A Universal Basic Income Increases Birth Rates with Minimal Impact on Newborn Health

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Abstract

We examine how a universal basic income affects which women give birth and how healthy their newborns are. We take advantage of an annual income transfer given to a large and diverse American population for over thirty years. The amount of this transfer varies annually in a manner akin to a random experiment, allowing us to make causal estimates of the relationship between income and newborn health. Prior work nearly exclusively focuses on how income directly affects newborn health through maternal prenatal behavior. Our model additionally incorporates a fertility response whereby income first can affect which women give birth and at what rates which indirectly affects newborn health. Integrating the two mechanisms, we find statistically significant and moderately large effects on short-term birth rates and the characteristics of women who give birth. We detect minimal effects on birth outcomes. One's start in life has marked impacts on later life health. America falls behind other developed nations with regard to perinatal health, so examining levers of potential change is vital to population health throughout the life-course. We conclude, however, that though universal income transfers may be beneficial for others purposes, the findings here suggest they are not an efficient tool to improve newborn health at current levels of support.

1 Introduction

A child's start in life affects later-life well-being [1]; premature birth and low birthweight are associated with health, educational and economic disadvantages in adolescence and adulthood [31] [14]. Though federal and state governments try to promote maternal and newborn health, America lags behind other developed nations with regard to perinatal health [28] [33]. American children born into poor families particularly experience health disadvantage compared to their higher income peers [14]. This correlation between income and newborn health is well-established, but the causal relationship is murkier. We examine this causal relationship by analyzing a large, universal basic income (UBI) program that began in 1982 and continues currently.

While definitions vary, the primary feature of a UBI is that a large portion or an entire population receives regular cash payments. It is not targeted to a particular subset of the population (e.g. pregnant women or the elderly), nor is it conditional on income as many safety net programs are. Of late, it has garnered considerable attention and two extensive pilots have begun in the United States [32] [37] [27] [22] [42] [12] [6].

Though not widely known, a universal basic income has already been given to hundreds of thousands of Americans for decades through the Alaska Permanent Fund Dividend. We exploit variation in the amount of this cash transfer to test how income affects fertility rates and newborn health. In doing so, we advance a theory whereby a cohort's health at birth is not just a function of a mother's behavior during pregnancy but also a function of who gives birth, both of which can be affected by an influx of cash.

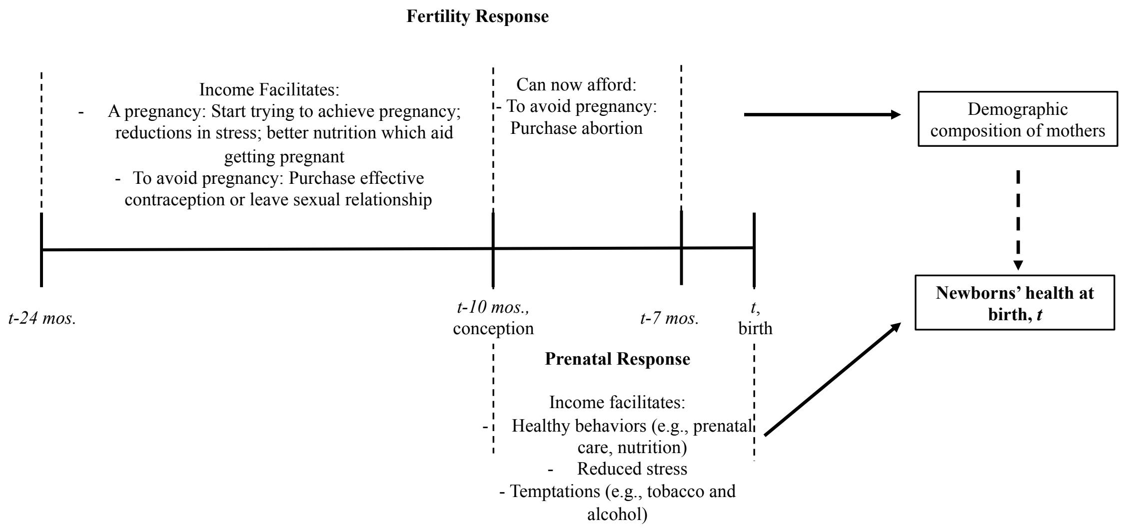
We explore two theoretical pathways by which income might impact an individual woman's decision-making and experiences that in turn would affect a birth cohort's health. First, income can affect which women give birth. Some women may be prompted by extra income to decide to have a birth soon instead of later or never. Extra income may also indirectly affect which women become pregnant through reduction of stress, changes in nutrition. Together, these effects constitute the fertility response to additional income, which directly affects maternal composition and indirectly affects newborn health. For instance, if low-income women respond more to the transfer than high-income women, then the resulting cohort of babies will be somewhat poorer than it would have been had no income transfer occurred. As low income women are at risk of having underweight or sick babies, the fertility response can result in a cohort with worse outcomes. The increased income does not increase any individual baby's risk; it sorts when high and low risk babies are being conceived. Second, income might affect what pregnant women buy or do or experience - the behavior response. Behavioral responses may have positive or negative effects on a birth cohort's health. For example, additional income may lead to maternal behaviors that improve the in utero environment, allowing weaker fetuses to be born rather than miscarry. This would appear as if the money worsened newborn health but it would be due to the increased survival rate of babies born to women who might otherwise not have had a live birth [8]. It is also possible women could use the additional money to consume tobacco, alcohol or other things detrimental to newborn health. Conversely, perhaps the additional money would reduce pregnant women's stress or improve her nutrition, which would result in a cohort of healthier babies.

