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INCOME SHOCKS AND CHILD MORTALITY RATES: EVIDENCE FROM FLUCTUATIONS IN OIL PRICES

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ABSTRACT

Previous studies show that children in lower socioeconomic status families reveal higher rates of mortality. We complement the income-mortality literature by establishing a causal link between income and child mortality. Our instrument for income is based on time-series global shocks to oil prices combined with the cross-sectional share of employment in manufacturing across US states as their exposure to oil price changes. Using the universe of death records between the years 1975-2004, we find the OLS results of income-child-mortality relationships are under-biased. The 2SLS-IV results suggest that a $1,000 increase in income per capita at the state level reduces child mortality and infant mortality by 0.87 and 0.53 fewer incidences per 1,000 population of age-specific children.

Contribution/Originality: This is the first study to establish a causal link between income and child mortality rate. Moreover, it adds to the literature on oil and income by introducing an oil-price-based instrument which has the potential to influence household income and health.

1. INTRODUCTION

An income shock has the potential to influence mortality rates specifically among children in several ways. First, it provides families with better resources to support the health of children including better nutrition (Barker & Osmond, 1986; Da Silva Lopes et al., 2017; Hart, 1993; Smith et al., 2017). Second, it helps families to relocate to areas with better health environments and less polluted residential locations which in turn reduces the likelihood of infant death (Chay & Greenstone, 2003; Currie, Neidell, & Schmieder, 2009). Third, it generates incentives among families to purchase insurance or change the composition of their insurance use to presumably better quality private insurance. Better health utilization has been documented to impact infants' health and infant mortality (Dave, Kaestner, & Wehby, 2019; Gryzbowski, Adamicz, & Wysocki, 2021; Hoynes, Miller, & Simon, 2015; NoghaniBehambari, Noghani, & Tavassoli, 2020b).

A small but growing body of literature establishes the fact that improvements in income and welfare reduce child mortality rates. Turner, Danesh, and Moran (2020) explore the dynamics in infant mortality in the US at the county-level between the years 1960-2016. They find that poor counties have relatively higher infant mortality rates compared to rich counties and that these gaps partially close between the years 1960-2000 while the largest reduction occurs between the years 1960-1980 which coincides with the introduction of a series of welfare programs including food stamp, Medicaid, and raises in unemployment insurance benefits. Ehntholt, Cook, Rosenquist, Muennig, and Pabayo (2020) document the relationship between income inequality and the risks of infant death and neonatal mortality using cross-sectional data for the US in the year 2010. They find that higher income inequality is associated with an increase in odds of infant mortality and neonatal mortality. Cooper and Stewart (2020) conduct a review study for research on income and infant mortality. They find consistent evidence in the literature that income affects children's health including their cognitive and social-behavioral outcomes. The effects are more pronounced for poor households and children living in poor areas and among minorities. In another study, Rees, Monuteaux, Raphael, and Michelson (2020) show that neighborhood income has the potential to influence pediatric mortality rates. The effect of neighborhood income on pediatric mortality is more pronounced for children living in the bottom quartile of the income distribution. O'Hare, Makuta, Chiwaula, and Bar-Zeev (2013) conduct a literature search study using 24 papers evaluating the income-mortality relationship across countries. They find that income is an important determinant of child mortality across developing countries. An increase of 10 percent in real GDP per capita (adjusted for purchasing power parity) could reduce the child mortality rate of a country with a child mortality rate of 50 per 1,000 live births to 45 per 1,000 live births, a reduction of 20 percent. In a similar study, NoghaniBehambari et al. (2020b) exploit the variations in child support policies as a source of shock to the income of single mothers and show that the income rises has the potential to reduce child mortality rates with larger impacts among infants. Baird, Friedman, and Schady (2011) document a negative correlation between per capita GDP and infant mortality rates across developing countries. They find that female infant mortality is more responsive to income shocks than male mortality rates. Finch (2003) shows that families with higher socioeconomic status reveal lower infant mortality rates. He finds that absolute material conditions are the main channel through which socioeconomic status affects infant mortality. Similar studies also document the income-mortality relationship (Adda, Banks, & Von Gaudecker, 2009; Almond, Hoynes, & Schanzenbach, 2011; Arno, House, Viola, & Schechter, 2011; Blakely, Collings, & Atkinson, 2003; Eli, 2015; Ensor, Cooper, Davidson, Fitzmaurice, & Graham, 2010; Evans & Moore, 2011; Finch, 2003; Haile & Niño-Zarazúa, 2018; Hanmer, Lensink, & White, 2003; Jusot, 2006; Kim, 2017; Myrskylä, 2010a; Myrskylä, 2010b; Myrskylä, Mehta, & Chang, 2013; NoghaniBehambari, Noghani, & Tavassoli, 2020a; Philipson & Becker, 1998; Van Den Berg, Doblhammer-Reiter, & Christensen, 2011; Waldmann, 1992; Wolfe & Behrman, 1982; Yeung, Van den Berg, Lindeboom, & Portrait, 2014). However, this literature fails to assess a causal link between income shocks and child mortality rates. This paper aims to fill this gap in the literature.

