.0002
	(0.0032)	(0.0045)	(0.0047)
Birth Outcomes			
Birthweight (grams)	-4.9716	-8.7292*	-0.9646
	(3.6293)	(5.1028)	(5.1641)
Probability of low birthweight (<2500 grams)	0.0016	0.0030	0.0001
	(0.0014)	(0.0021)	(0.0019)
Probability of very low birthweight (<1500 grams)	-0.0004	-0.0001	-0.0007
	(0.0005)	(0.0007)	(0.0007)
1 minute APGAR score	0.0132	-0.0235	0.0525*
	(0.0202)	(0.0294)	(0.0272)
5 minute APGAR score	0.0151**	0.0035	0.0277***
	(0.0067)	(0.0095)	(0.0095)

Notes:

1. ***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level
2. PNC = prenatal care
3. Controls include birth order, twin status, maternal age, and education categories, urban/rural status, region of residence, presence of pregnancy risk factors and year of birth.
4. The analysis uses the universe of children born to Chinese immigrant mothers in the 1989-2001 Natality Detail Files
5. Each pair of point estimates and standard errors are obtained from a separate regression; interaction effects are derived using the method described in Ai and Norton (2003)

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Appendix Table 1: Descriptive Statistics -- 1989-2001 Natality Detail Files

Sample means (and standard deviations in parentheses)

	All Mothers		Indian		Chinese	
Sample Size	7,532,315		155,217		308,846	
Child Characteristics	mean	st. dev.	mean	st. dev.	mean	st. dev.
Year of Birth	1995.02	(3.74)	1997.56	(2.74)	1995.48	(3.69)
Female babies	48.82	(49.99)	48.36	(49.97)	47.98	(49.96)
Percent multiple birth	2.70	(16.21)	2.47	(15.52)	1.96	(13.87)
Birthweight (grams)	3329.23	(615.27)	3148.66	(553.00)	3299.42	(514.08)
Percent with low-birthweight (Birthweight < 2500 g)	7.31	(26.03)	9.31	(29.06)	4.85	(21.48)
Percent with very-low-birthweight (Birthweight < 1500 g)	1.34	(11.49)	1.16	(10.73)	0.63	(7.92)
1 minute APGAR Score	8.04	(1.36)	8.44	(1.11)	8.38	(1.10)
Percent with 1 minute APGAR score < 7	73.11	(44.34)	94.27	(23.24)	84.68	(36.02)
Percent with 1 minute APGAR score < 4	71.26	(45.25)	94.05	(23.66)	84.12	(36.55)
5 minute APGAR score	8.94	(0.79)	9.02	(0.63)	9.02	(0.62)
Percent with 5 minute APGAR score < 7	30.05	(45.85)	43.13	(49.53)	51.64	(49.97)
Percent with 5 minute APGAR Score < 4	29.34	(45.53)	42.81	(49.48)	51.40	(49.98)
Percent with birth order = 1	40.69	(49.13)	48.85	(49.99)	50.58	(50.00)
Percent with birth order = 2	32.48	(46.83)	36.68	(48.19)	37.49	(48.41)
Percent with birth order = 3	16.39	(37.02)	10.86	(31.11)	9.40	(29.19)