While people with more income have healthier babies, causal analyses of transfers to disadvantaged populations show income has mixed results and primarily small effects on newborn health [19] [20] [25] [29] [9] [7] [10]. The initial Alaska payments improved birth outcomes, in particular the likelihood of a low birthweight baby, though these analyses only examine the onset of the program and do not consider a fertility response [10]. The Gary Income Maintenance Experiment from the early 1970's in Gary, Indiana most robustly tested a basic income's effects on infant outcomes by randomly assigning some families to receive a cash payment and others not to receive any. All the families were black and many were female-headed. Four hundred babies were born to participants. The income was associated with higher birthweights for babies who were at a high risk of low birthweight based on maternal characteristics and behavior. Among mothers who were at a low risk of having a low birthweight baby, those who received the money had worse outcomes than those who did not [24].

Prior scholars of cash transfers and birth outcomes focused almost exclusively on the maternal prenatal behavior mechanism, ignoring the fertility response. To our knowledge, only one study attends to a fertility response, and our work here builds on that: In a sensitivity analysis, Hoynes and co-authors examine how the EITC might change the composition of which women give birth while considering birth outcomes a year after a cash transfer [20]. We argue for a longer timeframe for a fertility response and an integration of the two mechanisms.

A fertility response timeframe of one year entails a pre-pregnancy fertility response window of two months. This window will only capture women who respond immediately to the income transfer, conceive quickly and do not miscarry. While this is an appropriate window for some women, on average, it takes longer for a woman to conceive [18][39]. It takes even longer, on average, to conceive a pregnancy that results in a live birth given that fifteen percent of recognized pregnancies end in miscarriage [34]. We extend the fertility response timeframe to 24 months prior to birth to account for the variation in the speed of decision-making, conception and miscarriage. The fertility response window may continue through early pregnancy depending on women's access to abortion. The maternal prenatal behaviors mechanism, however, begins after conception. Thus, with the exception of the abortion-related overlap, the two mechanisms that can affect a birth cohort's health operate on different timespans, as can be seen in Figure 1.

Figure 1: Mechanism Timeline for Cohort Birth Outcomes



2 Analytic Approach

We employ our theoretical model by considering a cash transfer's effects on fertility and birth outcomes in concert. We first test if there are fertility and maternal composition effects using the 24 month window. These results describe whether some women are giving birth at higher or lower rates due to the additional income - a process of selecting into or out of childbearing. We then incorporate these results into a birth outcome model that considers a cash payment's effects on maternal behavior during pregnancy.

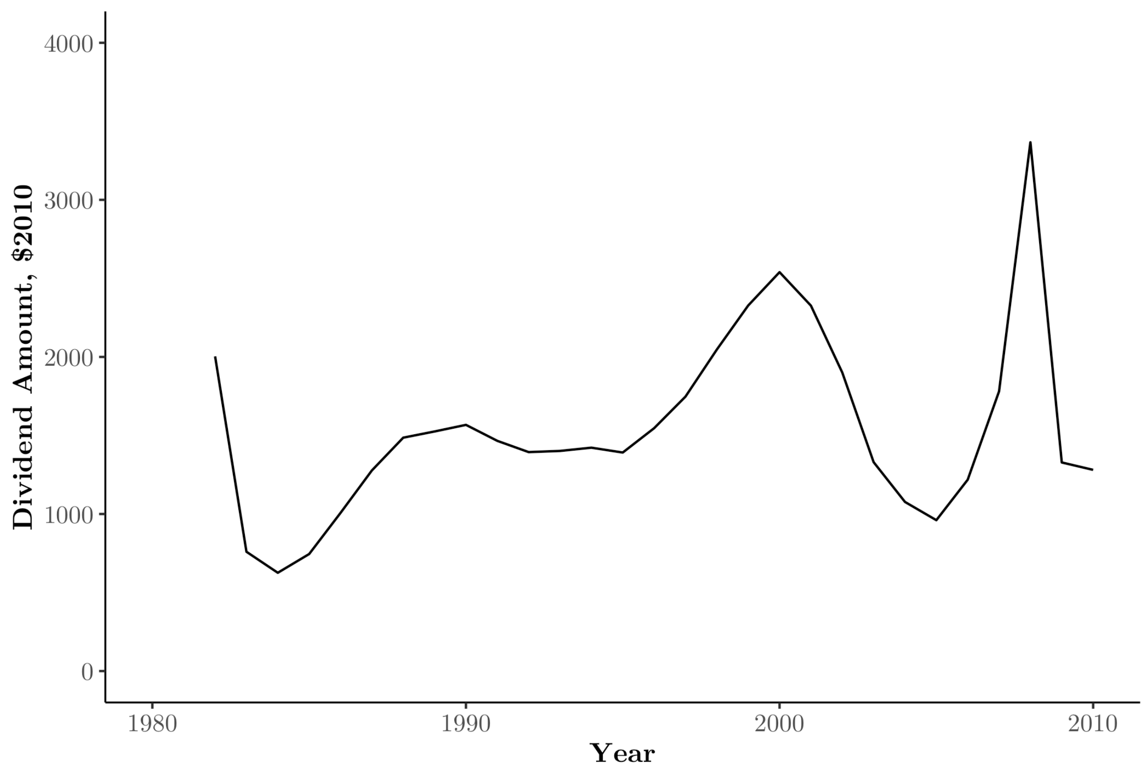
2.1 Empirical Case: Alaska Permanent Fund Dividend