This paper explores the effect of income on infant and child mortality rates across US states over the years 1975-2004. To solve Endogeneity issues, we exploit the time-series changes in oil prices combined with the cross-sectional variations in the share of employment in manufacturing across US states as their exposure to oil price changes. First, we show that our instrument for income has strong first stage effects. Second, using a 2SLS-IV approach, we show that a $1,000 increase in personal income per capita leads to 0.87, 0.53, and 0.02 fewer deaths to children (age 0-4), infants (age 0-1), and toddlers (age 1-4), respectively. These marginal effects are larger than the implied effects of OLS which suggests that the Endogeneity issues associated with OLS regressions under-estimate the true effects.

The results of this paper have important implications for policymakers in public health. They emphasize the importance of income on reducing child mortality and improving health inequality in society. The evidence of this paper also highlights the potential benefits of welfare payments on child health as the payments can offset the negative effects of income shocks specifically during recessions.

Another policy implication of these results is for closing the social gaps in health specifically during difficult times. For instance, Allen, Brown, and Wang (2021) show that the effect of pollution on mortality due to the covid-

19 pandemic is not uniformly distributed across different subgroups in a society. They show that the negative effects of pollution are more pronounced among blacks and poor people. In the same manner, the negative effect of income shock has also been shown to have larger effects among minorities and more vulnerable individuals (NoghaniBehambari, Noghani, & Tavassoli, 2020). Therefore, the fact that income can have large effects on child mortality suggests that policies that attempt to promote children's health while closing the racial and socioeconomic gaps must take into account the differential impact of income on child mortality across sub-groups in the population.

This paper adds to the literature in two ways. First, to the best of our knowledge, this is the first study to establish a causal link between income and child mortality rates. Second, it adds to the literature on welfare and health by providing evidence of the effectiveness of income in improving the health of children.

The rest of the paper is organized as follows. Section 2 introduces the data sources. Section 3 offers a theoretical framework. Section 4 discusses the empirical method and instrumental variable analysis. In section 5, we go over the results. We conclude the paper in section 6.

Table-1. Summary Statistics.

