Natural Resources and Early-life health Conditions: Evidence from Colombia*

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ABSTRACT

We provide evidence on the effect of changes in economic conditions on the health outcomes at birth and infant mortality condition of cohorts born between 1998 and 2014 in Colombia. Our approach exploits the 2000s international gold prices surge as a natural experiment generating exogenous shocks to local economies. The results indicate that higher gold prices are associated with gains in metrics of infant health, including birth weight, gestation, and infant mortality in municipalities producing more gold. Investigating mechanisms, we find that (1) the price shock increased fertility for less-educated mothers and decreased the number of prenatal visits (time-intensive activity), and (2) the shock had significant positive effects on the labor participation of mothers. Taken together, we highlight that the income effect is more important than any other opposite effect on the production of healthy children.

Keywords: Birth endowments, Health behavior, Child Care, Commodity prices, Income shocks.
JEL classification: J24, J13, I12, Q02
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RESUMO

O presente estudo estima o efeito de mudanças nas condições econômicas sobre a saúde ao nascer e condição de mortalidade infantil de cortes nascidas entre 1998 e 2014 na Colômbia. Este artigo explora o aumento dos preços internacionais do ouro dos anos 2000 como um experimento natural que gera choques exógenos para as economias locais. Os resultados indicam que maiores preços do ouro são associados com ganhos em medidas de saúde infantil tais como peso ao nascer, período de gestação e mortalidade infantil em municípios que produzem com maior intensidade o ouro. Investigando os mecanismos, encontra-se (1) um efeito positivo sobre a decisão de fertilidade das mães menos educadas e um efeito negativo sobre o número de visitas pré-natais (intensivas em tempo), e (2) o choque teve um efeito significativo e positivo sobre a participação no mercado laboral da mãe. No geral, destaca-se que o efeito renda é mais importante do que qualquer outro efeito oposto na procriação de crianças saudáveis.

Palavras-Chave: Dotações iniciais das crianças, Comportamento de saúde, Saúde Infantil, Preços de commodities, Choques de renda.

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1. Introduction

The effect of natural resource abundance on economic development in producer economies has stirred a heated debate[1]. The existing empirical literature suggests that abundance of natural resources, predominately in developing countries, is associated with negative outcomes as such corruption and rent-seeking, neglect of education, conflicts and environmental damages, which have a direct effect on the living conditions of the population (GYLFASON, 2001 ; VAN DER PLOEG, 2011). Most of the evidence, however, capture the effects of resource abundance on development indicators using aggregate data at the country level, which offer few details about the local economic effects of natural resource price booms/ busts.

The purpose of this paper is to investigate whether natural resources can improve living conditions of the local population. For this purpose, we focus on exogenous income shocks induced by the 2000s boom in international gold prices, and estimate how these shocks affected the health outcomes at birth (such as birth weight) and infant mortality condition of cohorts born between 1998 and 2014 in Colombia[2,3]. Furthermore, we try to explore how such boom affects parental behavior in both health and labor market participation as possible mechanisms through which these effects may play out. The focus on infants is compelling to understand the short-run health effects of income shocks for at least three reasons. First, governments are highly motivated to protect these most vulnerable members of society. Second, it has been documented that a variety of prenatal shocks can lead to poor health at birth, which has long-lasting negative effects in health -as infant mortality- and consequently on economic capabilities (see, for example, BARKER, 1995; BEHRMAN AND ROSENZWEIG, 2004; CASE ET AT., 2005; ALMOND, 2006; BLACK ET AL., 2007; BARRECA, 2010 , among other)[4]. Second, analyzing the infants' health outcomes offers us a link of cause and effect cleaner and immediate than focusing on adults' health status because adults' diseases today may reflect exposures to other health shocks, such as pollution, that occurred during the course of their lives (CURRIE;NEIDELL, 2005).

The theoretical implications of the effects of economic shocks on child health are ambiguous because changes in labor earnings have both income and substitution effects. On the one hand, higher wages may increase the opportunity cost of carrying out time-intensive activities. This may provide less incentives to allocate time devoted to children health production[5]. This is the substitution effect. On the other one, higher wages allow households to increase the expenditures on maternal and fetal related health items. This is the income effect.

Additionally, gold mining are associated to environmental damage (e.g., release of heavy metal pollution and deforestation, among other effects) and conflicts which could affect human health[6]. In Colombia context, commodity booms or busts can affect the levels of violence in mining producing regions. Dube and Vargas (2013) find a positive relationship between natural resource price shocks and

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[1] See, for instance, Allcott and Keniston,(2017); Sachs e Warner, (1999);Sachs e Warner, (2001) and Mehlum, Moene and Torvik, (2006), among others.

[2] We take advantage of the persistence of the shock, which we can assume is exogenous due to two factors: (i) Colombia has no market power to influence international gold prices (Colombia ranks 21th in gold production worldwide) and (ii) gold mines are randomly distributed among municipalities by natural factors.

[3] The gold production is distributed around the country, with about 20% of municipalities (analogous to counties in the US) showing geological prospects and mining activities occurring in at least 12 of Colombia's 32 departments (analogous to states). For one department, Chocó, the gold represents more than 5% of GDP. In relation to Colombian exports, the gold, which is a non-traditional export, equaled in value to traditional exports such as ferronickel and coffee (Ministry of Mines and Energy, 2010).

[4]The proposition that health conditions at birth have a lasting impact on adult life achievements comes from the so-called "fetal origins hypothesis". The first premise originated with David Barker in the 1980s. See Barker (2001) and Almond and Currie (2011) for a review of the epidemiological evidence in support of this hypothesis.

[5]For example, activities as practicing good hygiene and traveling to distant facilities for free preventive and primary health service require time to be performed.

[6] It is estimated that approximately 100 tons per year of mercury are released by artisanal mining, which makes Colombia the world's highest per capita mercury polluter (Cordy et al.,2011; Telmer and Veiga 2008).

violence (measured by the No. annual non-state armed groups attack, clashes and casualties, among other). This fact can have effects on health indicators at birth. In fact, according to Camacho (2008) the exposition to random landmine explosions during a woman's first trimester of pregnancy is robustly correlated with lower birth weight. Camacho (2008) explains this impact through the relationship between stress in the early stages of pregnancy and outcomes at birth. In our study, unfortunately, we do not have information in our database that allows us to separately identify each of the previously mentioned effects. Therefore, taking advantage of the fact that these effects work in opposite directions, we estimate the net effect of their combined influence. Thus, our research offers evidence about relative importance of time, environmental degradation and stress versus current income in the production of healthy children. Because credit constrains and other market imperfections are more common in developing countries, we expect that our results to be consistent with growing evidence that the income effect is more important other effects to produce healthy children (see for example, BURLANDO, 2014; BOZZOLI AND QUINTANA-DOMEQUE, 2014)[7].