We examine the payments the Alaskan state government has made to every Alaskan resident since 1982 through the Alaska Permanent Dividend Fund (APFD) program. Every October, this cash transfer is given to a large and diverse population irrespective of their characteristics or behavior. We argue, as Hsieh did before us, that the amount given every year increases and decreases in a way that mimics random assignment in an experiment [21]. The revenue for the transfer comes from smoothed five-year returns from an investment fund for which the principal is earnings from Alaska's oil and mineral reserves. The amount of the transfer varies markedly: It ranges from a low of $331 (1984; $626 in 2010 dollars) to a high of $3269 (2008, including a $1200 bonus; $3366 in 2010 dollars) per resident (including children), as can be seen in Figure 1. To put this into context, the value of the cash transfer for a family of four ranges from the equivalent of 70 percent of the annual value of food stamps (now called Supplemental Nutrition Assistance Program) to three times the value of food stamps. For each household, it typically exceeds the value of the federal Earned Income Tax Credit[11]. More detail on the dividend is provided below in the "Background and Data" section.

Despite popular assumptions, the Alaskan population resembles that of the United States as a whole. This is in large part due to Anchorage, where 40 percent of Alaskans live. The primary demographic difference between Alaska and the country as a whole is the racial composition of the minority population. In both Alaska and the United States, 64 percent of the population is white. In Alaska, however, the racial minority population is composed of markedly more Native Alaskans and fewer Black Americans and Hispanic Americans than the country all together. It also has a larger proportion of rural residents (see Supporting Information S1 for more detail).

Unlike other American cash transfers - or near-cash transfers such as food stamps - the dividend is given to every resident. There are no low income requirements as with welfare [30] [15], food stamps [2], or the Earned Income Tax Credit (EITC) [20] [38] [4]. It is not only available to working people like the EITC is, or pregnant women like Women, Infant and Children (WIC) is [36]. It does not phase out, even at high levels of income such as the tax provision of personal exemption does [41] [40]. Given this, and Alaska's similarity to the nation as a whole, our case provides the best window into the effects of a universal basic income, an unconditional cash transfer, for the country as a whole.

Our causal claims rest on two features: First, that the amount of the dividend is unrelated to individual Alaskan residents' behavior (i.e., it is exogenous) and, second, that the amount varies year to year. Using the language of medical randomized experiments, since 1982, the Alaskan population



has been treated every year to a dose of income, and the dosage varies year to year. Therefore, we prefer an internal comparison over time to an external control group. Once the dividend program begins, no other state or group of states can serve as a proper counterfactual for continually-treated Alaskans. In our models, Alaskans in years when the dividend is low serve as a control group for years when the dividend is high. This allows us to do two things: First, we can consider not just the start of the program [10] but its more recent effects as well. Second, because Alaskans get different amounts of money each year, we can identify the effect of specific amounts of money, rather than just the presence or absence of the policy as is typically done when examining transfers like the Earned Income Tax Credit.

2.2 Data

Our analyses use data from several sources. All analyses use restricted natality data provided by the National Vital Statistics System that include all births from 1980-2010. These individual-level data are used in the fertility and birth outcome analyses. For birth rate analyses, counts of births by maternal characteristics provide the numerators. The denominators, the female population count by maternal characteristics, are from interpolated Census data and, after 2010, American Community Survey data. These data are improved by intercensal estimates that take advantage of unique data provided to the Alaska Department of Labor and Workforce Development. A more detailed description of our birth rate construction as well as missing data procedures is located below.

In all analyses, we use the total dividend amount paid to the household. For instance, in 1996 an unmarried woman with no children received $1,547 ($2010) whereas a married woman with one child received $4,641. All analyses also account for macro-level Alaskan trends that could affect fertility and birth outcomes including the unemployment rate, per capita income and the crude price of oil in all models. To account for birth trends more generally, we include annual measures of birth rates and outcomes for the United States as a whole. Inclusion of U.S.-level measures results in better model fits than do measures from demographically-similar states such as Utah and South Dakota.

We align all data sources to years based on APF dividend payment distribution. Because payment occurs in October of each year, APF-aligned years begin in October and end in the following September. For instance, a birth occurring in March 2000 was coded as APF year 1999, as it falls in the twelve months following the distribution of the 1999 dividend payment. All references to years refer to APF-aligned years.