Variable	Observations	Mean	Std. Dev.	Min	Max
Children Characteristics:					
Child Death Rate	31,034	3.540	10.365	0.083	176.925
Infant Death Rate	31,034	14.749	51.876	0	876.009
Toddler Death Rate	31,034	0.703	1.255	0	17.707
Age	31,034	1.768	1.439	0	4.000
Female	31,034	0.490	0.500	0	1.000
White	31,034	0.464	0.499	0	1.000
Black	31,034	0.311	0.463	0	1.000
Other	31,034	0.225	0.418	0	1.000
State Characteristics:					
GSP per Capita	31,034	41668.537	13394.537	23257.498	166071.719
Unemployment Rate	31,034	6.117	2.052	2.300	17.800
Medicaid Coverage Rate	31,034	10.561	3.776	0.855	25.950
%Blacks	31,034	11.305	10.697	0.211	69.374
%Whites	31,034	84.278	12.710	24.038	99.454
%Males	31,034	48.930	0.903	46.264	53.218
%Population Aged 25-65	31,034	49.606	3.066	39.691	56.139
Average Weekly Wage	31,034	830.630	138.946	0	1991.750
Log Current Transfer Receipt	31,034	17.268	1.068	14.451	19.799
Log Income Maintenance Benefits	31,034	14.967	1.164	11.444	17.909
Log Unemployment Insurance Benefits	31,034	13.897	1.170	10.698	16.797
Log Other Welfare Programs	31,034	17.109	1.068	13.979	19.588
Minimum Wage	31,034	7.782	0.985	6.266	12.019
Education Expenditure per Capita	31,034	1.475	0.474	0.458	4.878
Health Expenditure per Capita	31,034	0.147	0.089	0.024	0.896
Policing Expenditure per Capita	31,034	0.048	0.076	0.001	0.912
Blacks Arrest Rate	31,034	598.223	771.506	0	7312.297
Whites Arrest Rates	31,034	57.093	26.448	0	231.040
Education less than High School	31,034	0.125	0.054	0.035	0.320
Education High School	31,034	0.519	0.053	0.353	0.670
Education Some College	31,034	0.250	0.046	0.120	0.391
Child Population	31,034	16907.077	25987.722	5.000	250213.000
%Manufacturing Employment	31,034	0.036	0.019	0	0.101
Personal Income per Capita	31,034	34.536	6.829	19.764	62.463

2. DATA SOURCES

This study uses a variety of data sources. The primary data is cause-specific mortality data extracted from National Center for Health Statistics (NCHS). We collapse the mortality data by age, race, state, and year. We restrict the sample only to deaths in ages 0-4 as the primary focus of our study is children. The denominator for mortality is age and gender-specific population extracted from SEER (2019). We also include a series of economic indicators in our regressions. The sources of these covariates are as follows. GSP per capita is taken from the Bureau of Economic Analysis. The unemployment rate is extracted from the Bureau of Labor Statistics. Medicaid coverage rate is extracted from Flood et al. (2018). Average wages are taken from replication materials of Noghani and Noghanibehambari (2019). Welfare payments are extracted from Kaplan (2018). Arrest rates are taken from FBI (2018). The data covers the years 1975-2004.

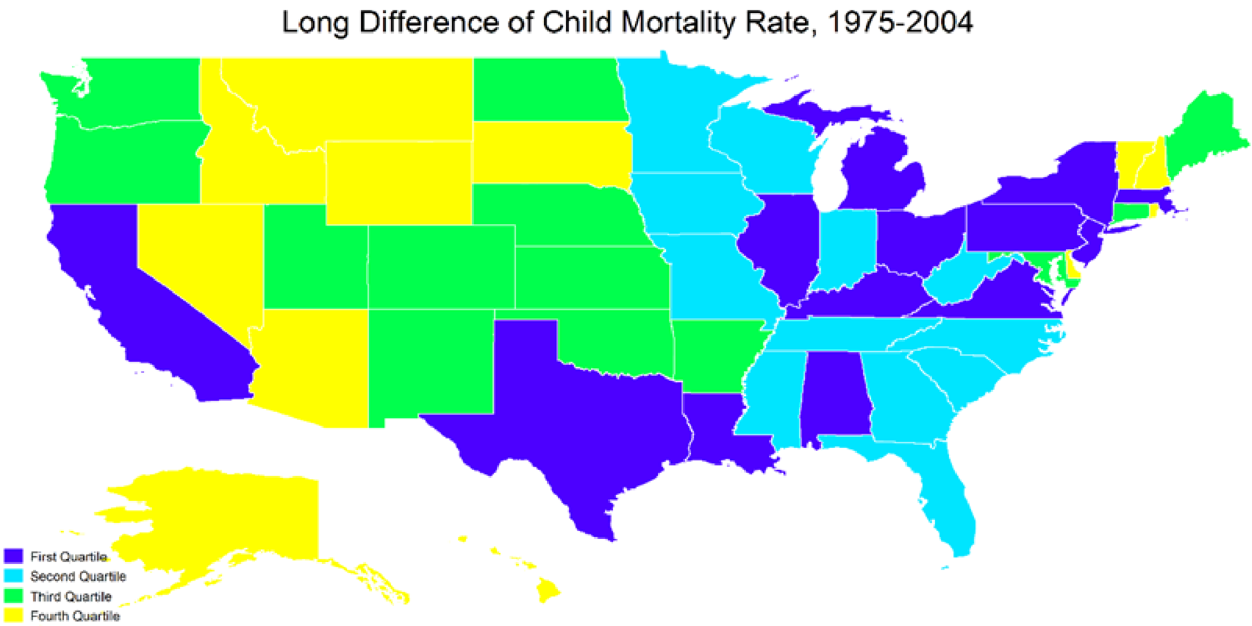

Figure-1. Geographic Distribution of Changes in Child Mortality Rates across US States.