In our empirical analysis, we use a difference-in-differences model which compares infant health indicators across municipalities whose local economies have different degrees of dependence to gold production. Specifically, our empirical strategy exploits the interaction between the exogenous international commodity price with the amount of the commodity produced in each municipality. As metrics of infant health we use infant mortality(probability of dying with less than one year) and birth weight (and other indicators such as preterm, extreme preterm and Apgar (Appearance, Pulse, Grimace, Activity and Respiration)) [8,9]We use birth weight because it is determined by fetal growth rate at a given gestation length, which in turn is largely influenced by nutrition (Kramer, 1987) [10]. This feature makes it an attractive measure for the study of the effects of historical events that altered the *in utero* environment on health at birth[11].

The results of our analysis provide evidence that the 2000s boom in international gold prices generated a positive impact on infant health outcomes in general. More specifically, we find a reduction both in the cases of low and very low birth weight (LBW and VLBW) and in infant mortality rates per thousand live births, with price increases inducing an improvement in child health conditions among municipalities whose economies rely heavily on gold production[12]. Sensitivity analyses show that the coefficients do not suffer large changes whether controls or fixed effects are included or excluded. Investigating mechanisms, we find that (1) the price shock increased fertility for less-educated mothers and decreased the number of prenatal visits (time-intensive activity), and (2) the shock had significant positive effects on the labor participation of mothers. These pieces of evidence suggest that health-related benefits associated to the income effect during this booming period prevail over the potential negative impacts represented by the substitution effect and the negative environmental externalities from the increasing mining production.

Our findings are in line with Aragón and Rud (2013), who highlight the dominance of the income effect in the case of the Peruvian economy. They studied the effect of the expansion of the largest gold mine in Peru on local living standards using households' survey data for the period 1997 to 2006. The

[7] Constraints on savings and borrowing weigh not only on households' consumption smoothing but also on their ability to pay for basic investments in their children.

[8] Apgar score is a composite index of a child's health at the first and fifth minute of birth. It takes into account factors: activity and muscle tone, heart rate, grimace, skin coloration, and respiration. Each of this factors are worth 2 points.

[9] we classify each child according to his/her birth weight in low birth weight (LBW), which are those born with a weight less than or equal to 2500 grams, and very low birth weight (VLBW) that are children with a birth weight of 1500 grams or less.

[10]Medical literature has established a strong link between low birth weight and health problems such as cerebral palsy, deafness, epilepsy, blindness, asthma, and lung disease (BROOKS et al., 2001; KAELBER; PUGH, 1969; LUCAS; MORLEY; COLE, 1998; MATTE et al., 2001; NELSON; GRETHER, 1997; PANETH, 1995). Low birth weight has been also shown to be a strong predictor of impaired development of the brain. Children born with very low birth weight are more likely to suffer from attention deficit, dyspraxia, and impaired learning (MARLOW et al, 1989; 1993).

[11] In this point, what becomes relevant is to understand the malleability of health at birth. Today it is not difficult to think that the consumption of tobacco, alcohol, and illegal drug cause intrauterine growth retardation, or that good nutrition and better access to medical care have positive effects on fetal health (Currie, 2011).

[12] These same results are found when we use the number of weeks of gestation and APGAR score.

authors found that the expansion of the mine has a positive impact on nominal and real income of the local population. They argue that a possible channel of transmission through which these effects emerge is the existence of backward linkages. To try to verify whether this is true for the case of Colombia, we present an exploratory analysis of the relationship between the proportion of mothers with a contributory regime and the boom in gold world price. This type of social protection, according to the Colombia' Ministry of Health, is mandatory for formal workers and other people with the capacity to pay. While the other regime, subsidized, is for the unemployed, informal sector workers and the poor. Therefore, knowing if the mother is affiliated or not to the contributory regime is a good proxy to have information about their labor participation. We find a positive relationship between these two variables which suggests that the gold boom generated a positive effect on mothers' labor participation. This result reinforces the idea that the income effect is greater in magnitude than any other opposite effect.

Our study makes a few contributions to literature examining the effects of economic shocks on children health. First, although there is a rich theoretical literature that suggest that countries and regions with an abundance of natural resources fail to provide better standards of living(Sachs and Warner, 1999; Mehlum et al, 2006, among others), our results show, at least in the short term, the gold boom had a positive impact on the living standards of the local population and improved the children health. Second, we see our empirical work as a first attempt to examine the effects of the abundance of gold within a country on birth outcomes of the cohorts affected by the gold boom. This is a contribution to a literature that emphasizes the long-lasting effects of the fetal exposure to economic shocks or health insults on an individual's economic well-being (see, for example, Almond, 2006; Oreopoulos et al., 2008; Barreca, 2010). Third, as will be seen later, our work also contributes to literature on fertility. Specifically, our empirical evidence that the gold boom led to increases to fertility for disadvantaged women (low-educated women) is consistent with life-cycle models in which credit constraints and skill depreciation during pregnancy are important in fertility decisions.

Finally, we also highlight the importance of prenatal interventions as a mechanism to reduce disparities in the accumulation of human capital in the long-run. This is of particular interest in view of the growing evidence indicating that interventions focused on the prenatal period are more effective and substantially less expensive to be implemented (Doyle et al., 2009). This is especially important in the context of Colombia because current policies are focused on the population over six years old.

The remainder of this paper proceeds as follows. Section 2 theoretical framework. Section 3 describes our micro data and the identification strategies. Section 4 contains our main results. In Section 5, we present some robustness check. Section 6 provides a possible exploring market channel through which the gold boom impacts birth weight. Finally, section 7 presents conclusions.

2. Theoretical framework

Grossman and Joyce (1988) and Rosenzweig e Schultz (1982) are two seminal papers that presented the concept of infant health production functions. Under this framework, infant health is assumed to be a function of several factors. First, baseline health status. Second, the time spent on activities that increase health (exercise, cooking, sleeping, time to go to visits to the doctor, among others). Third, health related goods (e.g. healthy food).

Following Rosenzweig e Schultz (1982), we assume that parents maximize the following intertemporal utility function:

$$U = U(X, Y, H) \quad (1)$$

This equation indicates that a family gets utility from three types of goods: H the health of each of its children (or child in utero); (Y) goods that do affect infant (growth of the fetus) and/or maternal health (e.g. medicines, vaccines and food), and X which are health-neutral (have no effect on H, such as books).

The child health production function is given by

$$H = f(Y, Z, \mu), F_y, F_z, F_\mu \neq 0 \quad (2)$$

where Z is the purchased market inputs such as medical services (general medical care during pregnancy or particular prenatal care procedures/advices), which affect U through their effects on H. μ is the component of child (fetal) health due to genetic or environmental conditions uninfluenced by parental

behavior and preferences. The child health production function has the property that it is imbedded in the constrained utility maximization behavior of the family.