2.3 Fertility Response: Birth Rate and Composition of Mothers

We test the effect of the dividend payments on fertility by assessing the impact of the dividend on Alaskan short-term birth rates. Specifically, the birth rate model is a a log-rate model that considers how the cash transfer affects birth rates one year and two years later:

$$\log \mu_{jt} = \log E_{jt} + \beta_1 DIV_{j(t-1)} + \beta_2 DIV_{j(t-2)} + \beta_3 DIV_{j(t-1)} * DIV_{j(t-2)} + \beta_4 \mathbf{X}_{jt} + \beta_5 US_t + \beta_6 \mathbf{Z}_t + \epsilon_{jt}$$

where j indicates groups of women based on specific combinations of demographic characteristics - what we call a category ID - and t indicates APF-aligned year. The category IDs are created by grouping women according to demographic characteristics - age, parity (the number of prior live births), marital status, race and education (e.g. women aged 20-24 who are married, giving birth to their first child, white and have a college degree or more). μ_{jt} is the count of births; log E_{jt} is an exposure term, or offset, and is the population of women in each category ID at t; $DIV_{j(t-1)}$ and $DIV_{j(t-2)}$ are the dividend amounts at years *t-1* and *t-2* multiplied by the household size of each category ID in that year; vector $\mathbf{X}_{jt}$ indicates a set of controls for maternal characteristics by category ID; US_t is the U.S. birth rate in year t; and vector $\mathbf{Z}_t$ indicates controls for macro-economic trends in year t.

Women decide to pursue having a(nother) child and conceive at different speeds. A woman who has difficulty conceiving and who gives birth in year t may have been induced to try to become pregnant by the payment in year *t-2*, whereas a woman who conceives easily was likely enabled by the payment in year *t-1*. With our only insight into a fertility response coming from birth rates, we cannot distinguish between these two women. Thus, we include in our model dividend payments one year and two years prior to birth. This model also comports with the longer fertility response window we argued for above. Including both dividend payments provides conservative estimates for the effect of each year. We interact the two dividend measures to account for the lengthy and sequenced process of conception and gestation. Further, models with the interaction provide a better fit to the data than those without. The dividend payments began in 1982; we estimate the model on years 1984-2010 due to the two-year lag.

Following estimation of the rate model, we predict birth rates with the *t-1* and *t-2* dividend amounts set to zero. These predictions represent the probability that a woman would give birth in year t if the dividend payments at *t-2* and *t-1* had not occurred. Because our data includes only years in which payments were made, we extrapolate outside of our observed data to create these rates. We use these predicted rates by category ID as weights in the outcome models to attend to the composition effects that can indirectly affect birth outcomes. This weighting is similar to an inverse probability of treatment model.

After assessing the impact of the dividend on birth rates, we determine the effect of the dividend on the demographic composition of mothers giving birth through a series of logistic regressions predicting the likelihood that mothers giving birth have specific characteristics. These outcomes are predicted by lagged household-adjusted dividend amounts at *t-1* and *t-2*, year of birth, maternal controls and macro-economic controls. The outcomes we assess are: maternal education (high school diploma or less; some college; bachelor's degree or more), maternal race (non-Hispanic white; non-Hispanic Native Alaskan; other race), and maternal parity (one; two; three; four plus).

We also assess the likelihood that mothers smoked cigarettes or drank alcohol while pregnant.

Smoking and drinking are behaviors that can directly affect the health of babies. Yet, they are characteristics of women that are determined well in advance of conception and largely do not change during pregnancy (see Supporting Information 2). Those that do change their behavior quit (rather than start smoking or drinking), but we cannot determine when in the pregnancy they do this, nor at what point during pregnancy doing so would protect newborn health. Our composition models therefore assess whether the selection of women who smoke or drink into giving birth is affected by the dividend payments, as this could have an impact on a newborn cohort's health. The model outcomes are smoking during pregnancy (1=smoked at least one cigarette a day on average while pregnant, 0=did not smoke while pregnant), and drinking during pregnancy (1=drank alcohol while pregnant, 0=did not drink while pregnant).

The maternal composition model is:

$$\ln(P_t/1-P_t) = \beta_0 + \beta_1 DIV_{i(t-1)} + \beta_2 DIV_{i(t-2)} + \beta_3 DIV_{i(t-1)} * DIV_{i(t-2)} + \beta_4 \mathbf{X}_{it} + \beta_5 \mathbf{Z}_t + \epsilon_{it}$$

where $\ln(P_t/1-P_t)$ is the odds that a mother has a given characteristic (P) in year t, $DIV_{i(t-1)}$ and $DIV_{i(t-2)}$ are the dividend amounts at years *t-1* and *t-2* multiplied by the household size of the mother before giving birth, vector $\mathbf{X}_{it}$ indicates a set of controls for maternal characteristics, and vector $\mathbf{Z}_t$ indicates controls for macro-economic trends in year t.

2.4 Maternal Behavior Response: Birth Outcomes

Following birth rate and compositional analyses, we assess the impact of receiving the dividend payment during pregnancy on birth outcomes for all singleton births. To do this, we estimate weighted regressions predicting the following outcomes: birthweight, low birthweight (<2500 grams), preterm birth (<37 weeks), five-minute Apgar score, month prenatal care began, and number of prenatal visits.