Percent with birth order = 4	6.30	(24.29)	2.52	(15.68)	1.88	(13.58)
Percent with birth order = 5	2.32	(15.06)	0.70	(8.35)	0.45	(6.68)
Percent with birth order = 6	0.95	(9.70)	0.23	(4.84)	0.12	(3.48)
Percent with birth order = 7	0.43	(6.51)	0.09	(3.04)	0.04	(2.12)
Percent with birth order = 8	0.44	(6.63)	0.06	(2.50)	0.03	(1.85)
Mother's Characteristics						
Age (years)	26.82	(6.03)	28.90	(4.56)	31.11	(4.64)
Percent married	68.92	(46.28)	92.82	(25.81)	93.83	(24.06)
Percent reporting no formal education	6.13	(23.99)	2.59	(15.90)	7.28	(25.98)
Percent reporting some high school education	16.44	(37.06)	6.25	(24.20)	6.98	(25.48)
Percent with high school completion	34.63	(47.58)	21.29	(40.93)	24.09	(42.76)
Percent reporting some college	21.48	(41.07)	20.25	(40.19)	14.74	(35.45)
Percent with college completion, or more	21.32	(40.96)	49.62	(50.00)	46.91	(49.90)
Percent with race = White	79.65	(40.26)	0.00	(0.00)	0.00	(0.00)
Percent with race = Black	16.02	(36.68)	0.00	(0.00)	0.00	(0.00)
Percent with race = Other	4.33	(20.34)	100.00	(0.00)	100.00	(0.00)
Percent of hispanic origin	17.59	(38.07)	0.23	(4.77)	0.86	(9.22)
Percent foreign born	18.39	(38.74)	100.00	(0.00)	100.00	(0.00)
Percent residing in MSA	81.26	(39.02)	98.94	(10.26)	97.69	(15.02)
Percent with region of residence = Northeast	17.66	(38.13)	43.89	(49.63)	31.42	(46.42)
Percent with region of residence = Midwest	22.92	(42.03)	12.78	(33.38)	8.28	(27.56)
Percent with region of residence = South	35.61	(47.88)	13.15	(33.80)	11.91	(32.39)
Percent with region of residence = West	23.81	(42.59)	30.18	(45.90)	48.38	(49.97)
Prenatal Care						
Percent who received an ultrasound during pregnancy	60.96	(48.78)	62.50	(48.41)	57.36	(49.46)
Percent who initiated PNC in 1st Semester	80.42	(39.68)	82.55	(37.95)	85.32	(35.39)
Number of prenatal care visits	11.37	(4.10)	11.16	(3.78)	11.45	(3.39)
Percent who used tobacco while pregnant	14.68	(35.39)	0.27	(5.23)	0.60	(7.73)
Number of cigarettes/day	1.65	(5.03)	0.02	(0.47)	0.04	(0.70)
Prenatal weight gain (pounds)	30.67	(12.88)	28.46	(10.77)	29.54	(9.75)
Percent with inadequate weight gain (<15 lb OR >40 lb)	42.86	(49.49)	49.87	(50.00)	56.72	(49.55)
Percent with inadequate/intermediate PNC (Kessner Index)	26.78	(44.28)	26.37	(44.06)	22.74	(41.92)
Percent with inadequate/intermediate PNC (Kotelchuck Index)	28.31	(45.05)	28.01	(44.91)	25.65	(43.67)
Percent with at least one medical risk factor	24.75	(43.15)	22.07	(41.47)	19.38	(39.52)