The problem facing the family is: To maximize (1) given (2) subject to the budget constraint, given by (3)

$$I = XP_x + YP_y + ZP_z \quad (3)$$

where I is exogenous income and P_x, P_y and P_z are, respectively, the prices of the health-neutral good, X, health-related consumer good, Y, child health investment goods. Expressions (1)– (3) can be manipulated to yield health input demand functions of the form

$$X = D_x(P_x, P_y, P_z, I, \mu) \quad (4)$$

$$Y = D_y(P_x, P_y, P_z, I, \mu) \quad (5)$$

$$Z = D_z(P_x, P_y, P_z, I, \mu) \quad (6)$$

The effects of changes in the prices of the three types of goods on the level of child health can be derived from these equations, noting that

$$dH = F_y dY + F_z dZ + F_\mu d\mu \quad (7)$$

From (2), these effects can be written as:

$$\frac{dH}{dP_x} = F_y \frac{dY}{dP_x} + F_z \frac{dZ}{dP_x} \quad (8)$$

$$\frac{dH}{dP_y} = F_y \frac{dY}{dP_y} + F_z \frac{dZ}{dP_y} \quad (9)$$

$$\frac{dH}{dP_z} = F_y \frac{dY}{dP_z} + F_z \frac{dZ}{dP_z} \quad (10)$$

where $\frac{d\mu}{dP_i}$ = 0, for i= *x,y,z* . Expressions (8), (9), and (10) indicate that price effects on child health depend on the effects of changes in prices on the demand for health production inputs as well as on the marginal products of these inputs in the production of health. In (10), if F_y >0 (goods that benefit health) and since Z considers intensive inputs in time, a reduction in wages would increase the demand for Z and decrease the demand for Y ($\frac{dY}{dP_z}$ < 0) leading to an ambiguous effect on child's health. Therefore, the existence of credit constraints and other market imperfections, which lead families to make an incomplete consumption smoothing, make health vulnerable to negative economic shocks (income effect greater than effect substitution).

Now an expansion of government expenditure would affect health and health behavior through the demand equation (4) -(6). Suppose an increase in public spending is reflected in the creation of more social programs. Thus, such programs may reduce the prices of the health inputs, through direct subsidization, or indirectly by increasing access. In the latter case, making services or inputs more readily available, i.e., by placing services in a remote area, reduce the time or travel costs to use the service. In addition, public programs may provide information on how to produce health more efficiently. This might include information on new inputs or on efficient practices with conventional inputs - when to breastfeed, how to sterilize baby formula, etc. - which yield greater survival rates for given total expenditures.

3. Data and Identification strategy

3.1 Data

3.1.1 Vital Statistics Records

The main source of data for this study is the vital statistics of Colombia, Estadísticas Vitales – EEVV-, collected by the Administrative Department of Statistics (DANE), which records births and deaths of children under one year of age. For births, the Dane registered them since 1998, and infant deaths since 1979. The data recorded in the birth certificates not only register the health status of newborn and the exact date of birth, but also contain information on the characteristics of the parents including age,

marital status and education, type of insurance. In addition to this information, the birth certificate allows us to observe the behavior of the mother during pregnancy, as it contains details about prenatal care. We obtained data from 1998 to 2014 for the 1120 municipalities in Colombia, which corresponds-approximately to 11 million birth records[13]. Likewise, the death certificates from the DANE provide comprehensive information on date and cause of death, birthdate, race, and gender, and mother's characteristics (education, marital status and age) are also provided for individuals who were under one year of life at death. This certificate covers over 96 percent of all annual deaths inferred from demographic census.

The Table 1 presents basic descriptive statistics from theses certificates. On the one hand, the prevalence of LBW in Colombia is on the order of 6.28%. Almost 0.58% of infants had VLBW. About 13% of the births in the analysis period had a weight above 3500 gr. The average of 5 minute Apgar score is 5.99. Of all infants born 51.28% were male. As for preterm deliveries, 13.11% of babies were born before week 37 and 0.23% of them were born before week 28. Regarding the characteristics of mothers, approximately 40.70% of them had a primary education level or less (<5 years of schooling). Also, 25.63% of mothers are under 19 years of age, 19.21% were married. Finally, the average number of prenatal visits is around 5 visits. At least 50.85% of mothers in our sample had 5 or fewer prenatal visits. On the other hand, the infant mortality rate per thousand births for the analysis period is 23.28 deaths on average.

3.1.2 International gold price

We use the World Bank's commodities prices series, which offers monthly price information for different commodities (such as coffee, oil and coal, to name but a few) from 1960 to the present. Figure 1 shows the evolution of average annual of gold world prices for the period 1900 to 2014. We can observe that the trend of prices was approximately stable between 1990 and 2001 and it increased continuously from 2002 to 2012. This trend provides us a natural experiment from which we can analyze the effect of gold mining on birth outcomes. We use the average of the natural log of the international gold price in the 12 months prior to birth in year *y* and month *t for* the construction of our main independent variable.

3.1.3 Local gold production

We use gold production data provided by Dube and Vargas (2013) . This dataset includes information on other commodities, such as coffee, oil and coal. This information is useful not only for the analysis of gold boom, but also to make a series of robustness checks, which will support our empirical result. Figure 2 and 3 show the cross-sectional variation of gold production in 2004 across different areas of Colombia. In Figure 2, we can observe that the distribution of production varies substantially across the municipalities that are at or above the 75th percentile. In this part of the distribution, the maximum production was 34.11 thousand grams, which was 33.56 thousand grams greater than the production of the municipality that produced the least (0.54 thousand grams). Additionally, the standard deviation in gold production across of these municipalities is around 10 thousand grams. As will be seen in the next section, this variation is essential for our empirical strategy.

3.2 Estimation strategy

The estimation of the causal effect of income variations on infant health raise some endogeneity issues, since some determinants of health are unobservable to the econometrician. A family's unobserved characteristics, for instance, might be correlated with family income as well as with health-related expenditures. This situation could lead to a classic case of failed inference. To avoid these identification problems, it is necessary to find an exogenous source of income variation. In the absence of a randomized controlled trial (for example, to assign randomly individuals different levels of permanent income), we exploit the 2000s boom in international gold prices as a natural experiment generating exogenous shocks

[13] An advantage of this data is that weight, length, Apgar score, and gestation time recorded at the time of the delivery in the hospital should be accurately measured variables. The sample is limited to births that were certified by a physician, which implies a reduction of about 6% in the number of observations. We have also disconsidered births that occurred in municipalities in which we have no information on the levels of production of gold. Thus, the final sample of our study consists of about 5,152,269 births. We aggregate the data into cells defined by municipality of residence of the mother, year and months of birth, and gender of the baby.

to local economies. This variable is a proxy to measure the gold boom in each municipality. The assumption here is that variations in the world gold prices are exogenous to local conditions in producing municipalities in Colombia. This assumption is not unrealistic since Colombia is not among the main gold producers in the world and therefore the country may be considered a price taker in the international gold market (Colombia ranks 21th in gold production worldwide).