Specifically, the birth outcomes models are:

$$\ln(P_t/1-P_t) = \beta_0 + \beta_1 DIV_{i(t)} + \beta_2 \mathbf{X}_{it} + \beta_3 US_t + \beta_4 \mathbf{Z}_t + \epsilon_{it}$$

or

$$Y_t = \beta_0 + \beta_1 DIV_{i(t)} + \beta_2 \mathbf{X}_{it} + \beta_3 US_t + \beta_4 \mathbf{Z}_t + \epsilon_{it}$$

where $\ln(P_t/1-P_t)$ indicates the odds of a dichotomous birth outcome in year t and Y_t indicates the mean of a continuous birth outcome in year t. DIV_{it} indicates the dividend amount at year t adjusted for the mother's household size before giving birth, $\mathbf{X}_{it}$ indicates a set of controls for maternal characteristics, US_t is the average for the birth outcome for the U.S. in year t, and vector $\mathbf{Z}_t$ indicates controls for macro-economic trends in year t. Models predicting birthweight, low birthweight, and preterm birth also controlled for the infant's sex. We weight the models using the probability weights obtained from the rate model that indicated the mother's likelihood of giving birth if there had been no prior dividend payments.This approach allows us to estimate the impact of the dividend in year t on birth outcomes net of the demographic compositional effects induced by the dividend at *t-1* and *t-2*. For pregnancies during which no dividend payment was received, the dividend amount is set to 0. We can only account for the composition effects of the maternal characteristics in the rate model: age, race, marital status, education and parity. Because we do not have population counts for women by these demographic characteristics and whether they smoke or drink alcohol, we cannot attend to those composition effects in the birth outcomes model. We therefore answer the question: How does providing a cash transfer to pregnant women affect the health of their babies, accounting for the fact that women of certain demographic characteristics are more or less likely to have a child due to prior transfers?

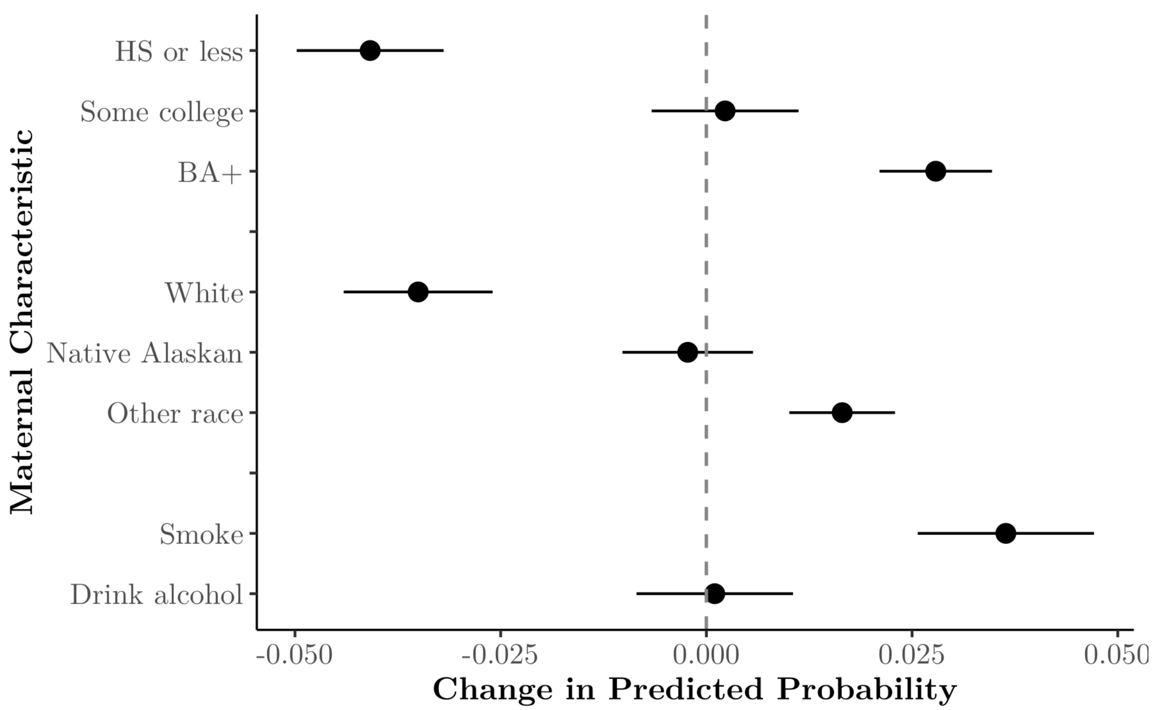
3 Results

3.1 Birth Rate and Composition of Mothers of Newborns

As seen in Figure 1, the first pathway by which income could impact birth outcomes is through the process of selection into and out of giving birth, thus altering the demographic composition of mothers. We first examine the impact of the dividend on the overall birth rate using a log-rate model. Increased income results in more births one and two years after disbursement (DIV_{t-1} IRR = 1.16; DIV_{t-2} IRR = 1.12; DIV_{t-1}*DIV_{t-2} IRR = 0.98; dividend units in thousand dollars) (Supporting Information S3 has the complete regression result.)