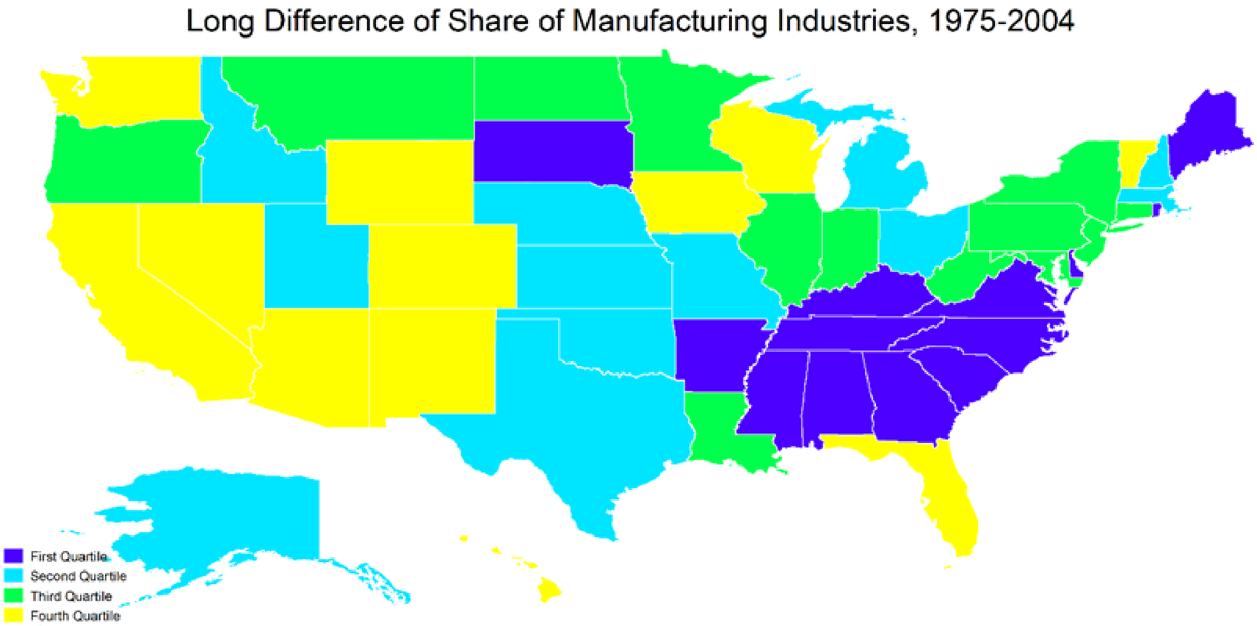

Figure-2. Geographic Distribution of Changes in Share of Manufacturing Industries across US States.