One should note that the world price of gold is invariant across regions. This invariance would leave the analysis without an adequate control group to measure the effect on birth outcomes, since all municipalities would be exposed to the same price variation. Our empirical strategy exploits the interaction between global gold prices and municipality gold production capabilities as treatment variable. Because the mother's nutritional status at the time of conception could also be an important predictor of child's initial health endowment, we use the average of gold prices in the 12-month period before birth to take into account that effect pre-pregnancy. Accordingly, to all the above considerations, we employ a difference-in-differences design to estimate the effects of the boom in the gold prices on infant health outcomes. We define non-producing municipalities as those with production equal to zero and producing municipalities as those with positive production. As previously seen, the level of gold production varies between producing municipalities. Thus, this strategy can be considered as a difference in difference model with intensity in the treatment[14]. This analysis is based on a municipality-by month of birth panel. So, the benchmark regression is the following:

$$H_{mdyt} = \alpha + \beta(Gold_{md} \times PGold_{av,ty}) + \delta' X_{mdyt} + \eta_{mt} + \gamma_{yt} + \eta_d \times y + \epsilon_{mdyt} \qquad (11)$$

here the left-hand-side variable, H_{mdgyt} ,is a measure of health outcome (average) and infant mortality rate in the municipality m , department d, year y and month t (with t = 1, 2, …, 12). Our key dependent variables are LBW and VLBW and infant mortality rate per thousand births (IMR)9, but we also look at other health outcomes such as length of gestation, and APGAR score. X_{mdyt} is a vector that contains mother-specific controls such as age, educational attainment, and marital status (municipality average). ($Gold_{md}$ is the gold production level in municipality m and the department d during 2004 and $PGold_{av,ty}$ denotes the average of the natural log of the international gold price in the 12 months prior to birth in year y and month t[15]for LBW and VLBW and 18 months before dying for infant mortality. η_{mt} is a set of municipality-by-month fixed effects, which take into account the possibility that any time-invariant differences between municipalities (like Geographical-Features) may be correlated with ($Gold_{md} \times PGold_{av,ty}$)and H_{mdgyt}.

The γ_{yt} is a set of year-by-month fixed effects, which captures unobserved aggregate shocks impacting the entire country and secular trends in health outcomes. To address potential unobserved long-run differences in improving public health and other socioeconomic characteristics across department, department-specific linear time trends ($\eta_d \times y$) are included in our benchmark specification. This linear time trend is common to all municipalities included in a given department (average of 38 municipalities per department). Further, all our models use robust standard errors adjusted for clustering at the municipality-month level to account for serial correlation (Bertrand et al., 2004). We weight observations by the number of births, which has two purposes: First, it emulates a regression at the individual level. Second, the weighted regression may control for the fact that smaller municipalities can generate some noise in the analysis due to lower-quality data collection. Thus, variations of smaller areas are given a lower weight.

Finally, the identifying assumption of our statistical approach can be summarized in three parts: First, the world price of gold is exogenous to local conditions in Colombian municipalities, i.e., it is not affected by Colombia's gold production. Second, we exploit the fact that this natural resource is not evenly distributed across the country (the distribution depend on natural factors), which produces a totally

[14] This type of methodology has been widely used in recent studies (See, for instant, Dube and Vargas (2013), Miller and l (2010) and Acemoglu et al (2013)).

[15]We measure prices in logs so we can assess its effects in percent terms. The results are robust when prices are specified in levels.

random assignment of the effect of a boom or bust associated to gold prices. Third, in the absence of a boom or bust in international gold price, municipalities in the treatment and control groups would have experienced the same trends in the outcome of interest (H_{mdyt}). This assumption would be violated only if there were differential trends in time-varying determinants of outcomes across treated and untreated areas. For example, if poorer municipalities were converging to richer ones in terms of income or any other potential determinant of infant health, then it may lead to overestimates of the effects of the gold boom on infant health. To provide an assessment on the validity of this assumption in our context, Figure 4 shows the difference in the temporal trend in the rate of newborns with low birth weight between the two types of municipalities (producer and non-producer)[16]. In this figure is observed that before 2004 the rate of children with LBW evolved relatively similar between the two groups and only after that year different tendencies were visualized. This observation would give meaning to the application of our difference-in-differences setup.

4. Empirical results

4.1 Main results

Table 2 presents the main empirical results. The results are obtained using OLS regression of LBW, VLBW and IMR on our measure of prenatal gold shocks controlling for different regressors (from 1998 to 2014). In our most basic specification presented in the first column, we regressed our child health measure on a set of controls, which includes month-by-year, municipality and year fixed effects. In the remaining columns we add to the firth specification other control variables as follows: Column 2 with municipality-by-month fixed effects, column 3 with mothers' characteristics and newborns' sex, and column 4 with department specific linear time trends.

Overall, the coefficients in columns (1)– (5) seem to suggest that gold price shocks have a positive relationship with infant health, that is to say: when international gold price increases, child health improves differentially in municipalities that produce gold more intensively. In all the specifications the coefficient of interest β suggest a statistically significant decrease in the incidence of LBW and IMR caused by exposure to gold boom . It is notable that our results are extremely robust across specifications, including for department-specific linear time trends and mother's characteristics. To understand the magnitude of the estimated, consider an increase in $\text{PGold}_{\text{av,ty}}$ of 0.20 log points and the coefficient estimated in column (4) and (5). For the average gold production in producing municipalities, which is 2.335 (hundred thousand grams), the coefficients imply that the increase in prices induced -0.02 less newborn babies with LBW, relative to the non-producing municipalities. Now when this effect is divided by mean of LBW rate, the resulting effect size is a decrease of -0.30% in the prevalence of LBW in producing municipalities relative to non-producers. We labeled in this and subsequent tables as ''% Impact ([coef*Δ log price* $\overline{Gold}$]/mean)''. This impact is greater for municipalities with production levels greater than $\overline{Gold}$.

This effect estimated of -0.30% that we uncover for the boom in gold world price is almost three times smaller in absolute value than the -1.02% reduction in the cases of LBW due to the introduction of the Food Stamp Program (FSP) in United States estimated by Almond, Hoynes and Schanzenbach (2011). Moreover, our estimated impact for LBW is a little lower than -0.50% reduction in babies with LBW explained by a 1% increase in the unemployment rate in the US labor market (see DEHEJIA et al, 2004). Comparing the coefficient found in our work (which is -0.04074) in relation to that found by Bozzoli and Quintana-Domeque (2014) for the Argentine economic collapse is 0.026 lower in absolute value than the -0.067 calculated by them. These comparisons suggest that our estimates are not so far from what has already been found in empirical studies analyzing economic shocks in the pregnancy stage.

After finding that the gold boom led to a substantial decrease in the cases of LBW, we turn to the analysis of the effects of the gold boom on infant mortality. Column (5) shows that gold price shocks

[16] In this figure, we define as a non-producing municipality those with gold production equal to zero and producing municipalities as those with gold production in the 95th percentile or above it.

have a negative relationship with IMR: when the price of gold increases, IMR decrease differentially in municipalities that produce gold more intensively. This estimate is of statistical and economic significance. In magnitude, the resulting effect size is a decrease of -0.56% in the IMR in Colombia's gold producing areas relative to non-producers. Finally, we obtain similar results when applying the same estimation procedure for VLBW. Specifically, from column (1) through (4) in panel B of the Table 2, we observe a significantly negative coefficient of effect of the gold boom on the rate of VLBW. These results are also very robust to the addition of more control variables to the model. As in panel A, we calculate the impact, evaluated in the average gold municipality, in percentage terms of an increase of 0.20 log points in $PGold_{av,ty}$,the resulting effect size is between -0.68 % and -0.71 % of reduction in cases of very low birth weight in producing municipalities relative to non-producers. In general, in Table 2, we view the specification with department specific linear time trends as very encouraging, because we have addressed a potential concern regarding the possibility of that our estimator is driven by common omitted factors correlated both with $Gold_{md} \times PGold_{av,ty}$ and health at birth.