The amount of the dividend not only affects the birth rate overall but also changes the composition of which women give birth. Figure 2 presents the change in the predicted probability that a mother giving birth has a given characteristic under two scenarios: (1) No dividend payments at *t-1* and *t-2* (both set to 0) and (2) Dividend payments at *t-1* and *t-2* set to \$4,522, the average payment for a family of three, which is the most common household size of mothers of newborns in Alaska during this time period. Mothers who receive additional cash are less likely to have a high school education or less and more likely to have a bachelor's degree or higher than mothers who do not. In addition, mothers are less likely to be white and more likely to be other race. Finally, mothers are more likely to smoke during pregnancy but no more likely to drink alcohol when receiving an average dividend payment as opposed to none. We interpret these results as a compositional effect, not a maternal behavior effect. This represents that the additional income has increased the birth rate among women who smoke and continue to smoke during pregnancy rather than pregnant women taking up smoking due to the increased income. This interpretation is empirically verified by analyses of smoking and alcohol consumption rates among mothers of newborns with a shorter time-lag (see Supporting Information S2).

Figure 2: Change in Predicted Probability that Mother has Characteristic after Dividend Payment: Dividends at *t-1* and *t-2* at 0 versus $4,522



If some women use the extra income to have an abortion more so than others then this would affect the demographic composition of mothers giving birth. Analyses not shown here indicate that abortion rates among Alaskan women were not affected by dividend payments; therefore we do not include them in our analyses (see Supporting Information S4).

3.2 Birth Outcomes

As we argue above, newborn health is indirectly a function of who gives birth and directly a function of maternal behavior during pregnancy. How the size of the dividend affects birth outcomes is reported in Table 1. Here, we have attended to the dividend's effects on the demographic composition of which women gave birth by the weighting procedure described above.

Cash transfers during pregnancy have negative but small effects on birth outcomes. If a pregnant woman receives an additional cash payment of one thousand dollars per household, the effect on birthweight, which scholars often regard as the most important birth outcome, is a decrease of 1.77g.

An additional thousand dollars per household causes a small increase in the likelihood of low birthweight (OR 1.02) and pre-term birth (OR 1.03) for mothers of newborns. The cash transfer has no effect on five-minute Apgar scores.

A more generous cash transfer is associated with in a very small delay in the start of prenatal care (.014 months) and no effect on the number of prenatal visits. The effects are similar if measured as the likelihood that prenatal care was obtained in the first trimester. While prenatal care has positive effects on maternal well-being it has no effects on birth outcomes [17] [5] so this does not meaningfully explain our results.

For low education mothers and first-time mothers, the dividend is likely a larger share of their annual income. Yet even for this population, the results are substantively similar to the population of births overall.

Table 1: Birth Outcomes Models

Dependent Variable	DIV_t (Thous.)	S.E.
Mothers of Newborns, N=234,034		
Birthweight (grams)	-1.770**	.645
Low Birthweight	1.015** (OR)	.006
Preterm Birth	1.025*** (OR)	.004
Apgar Score	-.000	.001
Month Prenatal Care Began	.014***	.002
Number of Prenatal Visits	.006	.005
Low-Ed Mothers of Newborns, N=132,745		
Birthweight (grams)	-2.156**	.822
Low Birthweight	1.019** (OR)	.007
Preterm Birth	1.024*** (OR)	.005
Apgar Score	-.001	.001
Month Prenatal Care Began	.015***	.003
Number of Prenatal Visits	.003	.006
First-Time Mothers of Newborns, N=89,470		
Birthweight (grams)	-.494	1.889
Low Birthweight	.984 (OR)	.015
Preterm Birth	1.048*** (OR)	.013
Apgar Score	.001	.003
Month Prenatal Care Began	.019***	.005
Number of Prenatal Visits	.059***	.013

Notes:
(1) Source: U.S. Natality Detail File, 1984-2010.
(2) *p<.05; ** p<.01; *** p<.001
(3) Births for which a dividend payment was not received during gestation are assigned a dividend of 0.
(4) Non-singleton births and births to mothers younger than 15 and older than 44 are excluded from analysis.
(5) Models are weighted by the probability that mother would give birth if dividends at t-1 and t-2 were 0.
(6) Low-ed is HS or less.
(7) Controls are: Year (aligned to APF dividend disbursement), race, marital status, age, maternal education, parity, and the outcome average for the United States (e.g., average birth weight or proportion of preterm births).
(8) All results are robust to the inclusion of macro-economic indicators: AK unemployment rate, the crude price of oil, and AK per capita income lagged two years.
(9) Results are consistent if dichotomous measure of prenatal care beginning in first trimester is used instead of month prenatal care began.
(10) Results are substantively the same, though somewhat attenuated if mothers age 15-19 are excluded.
Models with interactions were also tested and have
similar model fits and substantively similar results.

4 Discussion

We examined how a universal basic income affects fertility and newborn health in a large and diverse American population by examining the Alaska Permanent Fund dividend. We proposed that among the many factors that determine a birth cohort's health, there are two mechanisms of individual behavior: first, a fertility mechanism which affects the birth rate and composition of a cohort's mothers and, second, a maternal prenatal behavior mechanism. Therefore, the two mechanisms, though typically studied separately, needed to be studied in concert. Doing so here revealed the extra income is associated with increased birth rates and modestly affects the composition of mothers. This effect is in the same direction but smaller than that found for the effect of income tax on fertility [41] [40] though some scholars dispute those findings [13].