Notes: The sample for All Mothers represents a random 15% of all observations in the 1989-2001 Natality Detail Files.

PNC = Prenatal Care

Appendix Table 2: Descriptive Statistics -- 1988 National Maternal and Infant Health Survey

Sample means, and standard deviations in parentheses

	Mean	St. Dev.
Sample Size	9,953	
Child Characteristics		
Female babies (percent)	47.90	(9.89)
Birthweight (grams)	3355.51	(118.20)
Percent with low-birthweight (Birthweight<2500g)	6.90	(5.01)
Percent with very-low-birthweight (Birthweight<1500g)	1.22	(2.17)
1-minute Apgar score	8.06	(0.25)
5-minute Apgar score	8.99	(0.17)
Birth order	1.99	(0.23)
Percent pregnancies wanted at that time	56.77	(9.80)
Percent with no living brothers	65.95	(9.38)
Percent with no living sisters	66.89	(9.31)
Maternal Characteristics		
Age (years)	26.29	(1.11)
Percent residing in MSA	76.77	(8.36)
Percent reporting less than high school education	4.45	(4.08)
Percent reporting some high school education	14.62	(6.99)
Percent with high school completion	39.16	(9.66)
Percent reporting some college education	24.12	(8.47)
Percent with college completion, or more	17.65	(7.55)
Percent with race = White	78.71	(8.10)
Percent with race = Black	16.30	(7.31)
Percent with race = Other	4.98	(4.31)
Percent of Hispanic Origin	12.86	(6.63)
Percent married	74.48	(8.63)
Percent with HH Income <= $11,999	26.59	(8.74)
Percent with HH Income $12,000-$24,999	25.82	(8.66)
Percent with HH Income $25,000-$39,999	23.56	(8.40)
Percent with HH Income >= $40,000	24.04	(8.46)
Percent with source of PNC payment = Out-of-Pocket	13.19	(9.78)
Percent with source of PNC payment = Private Insurance	57.55	(8.68)
Percent with source of PNC payment = Public Insurance	25.99	(6.70)
Percent with source of PNC payment = Other	1.75	(2.60)
Prenatal Care		
Percent who received an ultrasound during pregnancy	64.09	(9.57)
Week prenatal care initiated	10.70	(2.55)
Number of prenatal care visits (self-reported)	11.11	(0.80)
Number of prenatal care visits (physician reported)	12.71	(1.07)
Percent who reported using tobacco while pregnant (~Natality)	22.48	(8.26)
Percent who quit smoking for at least 1 week, after pregnant	54.82	(9.84)
Number of cigarettes smoked, day after preg confirmed	8.93	(1.85)
Percent who reduced drinking during pregnancy	91.49	(6.02)
Percent who reduced drinking b/c concerned about baby	90.34	(6.44)
Percent with prenatal weight gain < advised	36.91	(9.77)
Percent with prenatal weight gain not as advised	89.76	(6.14)
Percent with prenatal weight gain <5lb OR >5lb than advised	58.49	(9.97)

Notes:
PNC = Prenatal Care

Appendix Table 3: Unconditional Means, 1989-2001 Natality Detail Files

Means x 100

	Ultrasound				Non-Ultrasound				Difference-in-	
	Girl	Boy	Diff.		Girl	Boy	Diff.		Differences	
Prenatal care initiated in 1st trimester	82.45	82.23	0.213	***	77.63	77.46	0.168	***	0.045	
Number of prenatal care visits	11.65	11.61	0.045	***	11.00	10.97	0.031	***	0.015	**
Prenatal weight gain (pounds)	30.52	31.22	-0.700	***	29.96	30.61	-0.654	***	-0.046	**
Pr. of inadequate weight gain (<15 lb OR >40 lb)	38.48	39.11	-0.631		47.60	48.06	-0.466		-0.165	**
Probability of prenatal tobacco use	15.27	15.40	-0.123	***	13.43	13.49	-0.065	***	-0.059	
Number of cigarettes/day during pregnancy	1.72	1.73	-0.015	***	1.48	1.49	-0.009	***	-0.006	
Pr of inadequate PNC (Kessner Indx = Inad/Int)	24.25	24.58	-0.322	***	30.18	30.44	-0.263	**	-0.059	
Pr of inadequate PNC (Kotelchuck Indx=Inad/Int)	25.89	25.49	0.406		32.46	31.99	0.477		-0.071	
Birthweight (grams)	3270.10	3388.08	-117.980		3269.57	3383.77	-114.200		-3.780	***
Probability of low birthweight (< 2500 g)	8.05	6.89	1.164	*	7.55	6.53	1.015	**	0.149	***
Probability of very low birthweight (< 1500 g)	1.37	1.35	0.015	***	1.28	1.28	-0.004	***	0.019	
1 minute APGAR score	8.06	8.01	0.044	***	8.07	8.03	0.043	***	0.001	
Probability 1 minute APGAR score < 7	74.45	74.59	-0.143	***	73.45	73.58	-0.132	***	-0.010	
Probability 1 minute APGAR score < 4	72.76	72.72	0.030	***	71.76	71.73	0.022		0.008	
5 minute APGAR score	8.95	8.93	0.024	***	8.94	8.92	0.024		0.000	
Probability 5 minute APGAR score < 7	25.30	25.37	-0.065	***	38.15	38.15	0.000	***	-0.066	
Probability 5 minute APGAR score < 4	24.61	24.54	0.074	***	37.59	37.47	0.124	***	-0.050	

***(**)(*) indicates statistical significance at the 0.01(0.05)(0.1) level

PNC = prenatal care

Appendix Table 4a: Effect of Knowing Fetal Gender on Prenatal Health Investments, by Mothers' Age and Race, 1989-2001 Natality Detail Files