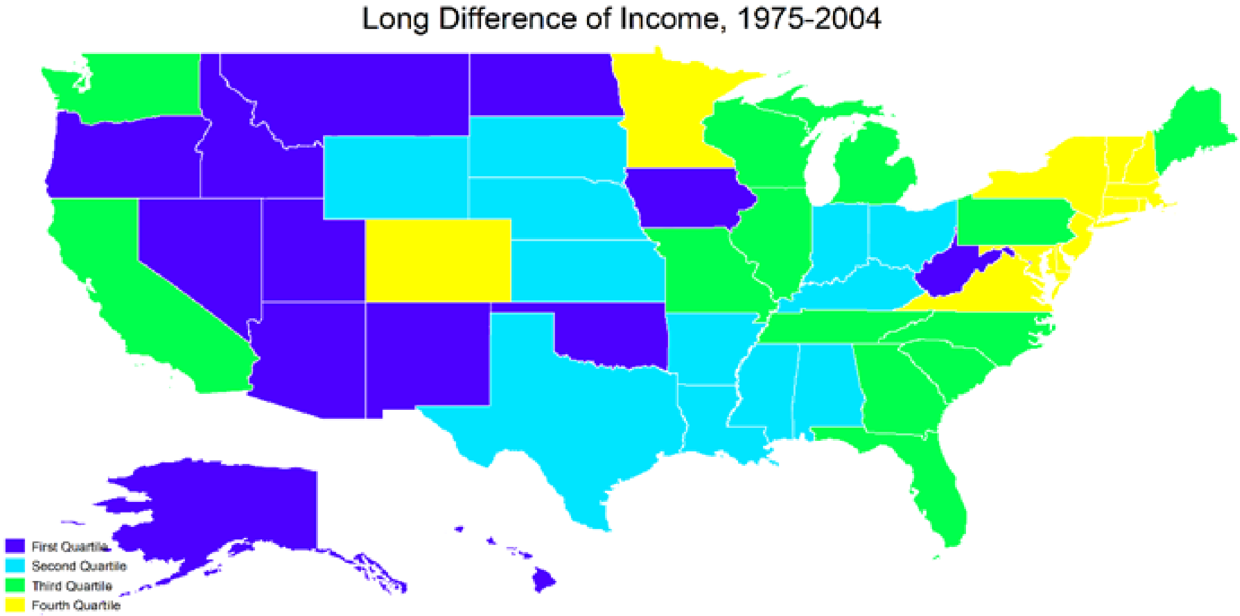

Figure-3. Geographic Distribution of Changes in Per Capita Income across US States

3. THEORETICAL FRAMEWORK

In this section, we construct a theoretical framework to show how income may affect child health outcomes including child mortality and infant mortality. We assume that the infant's health (or equivalently child health), represented by H, is part of a household utility function, U . The household also absorbs utility from a portfolio of goods, Y, which is also a determinant of the infant's health, such as food, clothing, house, etc. There is another set of goods that we cal composite goods that provide utility for households but are uncorrelated with infant's health, X. Household maximizes their utility given by:

$$U = \lambda \log X + \gamma \log Y + (1 - \lambda - \gamma) \log H \qquad (1)$$

Infant's health inputs follow a function of the form:

$$H = \beta Y^{\alpha} K^{1-\alpha} \qquad (2)$$

In this setting, K, is a set of goods that are considered health inputs for the infant's health that do not directly affect the household's utility, such as prenatal care and insurance use. The parameter β captures all family-specific time-invariant characteristics of the infant such as genetic attributes. The household budget constraint is as follows:

$$p_x X + p_y Y + p_k K = (1 - \kappa) w \qquad (3)$$

Where parameter κ is the cumulated tax rate (state and federal tax combined) and w represents total income of the household. Maximizing utility (1) subject to constraints 2 and 3 reveals the following equation regarding demand function for infant's health:

$$H = \Phi(\alpha, p_x, p_y, p_k, w; \beta, \lambda, \gamma, \kappa) \qquad (4)$$

The partial derivative of H with respect to w depends on partial derivatives of Y and K with respect to w. Specifically,

$$\frac{\partial H}{\partial w} = \frac{\alpha H}{Y}\frac{\partial Y}{\partial w} + \frac{(1-\alpha)H}{K}\frac{\partial K}{\partial w} + \frac{\partial \lambda}{\partial w} \qquad (4)$$

Equation 5 implies that an increase in income generates an incentive for households to buy more of good Y, that are useful for infants' health and also more of good Z which bring direct health effects for children. Therefore, this equation suggests two main channels of impact.

These facts can be summarized in *Remark 1*:

Remark 1- In the absence of income-induced correlates, an increase in net income is associated with improved infants' health, i.e., $\frac{\partial H}{\partial w} > 0$.