We attend to the composition changes when modeling birth outcomes and reveal that the dividend negligibly worsens newborn health. This worsening may be a result of composition effects for which we cannot account, such as the increase in the number of mothers who are smokers. It may also be that the cash protects pregnancies and reduces miscarriage rates so that in years in which the dividend is generous, weaker fetuses are born. Or alternatively, the cash improves the in utero environment so that women conceive who otherwise would not and similarly, weaker fetuses are born.

The effects on newborn health, though detectable, are small. While other recent work on cash transfers and birth outcomes showed generally more positive effects than this work, those results were statistically significant but primarily also small [29] [38] [20], though work in Canada showed greater gains [7]. Earned Income Tax Credits, for instance, one of the United States' primary tools to reduce poverty, increase birthweight by less than the weight of this article printed (birth weights increased approximately 15 grams or 3 printed pages) [29] [38], and similar results are found in other work [2] [3]. The exception may be in income's effects on the incidence of low birthweight, rather than mean birthweight or other outcomes. While our work shows negative effects of income on the incidence of low birthweight, prior work shows improvements for the smallest babies [2] [20] [1].

Methodologically, our work improves upon prior work by considering a population-level cash transfer intervention with more diverse recipients and by integrating fertility response models with maternal prenatal behavioral response models. The model integration not only captures both individual-level mechanisms that can affect birth outcomes but also acknowledges that cash transfer programs are designed to give cash to families year after year. Given the outsized impact of early life circumstances on later life outcomes [1], investments in pregnant women are likely an effective tool to address population-level inequality. The question is how best to improve the prenatal environment. We read the literature on cash transfers and newborn health, including our own contribution, to not strongly support a universal basic income given the small effects at this level of income support. We find that cash transfers in Alaska increase the birth rate which may be a goal in and of itself, particularly if it means women have the economic capacity to exercise their right to parent [35]. The income also alters which women are giving birth. The cash transfers do not, however, substantively improve newborn health for the population. Advocates of a universal basic income argue for much higher levels of support - on the order of $12,000 per adult per year [27] - which may alter family expenditures beyond which we can generalize from the levels of support analyzed here. Alternatively, perhaps investments in institutions and health services may prove to be a more effective approach to better infant health or directly working to improve other social determinants of health.

5 Background and Data

5.1 Alaska Permanent Fund Dividend

The Alaska Permanent Fund was created in 1976 via an amendment to the state's constitution. Court battles delayed implementation until 1982. Per the amendment, 25 percent of the state government revenue from mineral extraction is placed into a trust fund, the Permanent Fund. The Alaska Permanent Fund Corporation - a quasi-independent state agency – invests the fund's principal broadly in financial and real assets. The total payment of dividends is approximately a five year average of income from the investments.

Any individual resident in Alaska for the prior 12 months or born in Alaska in the prior 12 months is eligible with rare exceptions. There is an extensive application for first-time applicants that requires proof of residency among other verifications. Subsequent annual applications are trivial. Applications are due in March. Participation rates are high, above 92% in many years and often above 97% [16]. Minors' dividends are paid to one parent or legal guardian. News reports estimate the dividend amount in the spring with marked accuracy [26].The official amount is announced in September, and the payment is made as a lump sum in October. In the early years of the dividend, the payment was made via check; beginning in 1993, direct deposit was available.

5.2 Birth Rates

Population estimates for women at risk of giving birth were obtained in two steps. First, proportions of the population by maternal characteristics (age, marital status, education, race, and parity) were linearly interpolated from 1980, 1990, and 2000 Census five-percent samples and the 2008-2012 American Community Survey sample. Second, these proportions were multiplied by intercensal population counts for women ages 15-44 by age group provided by the Alaska Department of Labor and Workforce Development population counts. For the birth rate analysis, individuals in the birth certificate and population data samples were grouped based on combinations of the following maternal characteristics: race, marital status, education, parity, and age. This resulted in 520 unique characteristic combinations that are identified by a Category ID.

The U.S.-level birth rate measures were derived from the restricted natality data, and the U.S. population counts for the rate were obtained using the interpolation process described above without intercensal adjustments.

5.3 Missing Data

In total, four percent of births had missing values on one or more covariate, though this ranged from 0.93 percent of births in 1996 to 15.3 percent of births in 2003. To address missing data, we employed a threshold deletion strategy. Specifically, we chose a threshold of 7.5 percent and excluded from our analysis any year in which more than 7.5 percent of births had missing values on one or more covariates. Based on this threshold, 2001, 2003, and 2008 were excluded from our analyses. For all other years, we dropped all cases with missing values on covariates and then randomly dropped more observations until the percentage dropped reached 7.5 percent. That is, for all included years, exactly 7.5 percent of cases were dropped. We use this approach to ensure that the total number of births per year is not impacted by different rates of missingness across years. Because the rate model assesses changes in the number of births per year relative to the total number of women at risk of giving birth, we must be attentive to any data manipulations that alter the birth counts in some years and not others, as such changes could induce an artificial effect on birth rates. The threshold deletion strategy ensures that birth counts for each year are artificially reduced by the same proportional amount. We also tested alternative thresholds – 6 percent and 9 percent – and our results were not substantively altered. Individual-level data produced from the threshold deletion procedure were used in the composition and outcome analyses. For observations with missing values on the outcomes, which ranged from 0.02 percent for birthweight to 3.4 percent for number of prenatal visits, listwise deletion was employed because our birth outcome analyses do not have the same sensitivity to changes in counts as the birth rate analyses.