OLS coefficient or probit interaction effects of ULTRASOUND*FEMALE (standard errors in parentheses)

	Mothers <=22 years	Mothers 23-39 years	Mothers 40+ years	White	Black	Other Race
Number of prenatal care visits	0.0108	0.0119*	0.0408	0.0105	0.0097	0.0297
	(0.0122)	(0.0070)	(0.0488)	(0.0066)	(0.0172)	(0.0272)
Prenatal weight gain (pounds)	-0.1123**	-0.0925***	0.1221	-0.0843***	-0.0921	-0.1287
	(0.0459)	(0.0261)	(0.1696)	(0.0250)	(0.0591)	(0.1106)
Probability of inadequate weight gain	-0.0017	-0.0021	-0.0034	-0.0019**	-0.0010	-0.0020
(<15 lb OR >40 lb)	(0.0014)	(0.0008)	(0.0053)	(0.0008)	(0.0018)	(0.0030)
Probability of prenatal tobacco use	0.0003	-0.0005	0.0009	-0.0005	0.0006	0.0010
	(0.0012)	(0.0006)	(0.0040)	(0.0007)	(0.0012)	(0.0019)
Number of Cigarettes/day	0.0019	-0.0090	0.0249	-0.0068	-0.0027	0.0185
	(0.0162)	(0.0099)	(0.0661)	(0.0101)	(0.0145)	(0.0230)
Probability of inadequate/intermediate	0.0007	-0.0005	-0.0038	0.0004	-0.0025	-0.0028
PNC (Kessner Index)	(0.0014)	(0.0007)	(0.0048)	(0.0007)	(0.0018)	(0.0032)
Probability of inadequate/intermediate	0.0004	-0.0009	-0.0044	-0.0006	-0.0012	-0.0003
PNC (Kotelchuck Index)	(0.0014)	(0.0008)	(0.0050)	(0.0008)	(0.0018)	(0.0033)

Notes:
1. ***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level
2. Controls include birth order, twin status, maternal age, race, ethnicity and education categories, foreign-born indicator, urban/rural status, region of residence, presence of pregnancy risk factors and year of birth.
3. The analysis uses a 15% random sample of the 1989-2001 Natality Detail Files
4. Each pair of point estimates and standard errors are obtained from a separate regression;interaction effects are derived using the method described in Ai and Norton (2003)

Appendix Table 4b: Effect of Knowing Fetal Gender on Birth Outcomes, by Mothers' Age and Race, 1989-2001 Natality Detail Files

OLS coefficient or probit interaction effects of ULTRASOUND*FEMALE (standard errors in parentheses)

	Mothers <=22 years	Mothers 23-39 years	Mothers 40+ years	White	Black	Other Race
Birth Weight (grams)	-4.1140**	-2.3968**	-2.4654	-3.2049***	-0.2064	-3.4165
	(1.6585)	(1.0469)	(7.4462)	(0.9692)	(2.4159)	(3.9223)
Probability of low	0.0014*	-0.0001	0.0012	0.0010***	-0.0011	-0.0003
birthweight (< 2500g)	(0.0008)	(0.0004)	(0.0031)	(0.0004)	(0.0012)	(0.0017)
Probability of very low	0.0002	0.00004	0.0008	0.0001	0.0004	0.0002
birthweight (< 1500g)	(0.0003)	(0.0002)	(0.0014)	(0.0002)	(0.0006)	(0.0006)
1 minute APGAR score	-0.0042	-0.0018	0.0243	-0.0047	0.0046	0.0009
	(0.0075)	(0.0045)	(0.0377)	(0.0042)	(0.0102)	(0.0197)
5 minute APGAR score	-0.0027	-0.0001	-0.0116	-0.0002	-0.0082**	0.0031
	(0.0029)	(0.0016)	(0.0117)	(0.0015)	(0.0040)	(0.0068)