In general, our estimates unveil a clear pattern: they show a positive relationship between gold price shocks and health, with price increases inducing a differential improved in child health among municipalities that exploit more this natural resource.

Taken together, this pattern of results seems to suggest that income shocks are a more powerful determinant of health at birth than the joint effect of the opportunity cost of time, environmental degradation and stress to produce healthy children. However, due to the level of aggregation of the analysis, we cannot rule out that the main result may be driven by changes in the composition of births, composition of parturients (fertility decisions) and the health-related behavior of pregnant women. To address these possible channels, we test for impacts of the gold shocks on total births, mothers' demographic characteristics and parental behaviors related-health. These results are presented in the following subsections.

4.2 Other newborn outcomes

We next explore whether the gold boom improves other health measures in addition to birth weight. Results are presented in Table 3. To carry out this analysis, we use the same specification of equation (11). The analysis is undertaken with the following birth health measures: the rate of premature babies (less than 37 weeks' gestation), rate of extreme prematurity (less than 28 weeks' gestation) and low 5 minutes APGAR (Apgar score < 8). In panel A we show the results for the fraction of prematurity with different specifications. We can observe that coefficient is significantly negative and robust to the inclusion of additional controls. Similar results we obtained for all other birth outcomes. Overall, the results show an improvement in health indicators at birth.

5. Robustness check

In this subsection we present a number of robustness tests designed to assess the validity of our identification strategy. Specifically, we explore whether our findings are influenced by inclusion of other commodities (coal, coffee and oil), changes in mother behavior and changes in the composition of births or parturients. In general, the results from these robustness checks are reassuring.

5.1 Mother Characteristics

The gold boom can lead to increase in fertility for women with low educational level and credit restrictions against those women who have a better economic status. This change in the composition of the sample could bias downward our estimator. Table 4 presents the results for mothers with primary education or less, mothers with high school incomplete or less, mothers with high school and mother with college or more. The coefficients in columns (1) and (2) show that gold price shocks have a positive relationship with the proportion of mothers with low socioeconomic status (SES): when the price of gold increases, babies born to low-SES (low-educated women) mothers increase differentially in municipalities that produce gold more intensively.

This pattern in mothers' education distribution support the hypothesis of that low-SES mothers who are more likely to face credit constraints will tend be more fertile than high-SES women when the economy experiences positive macroeconomic shocks (see, for example, Dehejia et al, 2004). Overall, we consider the estimates in Table 4 are encouraging because they suggest that our main results (Table 2) are biased downwards by endogenous sample selection, which means that the effects of gold shocks on health at birth is greater than estimated.

5.2 Behavioral changes

We next study the cyclicality of time-intensive child health investments. In addition to changes in the composition of parturients, gold price shocks could also encourage behaviors that could harm or improve infant health. In Table 5, we present the results of this empirical exercise. To obtain these results, we use the specification of equation (11). According to the existing empirical literature; we also find a countercyclical relationship between prenatal care visits and the gold boom. From column (1) to (3), we observe a significant deterioration in the use of the prenatal care service among mothers: the average number of prenatal care visits decreases, the proportion of mothers with less than 5 prenatal care visits increases, and the proportion of mothers with more than 7 prenatal care visits decreases. This result is consistent with the fact that time-intensive activities decrease as a result of a positive shock in the economy (Dehejia and Lleras-Muney, 2004). Additionally, this result supports our hypothesis that the income effect, in the case of gold, is more important than other factors in the production of healthy children.

5.3 Composition of births

Another potential concern that could arise is that gold shocks may generate, through selective mortality, gradual changes in the composition of birth cohorts. Put differently, babies born during the gold boom may be different, for example in terms of health, from what would otherwise they have been. This empirical analysis is presented in the Table 6. The finding in column (1) suggests that gold price shocks have a procyclical relationship with the total number of births: when the price of gold increases, the total number of babies increases differentially in municipalities that produce gold more intensively. Overall, this result is reassuring, because the increase in total births could be interpreted as indicative of the improvement in survivability of marginal fetuses, which would lead to a negative composition effect on child health. That is to say, this change in composition of births leads to a bias downward in the estimated effect of the gold boom on health outcome at birth.

5.4 Other commodity and child health

Another potential problem pervading our analysis concerns to the possibility existence of spillover effects in municipalities that are also producers of other commodities or are close to other municipalities that produce these commodities. To address this concern, we use data from production levels of oil and coal, and hectares cultivated coffee for the years 1988, 2004 and 1997, respectively. Based on this data, we estimate a broader specification of our base model (Equation 1) adding the term $Commodity_{md}^{r} \times \gamma_{yt}$ for each commodity which is an interaction between the production (or cultivated area) and year-by-month fixed. In this specification, we consider some possible contemporary booms or busts to gold in other commodities, which could drive our estimator of the impact of gold shocks on early health outcomes.

Table 7 shows the results to this exercise. The column (1) is our benchmark specification, which we use to compare it with the other specifications. In columns (2) to (3) we look whether the main estimator changes in magnitude and significance when we control for oil production, coal production and coffee hectares. Note that the results for LBW LVBW and IMR are reasonably robust across the alternative specifications. Indeed, when we include all three commodities in the same specification, our finding remains unchanged in both the level of statistical significance and the magnitude of the effect. These results reduce concerns that the improvement in health at birth may be due to price variations in other commodities than gold.

6. Exploring market channel

We next study whether the surge in gold world prices propelled economic activity in the municipalities that produce this precious metal. The literature on the curse of natural resources points out that the abundance of natural resources would fail to provide a better quality of life for the population, and in particular, under the context of poor quality institutions and bad governance. However, the debate is still open. A recent contribution by Aragón and Rud (2013) studied the effect of the expansion of the largest gold mine in Peru on local living standards using households' survey data for the period 1997 to 2006. The authors found that the expansion of the mine has a positive impact on nominal and real income of the local population. They argue that a possible channel of transmission through which these effects emerge is the existence of backward linkages.

Given our limited information on the labor market, we will try to verify whether the increase in international gold prices has led to changes in the labor participation rate of mothers in the gold producing municipalities. For this purpose, we will use information regarding the type of mother's social security regime in health. In particular, we estimate the relationship between the proportion of mothers with a contributory regime and our main dependent variable. This type of social protection, according to the Colombia' Ministry of Health, is mandatory for formal workers and other people with the capacity to pay. While the other regime, subsidized, is for the unemployed, informal sector workers and the poor. Therefore, knowing if the mother is affiliated or not to the contributory regime is a good proxy to have information about their labor participation. Table 8 presents the results for this exercise. In this specification, we restricted the sample to municipalities with gold production in 2004. Note that in all cases, the estimates of are significantly positive and robust to the inclusion of additional controls. This result reinforces the idea that the income effect is greater in magnitude than any other opposite effect.