4. EMPIRICAL STRATEGY

The idea behind an empirical investigation of the income-mortality relationship is to compare the mortality rates of individuals with higher income to those with lower income over time. This impact can be obtained by the following OLS specifications:

$$y_{argst} = \alpha_0 + \alpha_1 Income_{st} + \alpha_2 X_{st} + \zeta_a + \eta_r + \theta_g + \gamma_s + \lambda_t + \xi_s \times T + \epsilon_{argst} \qquad (6)$$

Where y is mortality rate for children in age group (0-4) a, race group (whites, blacks, and others) r, gender group (male and female) g, state s, and year t. $Income$ is the personal income per capita at the state level. In X, we include a series of state-by-year covariates as follows: GSP per capita, unemployment rate, Medicaid coverage rate, average wage, log unemployment insurance payments, log current transfer receipts, log income maintenance benefits, log other welfare payments, education expenditure per capita, health expenditure per capita, policing expenditure per capita, arrest rates of blacks, arrest rates of whites, education, percentage whites, percentage blacks, percentage males, and percentage population aged 25-65. ζ is age fixed effect, η is race fixed effect, θ is gender fixed effect, γ is state fixed effect, λ is year fixed effect, and $\xi \times T$ is a state-by-year linear trend. Standard errors are clustered at the state level. The regressions are weighted using the average child population in each cell. Our sample covers the years 1975, the first year that the data of share of manufacturing industries are available, to 2004, the last year that mortality data is publicly available.

However, the results of Equation 6 are probably endogenous due to omitted variables that we fail to include in the regression or fail to observe. To solve this problem, we follow the study of Raphael and Winter-Ebmer (2001) and construct an instrument that exploits the global shocks to oil price in combination with the likely different exposures of states to these shocks based on the share of employment in manufacturing, a sector highly dependent on oil consumption.

The idea is that changes in global oil prices cannot be influenced by the production and income of the states. Also, people in each individual state may not be able to fully predict the oil price changes and respond to changes by changing their occupation or location of residents. Another source of variation is the cross-sectional changes in the share of employment in manufacturing. This variation is also orthogonal to other determinants of infant mortality since households do not choose their residential location based on the share of manufacturing employment but the dependency of manufacturing employment affects to what extent the state's income change. Therefore, the combination of oil price changes and manufacturing employment provides an exogenous shock to income. We should note that as long as the shock to income is exogenous (exclusion criteria satisfied) and we have strong first-stage effects (relevance assumption satisfied) the use of the instrument is validated. The fact that we have high F-statistics Table 3 supports the argument of relevance assumption regardless of the potential percentage effect of the IV on income (Angrist & Pischke, 2008).

The instrument is built using the following formula:

$$OCB - IV_{st} = Pct\_Manufact_{st} \times OP_t \quad (7)$$

Where $OCB - IV$ is the oil-cost-based instrument for income, $Pct\_Manufact$ is the share of manufacturing employment in state s and time t, and OP is oil price at time t. We then use this instrument in Equation 6 and run 2SLS-IV regressions of the following forms:

$$Income_{argst} = \alpha_0 + \alpha_1 OCB_{st} + \alpha_2 X_{st} + \zeta_a + \eta_r + \theta_g + \gamma_s + \lambda_t + \xi_s \times T + \epsilon_{argst} \quad (8)$$

$$y_{argst} = \alpha_0 + \alpha_1 Income_{st} + \alpha_2 X_{st} + \zeta_a + \eta_r + \theta_g + \gamma_s + \lambda_t + \xi_s \times T + \epsilon_{argst} \quad (9)$$

Where all parameters are as in Equation 6. The first stage is estimated by Equation 8 and the 4 regression is estimated by Equation 9. The underlying assumption is that the changes in the global price of oil are mainly determined by political concerns and changes in the supply of oil-producing countries to raise their government revenue for reasons that are quite likely orthogonal to other factors that affect child mortality in Equation 6. Therefore, one may expect unbiased estimates to be derived from Equation 9.

Table-2. The OLS results of the effect of income per capita on child mortality rates (1975-2004).