Notes:
1. ***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level
2. Controls include birth order, twin status, maternal age, race, ethnicity and education categories, foreign-born indicator, urban/rural status, region of residence, presence of pregnancy risk factors and year of birth.
3. The analysis uses a 15% random sample of the 1989-2001 Natality Detail Files
4. Each pair of point estimates and standard errors are obtained from a separate regression; interaction effects are derived using the method described in Ai and Norton (2003)

Appendix Table 5: Effect of Knowing Fetal Gender on Prenatal Health Investments, Indian Immigrant Mothers, 1992-2001 Natality Detail Files

OLS coefficient or probit marginal effects of ULTRASOUND*FEMALE (standard errors in parentheses)

	All Births	**First Births**	**Higher Order Births**
Number of PNC visits			
Less than or some HS	0.0553	-0.1423	0.1255
	(0.1478)	(0.2448)	(0.1851)
HS graduate	0.0768	0.0342	0.0914
	(0.0861)	(0.1355)	(0.1116)
More than HS education	0.0036	-0.0383	0.0430
	(0.0448)	(0.0625)	(0.0645)
Probability of inadequate weight gain (<15 lb OR >40 lb)			
Less than or some HS	0.0177	-0.0261	0.0474**
	(0.0153)	(0.0243)	(0.0198)
HS graduate	-0.0143	-0.0273*	-0.0051
	(0.0098)	(0.0151)	(0.0130)
More than HS education	0.0034	0.0016	0.0054
	(0.0048)	(0.0066)	(0.0070)
Probability of inadequate/intermediate Care (Kotelchuck Index)			
Less than or some HS	-0.0084	0.0042	-0.0126
	(0.0177)	(0.0277)	(0.0232)
HS graduate	-0.0169	-0.0261	-0.0079
	(0.0115)	(0.0177)	(0.0151)
More than HS education	0.0021	0.0055	-0.0010
	(0.0056)	(0.0075)	(0.0083)
Birthweight (grams)			
Less than or some HS	-33.5005*	-53.5419*	-18.3418
	(19.4927)	(31.2208)	(25.0851)
HS graduate	-12.2865	-16.1843	-8.3070
	(12.4050)	(18.9019)	(16.4726)
More than HS education	7.4631	9.5823	6.3767
	(6.5740)	(9.1171)	(9.4937)
Probability of low birthweight (<2500 grams)			
Less than or some HS	0.0068	0.0303*	-0.0089
	(0.0100)	(0.0175)	(0.0123)
HS graduate	0.0078	0.0108	0.0052
	(0.0065)	(0.0108)	(0.0080)
More than HS education	-0.0028	0.0039	-0.0100**
	(0.0034)	(0.0050)	(0.0045)
Probability of very low birthweight (<1500 grams)			
Less than or some HS	0.0072*	0.0091	0.0047
	(0.0041)	(0.0066)	(0.0048)
HS graduate	0.0027	-0.0020	0.0061*
	(0.0024)	(0.0036)	(0.0032)
More than HS education	0.0008	0.0004	0.0011
	(0.0012)	(0.0017)	(0.0016)
1 minute APGAR score			
Less than or some HS	-0.0543	-0.0612	-0.0843
	(0.2094)	(0.3898)	(0.2349)
HS graduate	0.0358	0.1723	-0.0776
	(0.0770)	(0.1259)	(0.0945)
More than HS education	-0.0397	-0.0483	-0.0213
	(0.0565)	(0.0843)	(0.0750)
5 minute APGAR score			
Less than or some HS	-0.0199	-0.0369	-0.0018
	(0.0275)	(0.0426)	(0.0364)
HS graduate	0.0271	0.0839***	-0.0123
	(0.0182)	(0.0282)	(0.0239)
More than HS education	-0.0143	-0.0224	-0.0050
	(0.0108)	(0.0156)	(0.0149)

Notes:

1. ***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level
2. PNC = prenatal care
3. Controls include birth order, twin status, maternal age, and education categories, urban/rural status, region of residence, presence of pregnancy risk factors and year of birth.
4. The analysis uses the universe of children born to Indian immigrant mothers in the 1992-2001 Natality Detail Files
5. Each pair of point estimates and standard errors are obtained from a separate regression;interaction effects are derived using the method described in Ai and Norton (2003)