7. Final remark

This paper exploits the local economic shocks induced by the 2000s surge international gold prices to provide credible estimates of the effect of economic conditions on infant health in the Colombian context. We take advantage of the persistence of the shock, which we can assume is exogenous due to two factors: (i) Colombia has no market power to influence international gold prices (Colombia ranks 21th in gold production worldwide) and (ii) gold mines are randomly distributed among municipalities by natural factors. Using information of around 11 million births between 1998 and 2014, we have found that the prenatal exposure to gold boom improved the initial health endowments.

Because the type of women who have children in positive business cycles may differ from those who choose to postpone fertility, we check whether the shock of gold led to changes in the composition of parturients. Knowing this is important since parental characteristics are correlated to the health status of children and therefore, a change in the selective timing of conceptions can lead to differences in the birth outcomes during the economic cycle. In this analysis, we find that less-educated mothers are more likely to have children during gold boom, thus decreasing the average health status of their babies. In contrast, we observed that high-educated mothers choose to postpone fertility. In addition, the gold boom may lead to change in mothers' health-related behaviors. We find evidence that gold price shock had a negative effect on prenatal care visits, which would lead to a decrease in children's health.

Overall, our results can be interpreted as follows: exposure to the boom in international gold price led to improve in initial health endowments differentially in areas that produce more gold, even with negative effects such as the increase in the proportion of low-SES mothers, decrease in the number of prenatal visits and the degradation of the environment. This suggests that, given that women's health behavior worsens with gold boom and that incomes are higher in this cycle, it would seem that the income effect is an important determinant of health. Our main results are compatible with those obtained by Bozzoli and Quintana-Domeque (2014) and Burlando (2014) ,who found a net negative effect on health at the birth of the Argentine macroeconomic collapse between 2001 and 2002 and an electric blackout in Tanzania, respectively.

Regarding possible mechanisms, we analyze the relationship between main dependent variable and the proportion of women with a contributory health regime, which covers formal workers and other

people with the capacity to pay. We find a positive relationship between these variables. This suggests that the shock may have generated an increase in the real income of the locating households in the producing municipalities, which led to an improvement in the health of both the mother and the newborn. This result reinforces the idea that the income effect is greater in magnitude than any other opposite effect.

There are certain limitations of this study that must be acknowledged. Probably the most important one is the absence of information on direct measures of mothers' labor market outcomes which prevents us from obtaining accurate estimates of the labor market mechanism. However, our findings represent an advance in understanding the impact of changes in economic conditions on children's health, which is important for policy formulations that aim to reduce economic inequality among individuals.

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TABLES

Table 1. Descriptive Statistics

	Number of Municipalities	Number of Observations	Mean	Standard Deviation
***Child's characteristics (1998–2014)*:**				
Number of births	990	5152269	195.69	220.53
%Male	990	5152269	51.28	49.98
Very low birth-weight rate($\leq$ 1500 gr)	990	5144737	0.58	1.21
Low birth-weight rate ($\leq$ 2500 gr)	990	5144737	6.28	5.36
Infant mortality rate per 1000 births	990	6960221	23.28	24.71
% Birth weight $\leq$ 1000 gr	990	5140576	0.19	0.82
% Birth weight $\leq$ 2000 gr	990	5140576	1.57	2.73
% Birth weight $\leq$ 3000 gr	990	5140576	29.32	14.56
% Birth weight $\leq$ 3500 gr	990	5140576	72.04	14.96
% Birth weight $\geq$ 3500 gr	990	5140576	13.38	14.16
Extreme prematurity rate	990	4876512	0.23	0.84
Prematurity rate	990	5149050	13.11	8.48
APGAR score rate	990	5137364	5.90	10.31
Maternal Characteristic (1998-2014):				
mothers less than age 19 rate	990	5151106	25.63	9.58
mothers between age 20 and 39 rate	990	5151106	72.04	12.12
mothers greater than 39 rate	990	5151106	2.33	3.72
Moms with primary or less rate	990	5149063	40.71	19.72

Moms with high school incomplete or less rate	990	5149063	68.94	18.40
Moms with high school rate	990	5149063	22.44	11.89
Moms with college or more rate	990	4876640	4.48	5.35
moms married rate	990	5150031	19.21	13.76
% moms with health security	990	4875931	22.36	20.38
Prenatal Care (1998-2014) :				
No. of prenatal care visits	990	4872948	5.19	1.19
% with fewer than 5 prenatal	990	4872948	50.85	20.19
% with greater than 5 prenatal	990	4872948	32.78	18.25
Municipal-level variables :				
Gold production, hundred thousand grams,2004	990	990	0.354	2.61
Coffee intensity, thousands of hectares, 1997	990	971	0.835	1.54
Oil production, hundred thousand barrels/day,1988	990	990	0.003	0.05
Coal production, thousands of tons, 2004	990	990	1.885	12.80
Log int'l gold price, average twelve months before birth (1998-2014)	990	17	6.331	0.64
Log int'l gold price, average twelve months before conception (1998-2014)	990	17	6.389	0.66

Source: Research results. In panel of child's characteristics all variables are dummies, except for number of births. In panel of maternal characteristic all variables are dummies. Prematurity is the birth of an infant before 37 weeks of pregnancy. Extreme prematurity is the birth of an infant before 28 weeks of pregnancy.

Table 2. Effects of the Gold Prices Shocks on Birth Outcomes in Colombia, 1998-2014

	(1)	(2)	(3)	(4)	(5)
***Panel A**: Dependent variable is Low Birth-Weight Rate and Infant mortality Rate*					
Gold production2004 x gold price	-0.05061***	-0.05054***	-0.05060***	-0.04074***	
(Twelve months before birth)	[0.00381]	[0.00382]	[0.00376]	[0.00643]	
Gold production2004 x gold price					-0.28355**
(Eighteen months before dying)					[0.0375]
% effect of 20% Δ in gold price	-0.377	-0.376	-0.376	-0.303	-0.56
Observations	302101	302101	299456	299456	6960221
R-sq	0.252304	0.280820	0.291586	0.293949	0.105768
***Panel B**: Dependent variable is Very Low Birth-Weight Rate*					
Gold production2004 x gold price	-0.00879***	-0.00882***	-0.00875***	-0.00844***	
(Twelve months before birth)	[0.00111]	[0.00112]	[0.00112]	[0.00148]	
% effect of 20% Δ in gold price	-0.71	-0.709	-0.703	-0.678	
Observations	302101	302101	299456	299456	
R-sq	0.134930	0.169862	0.172270	0.173906	
Departament x linear time				Yes	Yes
Other controls			Yes	Yes	Yes
Municipality x Month fixed effects		Yes	Yes	Yes	Yes
Month x year fixed effects	Yes	Yes	Yes	Yes	Yes
Municipality fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes

Source: Research results.