	Child Mortality Rate		Infant Mortality Rate		Toddler Mortality Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
Income per Capita	-0.056*** (0.016)	-0.048*** (0.015)	-0.356*** (0.098)	-0.342*** (0.088)	-0.008*** (0.002)	-0.007*** (0.002)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Covariates	Yes	Yes	Yes	Yes	Yes	Yes
State-by-Year Trend	No	Yes	No	Yes	No	Yes
R^2	0.15	0.18	0.25	0.28	0.09	0.12
Observations	31,034	31,034	31,034	31,034	31,034	31,034

Notes: Standard errors are reported in parentheses and clustered at the state level. The regressions are weighted using the average child population in each cell. State covariates are GSP per capita, unemployment rate, Medicaid coverage rate, average wage, log unemployment insurance payments, log current transfer receipts, log income maintenance benefits, log other welfare payments, education expenditure per capita, health expenditure per capita, policing expenditure per capita, arrest rates of blacks, arrest rates of whites, education, percentage whites, percentage blacks, percentage males, and percentage population aged 25-65.

5. MAIN RESULTS

Before starting with the main results, we show the geographic distribution of changes in child mortality, changes in the percentage of manufacturing employment, and changes in income per capita between the years 1975-

2004 in Figures 1, 2, and 3, respectively. In a visual manner, one can see that states in the top quartiles of income change are at the bottom quartiles of child mortality change and vice versa. The visual depiction of distribution suggests that there is a negative association between income and child mortality. On the other hand, the higher changes in manufacturing employment are also associated with higher changes in income. This is because the primary source of shock to income is cross-sectional dependence on percentage manufacturing. This visual depiction reveals two facts: 1) the relevance assumption which states that manufacturing industries influence income variations across US states. 2) income is among the main determinants of child mortality rates. As one can see from a comparison between these figures, states with higher changes in manufacturing have experienced similar changes in income while lower changes in child mortality rates.

Table-3. First stage effects of the IV on income per capita.

	Outcome: Income per Capita		
	(1)	(2)	(3)
Oil-Cost-Based IV	-0.975*** (0.143)	-0.892*** (0.158)	-0.873*** (0.150)
State Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
State Covariates	No	Yes	Yes
State-by-Year Trend	No	No	Yes
F-Statistics	42.58	35.96	32.03
P-Value	0.0001	0.0001	0.0001
R^2	0.45	0.49	0.61
Observations	31,034	31,034	31,034

Notes: Standard errors are reported in parentheses and clustered at the state level. The regressions are weighted using the average child population in each cell. State covariates are GSP per capita, unemployment rate, Medicaid coverage rate, average wage, log unemployment insurance payments, log current transfer receipts, log income maintenance benefits, log other welfare payments, education expenditure per capita, health expenditure per capita, policing expenditure per capita, arrest rates of blacks, arrest rates of whites, education, percentage whites, percentage blacks, percentage males, and percentage population aged 25-65.

Moreover, Table 1 reports the summary statistics of the final sample. On average, there are 3.5 and 14.7 deaths to children (aged 0-4) and infants (aged 0-1) per 1,000 age-specific population. Over the sample period, the average income is $34,536. Furthermore, roughly 3.6 percent of people are employed in manufacturing industries.

We start by reporting the results of OLS regressions of Equation 6 in Table 2 for different outcomes and specifications. In the full specification where we add a linear state trend, a standard deviation change in income (equivalent to $6,829) is correlated with 0.33, 2.34, and 0.05 fewer deaths to children, infants, and toddlers per 1,000 age-specific population, respectively (columns 2, 4, and 6). To put these numbers into perspective, the marginal effects are equivalent to 9.2, 15.8, and 6.8 percent reduction from the mean of child mortality rate, infant mortality rate, and toddler mortality rate over the sample period.

In Table 3, we report the results of the first stage regressions to validate the relevance assumption. In all specifications, the OCB instrument is strongly correlated with changes in income. A 1 percentage point rise in OCB variable is associated with a roughly $873 reduction in state-level income per capita (column 3). This effect is strongly significant across specifications and economically meaningful. Moreover, the F-statistics are large enough to rule out the concerns over weak instruments (Angrist & Pischke, 2008).

Table 4 reports the main results of the 2SLS-IV approach to measuring the causal link between income and child mortality. The marginal effects are significantly larger than those reported in Table 2 suggesting that the omitted variables probably understate the true effects. In the full specifications that contain fixed effects, controls, and state-specific trends, a $1,000 increase in income per capita leads to 0.87, 0.53, and 0.02 fewer deaths to children, infants, and toddlers per 1,000 age-specific population, respectively (columns 2, 4, and 6).