Appendix Table 6: Effect of Knowing Fetal Gender on Prenatal Health Investments, Chinese Immigrant Mothers, 1989-2001 Natality Detail Files

OLS coefficient or probit marginal effects of ULTRASOUND*FEMALE (standard errors in parentheses)

	All Births	First Births	Higher Order Births
Number of PNC visits			
Less than or some HS	-0.0301	-0.0978	0.0181
	(0.0638)	(0.0993)	(0.0835)
HS graduate	0.0812	0.0852	0.0824
	(0.0499)	(0.0739)	(0.0678)
More than HS education	-0.0169	-0.0818*	0.0552
	(0.0310)	(0.0427)	(0.0450)
Probability of inadequate weight gain (<15 lb OR >40 lb)			
Less than or some HS	0.0079	-0.0084	0.0202**
	(0.0073)	(0.0116)	(0.0094)
HS graduate	0.0018	0.0026	0.0007
	(0.0060)	(0.0089)	(0.0082)
More than HS education	0.0017	0.0066	-0.0039
	(0.0033)	(0.0046)	(0.0048)
Probability of inadequate/intermediate Care (Kotelchuck Index)			
Less than or some HS	0.0030	-0.0006	0.0062
	(0.0091)	(0.0139)	(0.0119)
HS graduate	-0.0104	-0.0157	-0.0062
	(0.0071)	(0.0103)	(0.0097)
More than HS education	0.0048	0.0076	0.0020
	(0.0040)	(0.0054)	(0.0059)
Birthweight (grams)			
Less than or some HS	-1.7051	-3.0614	-1.3494
	(9.4854)	(14.3504)	(12.6536)
HS graduate	-9.2226	-13.3944	-5.6901
	(7.5502)	(10.9055)	(10.4709)
More than HS education	-3.8661	-8.3444	1.6764
	(4.5990)	(6.3066)	(6.7186)
Probability of low birthweight (<2500 grams)			
Less than or some HS	-0.0047	0.0030	-0.0100**
	(0.0040)	(0.0066)	(0.0049)
HS graduate	0.0034	0.0023	0.0041
	(0.0031)	(0.0047)	(0.0040)
More than HS education	0.0024	0.0033	0.0013
	(0.0018)	(0.0025)	(0.0024)
Probability of very low birthweight (<1500 grams)			
Less than or some HS	0.00004	0.0021	-0.0015
	(0.0014)	(0.0022)	(0.0020)
HS graduate	-0.0012	-0.0018	-0.0005
	(0.0012)	(0.0018)	(0.0015)
More than HS education	-0.0002	0.00002	-0.0005
	(0.0006)	(0.0009)	(0.0009)
1 minute APGAR score			
Less than or some HS	0.06568	-0.0727	0.1737***
	(0.0509)	(0.0823)	(0.0645)
HS graduate	-0.0166	-0.0077	-0.0244
	(0.0339)	(0.0515)	(0.0441)
More than HS education	0.0132	-0.02058	0.0608
	(0.0287)	(0.0396)	(0.0405)
5 minute APGAR score			
Less than or some HS	0.0473***	0.0064	0.0781***
	(0.0181)	(0.0266)	(0.0246)
HS graduate	-0.0021	0.0030	-0.0074
	(0.0133)	(0.0192)	(0.0184)
More than HS education	0.0139	0.00229	0.0295**
	(0.0086)	(0.0120)	(0.0121)

Notes:
1. ***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level
2. PNC = prenatal care
3. Controls include birth order, twin status, maternal age, and education categories, urban/rural status, region of residence, presence of pregnancy risk factors and year of birth.
4. The analysis uses the universe of children born to Chinese immigrant mothers in the 1989-2001 Natality Detail Files
5. Each pair of point estimates and standard errors are obtained from a separate regression; interaction effects are derived using the method described in Ai and Norton (2003)

Appendix Table 7: Post-natal Smoking Anti-Test -- % Mothers Who Use Tobacco Post-natally, by Child Gender and Ultrasound Receipt, 1988 National Maternal and Infant Health Survey

Means x100 (standard errors in parentheses)