Notes: The dependent variable is the fraction of children born - by sex, municipality, month and year. The effect of a 20% increase in gold prices is computed by multiplying the average production of gold- producing municipalities by the coefficient on Gold production2004 x gold price, and dividing the resulting value by the mean of dependent variable. "Other controls" include the newborn's sex, mother's school attainment, maternal age and mother's marital status. Estimates are weighted using the number of birth. Robust standard errors are in parentheses and are clustered at the municipality-months level. Yes that means that the group of variables is included in the regressions. Significance : $*$ p < 0.10, $**$ p < 0.05, $***$ p < 0.01.

Table 3. Effects of the Gold Prices Shocks on other Birth Outcomes

	(1)	(2)	(3)	(4)
		Panel A: *Dependent variable is Preterm*		
Gold production2004 x gold price	-0.12570***	-0.12551***	-0.12645***	-0.09978***
(Twelve months before birth)	[0.00967]	[0.00978]	[0.00970]	[0.01181]
% effect of 20% Δ in gold price	-0.45	-0.45	-0.45	-0.36
Observations	306128	306128	303274	303274
R-sq	0.235162	0.262970	0.265751	0.271129
		Panel B: *Dependent variable is Extreme Preterm*		
Gold production2004 x gold price	-0.00302***	-0.00302***	-0.00295***	-0.00275***
(Twelve months before birth)	[0.00073]	[0.00075]	[0.00076]	[0.00083]
% effect of 20% Δ in gold price	-0.60	-0.60	-0.59	-0.55
Observations	306128	306128	303274	303274
R-sq	0.023455	0.063589	0.065404	0.065948
		Panel C*: Dependent variable is Apgar Score*		
Gold production2004 x gold price	-0.04209***	-0.04167***	-0.04082***	-0.09612***
(Nine months before birth)	[0.00875]	[0.00896]	[0.00896]	[0.01024]
% effect of 20% Δ in gold price	-0.33	-0.33	-0.32	-0.76
Observations	294885	294885	292580	292580
R-sq	0.159754	0.191071	0.193676	0.221663
Department x linear time				Yes
Other controls			Yes	Yes
Municipality x Month fixed effects		Yes	Yes	Yes
Month x year fixed effects	Yes	Yes	Yes	Yes
Municipality fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Source: Research results.
Notes: The dependent variable is the fraction of children born - by sex, municipality, month and year The effect of a 20% increase in gold prices are computed by multiplying the average production of gold- producing municipalities by the coefficient on Gold production2004 x gold price, and dividing the resulting value by the mean of dependent variable. "Other controls" include the newborn's sex, mother's school attainment, maternal age and mother's marital status. Estimates are weighted using the number of birth. Robust standard errors are in parentheses and are clustered at the municipality-months level. Significance: ∗ $p < 0.10$ ∗∗ $p < 0.05$, ∗∗∗ $p < 0.01$.

Table 4. Effect of the Gold Prices Shocks on Mother Characteristics

Dependent variable	% Moms with primary or less	% Moms with high school incomplete or less	% Moms with high school	% Moms with college or more
Gold production2004 x gold price	0.09291***	0.06704***	-0.03181**	-0.02558***
(Twelve months before conception)	[0.01139]	[0.01908]	[0.01531]	[0.00348]
Observations	305913	305913	305913	305913
R-sq	0.659689	0.672004	0.452724	0.60982
Department x linear time	Yes	Yes	Yes	Yes
Municipality x Month fixed effects	Yes	Yes	Yes	Yes
Month x year fixed effects	Yes	Yes	Yes	Yes
Municipality fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Notes: The dependent variable is the fraction of children born - by sex, municipality, month and year. Estimates are using the number of birth. Robust standard errors are in parentheses and are clustered at the municipality- months level. *Yes* that means that the group of variables is included in the regressions. Significance: ∗ $p < 0.10$ ∗∗ $p < 0.05$, ∗∗∗ $p < 0.01$

Table 5. Effect of the Gold Prices Shocks on Mother Behaviors

Dependent variable	Average no. Of prenatal care visit	% < than 5 prenatal care visit	% > than 7 prenatal care visit
Gold production2004 x gold price	-0.01068***	0.29785***	-0.35283***
(Twelve months before conception)	[0.00093]	[0.01829]	(0.02004)
Observations	299534	299534	299534
R-sq	0.618278	0.564033	0.545733
Departament x linear time	Yes	Yes	Yes
Other controls	Yes	Yes	Yes
Municipality x Month fixed effects	Yes	Yes	Yes
Month x year fixed effects	Yes	Yes	Yes
Municipality fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

Source: Research results.
Notes: In column (1), the dependent variable is the average number of prenatal visits by sex, municipality, month, and year. In column (2) and (3), The dependent variable is the fraction of children born - by sex, municipality, month and year. Estimates are weighted using the number of birth. Robust standard errors are in parentheses and are clustered at the municipality-months.Significance : $*$ p < 0.10 $**$ p < 0.05, $***$ p <0.01

Table 6. Effect of the Gold Prices Shocks on Number of Births

Dependent variable	Number of births	log(Number of births)
Gold production2004 x gold price	0.09876**	0.01016***
(Twelve months before conception)	[0.03587]	[0.00097]
Observations	308896	308896
R-sq	0.925241	0.834923
Department x linear time	Yes	Yes
Municipality x Month fixed effects	Yes	Yes
Month x year fixed effects	Yes	Yes
Municipality fixed effects	Yes	Yes
Year fixed effects	Yes	Yes

Source: Research results.

Notes: The dependent variable is the fraction of children born with - by sex, municipality, month and year. Robust standard errors are in parentheses and are clustered at the municipality-months level. Significance: $*$ p < 0.10 $**$ p < 0.05, $***$ p < 0.01.

Table 7. Other Commodities and Birth Outcomes

	Gold	Oil	Coffee	Coal	All
	Panel A: *Dependent variable is LBW*				
Gold production2004 x gold price	-0.04074***	-0.04063***	-0.03980***	-0.04090***	-0.03980***
(Twelve months before birth)	[0.00643]	[0.00643]	[0.00656]	[0.00643]	[0.00657]
Observations	299456	299456	299456	299456	299456
R-sq	0.293949	0.294755	0.294644	0.294678	0.296181
	Panel B: *Dependent variable is IMR*				
Gold production2004 x gold price	-0.28355**	-0.21253**	-0.19325**	-0.17375**	-0.19136**
(Eighteen months before dying)	[0.0375]	[0.0348]	[0.0356]	[0.0383]	[0.0347]
Observations	6960221	6960221	6960221	6960221	6960221
R-sq	0.105768	0.123768	0.12769	0.13664	0.126762
	Panel C: *Dependent variable is VLBW*				
Gold production2004 x gold price	-0.00844***	-0.00843***	-0.00821***	-0.00845***	-0.00820***
(Twelve months before birth)	[0.00148]	[0.00148]	[0.00151]	[0.00148]	[0.00151]
Observations	299456	299456	299456	299456	299456
R-sq	0.173906	0.176014	0.174774	0.174821	0.177813
Departament x linear time	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes
Municipality x Month fixed effects	Yes	Yes	Yes	Yes	Yes
Coffee intensity1997 x(MonthXyear fixed effects)			Yes		Yes
Oil production1988 x (Month x year fixed effects)		Yes			Yes
Coal production2004 x (Month x year fixed effects)				Yes	Yes
Month x year fixed effects	Yes	Yes	Yes	Yes	Yes
Municipality fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes

Source: Research results.
Notes: The dependent variable is the fraction of children born - by sex, municipality, month and year. Estimates are weighted using the number of birth. Robust standard errors are in parentheses and are clustered at the municipality-months level. Significance: $*$ p < 0.10 $**$ p < 0.05, $***$ p < 0.01.