Table-4. Instrumental variable estimations of income on child mortality.

	Child Mortality Rate		Infant Mortality Rate		Toddler Mortality Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
Income per Capita (IV: Oil-Cost Based)	-0.098*** (0.014)	-0.087*** (0.015)	-0.548*** (0.176)	-0.533*** (0.164)	-0.018*** (0.004)	-0.017*** (0.004)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Covariates	Yes	Yes	Yes	Yes	Yes	Yes
State-by-Year Trend	No	Yes	No	Yes	No	Yes
R^2	0.22	0.25	0.34	0.36	0.12	0.13
Observations	31,034	31,034	31,034	31,034	31,034	31,034

Notes: Standard errors are reported in parentheses and clustered at the state level. The regressions are weighted using the average child population in each cell. State covariates are GSP per capita, unemployment rate, Medicaid coverage rate, average wage, log unemployment insurance payments, log current transfer receipts, log income maintenance benefits, log other welfare payments, education expenditure per capita, health expenditure per capita, policing expenditure per capita, arrest rates of blacks, arrest rates of whites, education, percentage whites, percentage blacks, percentage males, and percentage population aged 25-65

To put these numbers into perspective, we compare them with the mean of their respective variable. The marginal effects imply a 2.5, 3.6, and 2.4 percent reduction from the mean of child mortality rate, infant mortality rate, and toddler mortality rate over the sample period. The effects are larger (both for marginal effects and relative to the mean) for infant mortality suggesting that income plays a more important role in child mortality rates compared to toddlers and infants are more sensitive to income shocks than children who are older. Moreover, the effects (not reported here) are also larger among female children and children who are black. Overall, the results of the instrumental variable analysis confirm the protective effect of income on child mortality rates while they signify considerable Endogeneity issues in OLS estimation. These estimations are also comparable with similar literature on income-mortality and income-health (Baird et al., 2011; Currie & Grogger, 2002; Dave et al., 2019; Dooley & Prause, 2002; Elder, Goddeeris, & Haider, 2016; Ensor et al., 2010; Evans & Moore, 2011; Hanmer et al., 2003; Kaplan, Collins, & Tylavsky, 2017; Leonard & Mas, 2008; Lindahl, 2005; NoghaniBehambari et al., 2020a; NoghaniBehambari et al., 2020b; Schnalzenberger, 2016; Tacke & Waldmann, 2013; Wolfe & Behrman, 1982).

6. CONCLUSION

From a policymaker's perspective, the effectiveness of a welfare program to promote children's health and reducing mortality among infants and children lies under the causal effect of income on these outcomes. This paper aimed to do so. We established a causal link between income and child mortality using an instrumental variable design. Our instrument takes advantage of plausibly exogenous shocks to oil price shocks over time combined with variations in state-level employment in manufacturing which has been documented to be heavily reliant on oil consumption. The exogenous cross-state and over-time variations in our oil-cost-based instrument allowed us to solve the Endogeneity that lies in OLS regressions prevalent in the literature.

Using all death records in the US over the years 1975-2004, we documented that income has a protective effect on child mortality rates. The results of the 2SLS-IV approach suggest that a $1,000 increase in per capita income leads to 0.87, 0.53, and 0.02 fewer deaths to children (ages 0-4), infants (ages 0-1), and toddlers (ages 1-4) per 1,000 age-specific population, respectively. The effects are strongly significant and robust to including a wide array of state controls and state-specific time trends. We find that female infants are more susceptible to income changes and income shocks have larger impacts among black children. Moreover, the 2SLS-IV marginal effects are larger than those of OLS which implies that Endogeneity issues probably understate the true effects.

Overall, we confirm the negative association between income and mortality that was documented in the literature. The results suggest that welfare programs and cash transfers have positive externalities for children's health and children mortality rates. The fact that an income rise is associated with a reduction in infant mortality justifies the health benefits of welfare payments for infants' health outcomes which have been documented in the literature (Almond et al., 2011; Goodman-Bacon, 2018; Kim, 2017). However, we should mention that the income-child-mortality relationship in this study is based on the data from an advanced economy and caution should be taken in interpreting the results for other developing countries.

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