	Girl	Boy	Difference
Ultrasound Received	30.440	29.646	0.794
	(0.834)	(0.812)	(1.164)
Ultrasound Not Received	27.088	26.975	0.113
	(1.071)	(1.074)	(1.516)
Difference			0.681
			(1.912)

***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level

Appendix Table 8: First trimester PNC Anti-test, by Birth Order and Maternal Characteristics, 1989-2001 Natality Files

	Interaction Effect of ULTRASOUND*FEMALE (standard erros in parentheses) from regressions where dependent variable = PNC initiated in 1st trimester
Subgroup of analysis:	
All Births	0.0006
	(0.0006)
First Births	-0.0004
	(0.0009)
Higher Order Births	0.0011
	(0.0008)
Married Mothers	-0.0001
	(0.0006)
Unmarried Mothers	0.0024*
	(0.0013)
Mothers <= 22 years	0.0005
	(0.0013)
Mothers 23-39 years	0.0004
	(0.0006)
Mothers >= 40 years	0.0049
	(0.0041)
Mothers with race = White	-0.0002
	(0.0006)
Mothers with race = Black	0.0036**
	(0.0017)
Mothers with race = Other race	0.0031
	(0.0028)

Notes:
1. ***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level
2. PNC = prenatal care
3. Controls include birth order, twin status, maternal age, race, ethnicity and education categories, foreign-born indicator, urban/rural status, region of residence, presence of pregnancy risk factors and year of birth.
4. The analysis uses a 15% random sample of the 1989-2001 Natality Detail Files
5. Each pair of point estimates and standard errors are obtained from a separate regression.

Appendix Table 9: Specification Check -- Effect of Ultrasound Receipt at Delivery/Labor on Prenatal Health Investments and Birth Outcomes, 2001 California Birth Statistical Master File

OLS coefficients or probit interaction effects of ULTRASOUND AT DELIVERY*FEMALE (standard errors in parentheses)

Dependent Variable		
Number of prenatal care visits	Coefficient	0.0574
	(std. err.)	(0.0655)
	n	496,599
Birthweight (grams)	Coefficient	15.09718*
	(std. err.)	(9.1109)
	n	510,332
Probability of low birthweight (< 2500g)	Interaction effect	0.0031
	(std. err.)	(0.0042)
	n	510,332
Probability of very low birthweight (< 1500g)	Interaction effect	-0.0032
	(std. err.)	(0.0020)
	n	510,332

Notes:
1. ***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level
2. Controls include birth order, twin status, maternal age, race, ethnicity and education categories, and presence of pregnancy risk factors.
3. The analysis uses the universe of live births in the 2001 California Birth Statistical Master File.
4. Each pair of point estimates and standard errors are obtained from a separate regression.

Appendix Table 10: Gender Difference in Post-Natal Investments, 1998 National Maternal and Infant Health Survey

Means x 100 (standard errors in parentheses)

	Girls		Boys		Difference
	Mean	(s.e.)	Mean	(s.e.)	
Number of Wellchild Visits	42.572	(0.345)	43.005	(0.348)	-0.432
Got WIC post-natally, no WIC before	66.944	(0.972)	64.118	(1.006)	2.826 **
Number of days breast fed	141.535	(3.107)	128.856	(2.764)	12.679 ***
Intensity of breast feeding, 1st month	4.782	(0.076)	4.728	(0.077)	0.054
Intensity of breast feeding, 2nd month	3.802	(0.072)	3.683	(0.072)	0.119
Intensity of breast feeding, 3rd month	2.883	(0.064)	2.813	(0.065)	0.070
Intensity of breast feeding, 4th month	2.212	(0.056)	2.142	(0.058)	0.070
Intensity of breast feeding, 5th month	1.803	(0.051)	1.745	(0.053)	0.058
Intensity of breast feeding, 6th month	1.534	(0.048)	1.478	(0.049)	0.056
Insurance Status, post-natal	68.691	(0.695)	70.004	(0.680)	-1.313
Any Immunization	97.183	(0.247)	97.291	(0.240)	-0.108

***(**)(*) indicates statistical significance at 0.01(0.05)(0.1) level