Table 8. Health Security and Gold Prices Shocks

	(1)	(2)	(3)	(4)
	Panel: *variable dependent is % mothers with contributory regimen*			
Gold production2004 x gold price	0.05244***	0.05203***	0.06684***	0.05753**
(Twelve months before birth)	[0.01420]	[0.01448]	[0.01487]	[0.01281]
N	55652	55652	55280	55280
R-sq	0.805307	0.810274	0.816869	0.833922
Department x linear time				Yes
Other controls			Yes	Yes
Municipality x Month fixed effects		Yes	Yes	Yes
Month x year fixed effects	Yes	Yes	Yes	Yes
Municipality fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes

Source: Research results.
Notes: The dependent variable is the fraction of mothers with contributory regimen - by newborn's sex, municipality, month and year of birth. “Other controls” include the newborn's sex, mother’s school attainment, maternal age and mother's marital status. Estimates are weighted using the number of birth. Robust standard errors are in parentheses and are clustered at the municipality-months level. Significance: $*$ p < 0.10 , $**$ p< 0.05, $***$ p < 0.01.

FIGURE

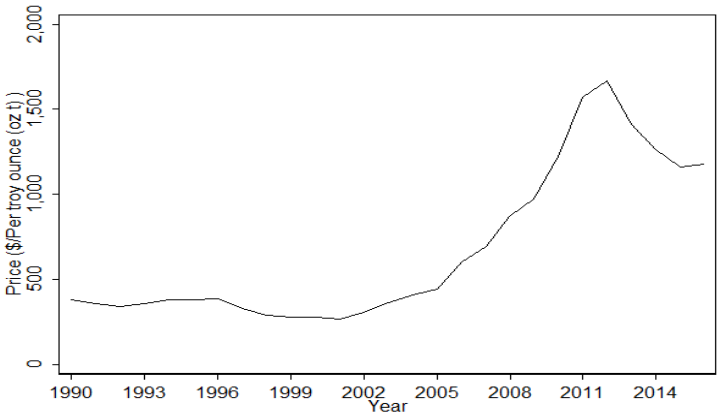

Figure 1 Gold World Prices Trend 1998-2014

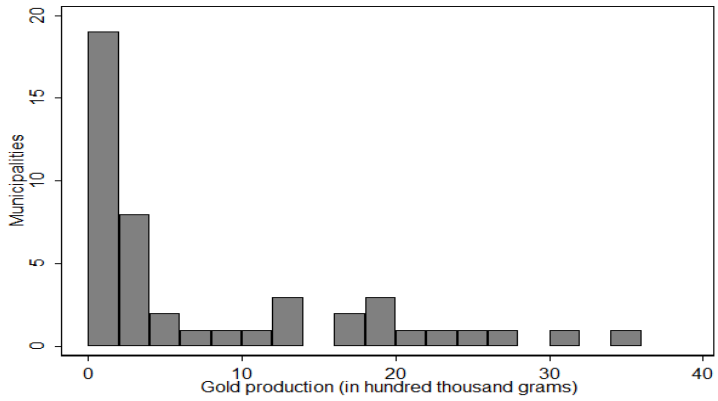

Figure 2. Distribution of gold production in 2004 by municipalities in Colombia.

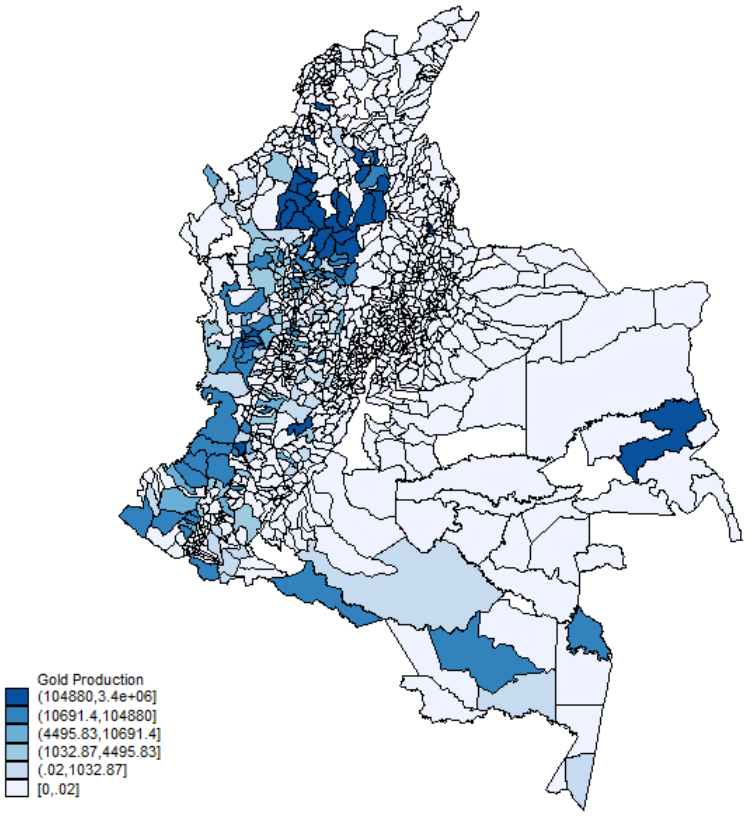

Figure 3. Map of geographical distribution of gold in 2004 in Colombia.

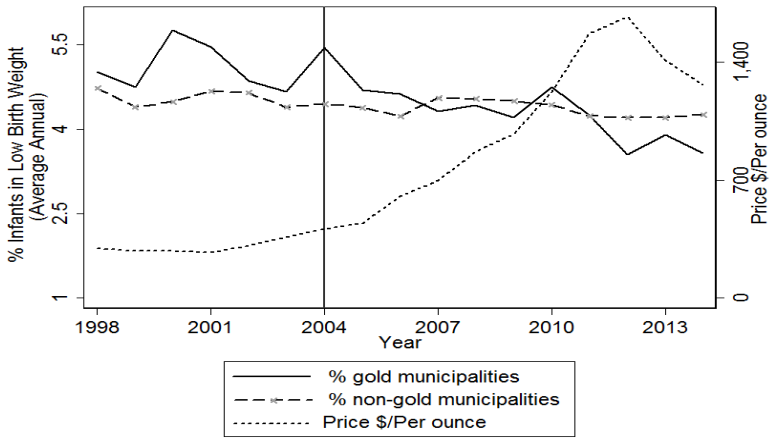

Figure 4. Gold Price and Birth Weight Trends 1998-2014