5.4 Sensitivity Analyses

We performed the following sensitivity analyses:

- Various different model specifications, particularly with regard to interaction terms. We chose the models presented here because they fit the data best based on both AIC and BIC measures.

- An analysis of Anchorage alone.
- Including trends from demographically comparable states (e.g. Utah, South Dakota) which resulted in substantively similar results but worse model fit.
- Analyses in which we varied the duration in which we allowed the income to have an effect by varying the lag time.
- Analyses to test whether people acclimate to the dividend (see Supporting Information S5).
- Birth rate analyses that included decade fixed effects and outcome analyses that include year fixed effects.
- A synthetic control approach to determine if a weighted group of states could serve as an adequate control for Alaska once the dividend program began in 1982. The synthetic control approach was not able to generate a suitable control for Alaska.
- Birth outcome analyses that assessed impact of receiving the dividend in the first, second, or third trimester, rather than simply at some point during pregnancy.

References

[1] Douglas Almond, Janet Currie, and Valentina Duque. "Childhood circumstances and adult outcomes: Act II". In: *Journal of Economic Literature* 56.4 (2018), pp. 1360–1446.

[2] Douglas Almond, Hilary W Hoynes, and Diane Whitmore Schanzenbach. "Inside the war on poverty: The impact of food stamps on birth outcomes". In: *The Review of Economics and Statistics* 93.2 (2011), pp. 387–403.

[3] Kevin Baker. "Do cash transfer programs improve infant health: Evidence from the 1993 expansion of the earned income tax credit". In: *manuscript, University of Notre Dame* (2008).

[4] Reagan Baughman and Stacy Dickert-Conlin. "The earned income tax credit and fertility". en. In: *Journal of Population Economics* 22.3 (July 2009), pp. 537–563. ISSN: 0933-1433, 1432-1475. DOI: 10.1007/s00148-007-0177-0. URL: https://link.springer.com/article/10.1007/s00148-007-0177-0 (visited on 12/08/2017).

[5] Janet M. Bronstein. *Preterm Birth in the United States: A Sociocultural Approach*. Cham: Springer International Publishing, 2016. ISBN: 978-3-319-32715-0. DOI: 10.1007/978-3-319-32715-0_1. URL: https://doi.org/10.1007/978-3-319-32715-0_1.

[6] Ryan Browne. "Silicon Valley giant Y Combinator to give people varied amounts of cash in latest basic income trial". In: *CNBC* (Sept. 21, 2017). URL: https://www.cnbc.com/2017/09/21/silicon-valley-giant-y-combinator-to-branch-out-basic-income-trial.html (visited on 03/15/2019).

[7] Marni Brownell et al. "An unconditional prenatal income supplement reduces population inequities in birth outcomes". In: *Health Affairs* 37.3 (2018), pp. 447–455.

[8] Tim A Bruckner and Ralph Catalano. "Selection in utero and population health: theory and typology of research". In: *SSM-population health* (2018).

[9] Tim A Bruckner, David H Rehkopf, and Ralph A Catalano. "Income gains and very low-weight birth among low-income black mothers in California". In: *Biodemography and social biology* 59.2 (2013), pp. 141–156.

[10] Wankyo Chung, Hyungserk Ha, and Beomsoo Kim. "Money transfer and birth weight: evidence from the Alaska permanent fund dividend". In: *Economic Inquiry* 54.1 (2016), pp. 576–590.

[11] Margot Crandall-Hollick. *The Earned Income Tax Credit (EITC): A Brief Legislative History*. Tech. rep. Congressional Research Service, Mar. 2018.

[12] Rachel Crane. "This California town will give a $500 monthly stipend to residents". In: *CNN* (July 9, 2018). URL: https://money.cnn.com/2018/07/09/technology/stockton-california-basic-income-experiment/index.html (visited on 03/15/2019).

[13] Richard Crump, Gopi Shah Goda, and Kevin J Mumford. "Fertility and the personal exemption: comment". In: *American Economic Review* 101.4 (2011), pp. 1616–28.

[14] Janet Currie. "Healthy, wealthy, and wise: Socioeconomic status, poor health in childhood, and human capital development". In: *Journal of EconomIc LiteratUre* 47.1 (2009), pp. 87–122.

[15] Janet Currie and Nancy Cole. "Welfare and Child Health: The Link Between AFDC Participation and Birth Weight". In: *The American Economic Review* 83.4 (1993), pp. 971–985. ISSN: 00028282. URL: http://www.jstor.org/stable/2117589.

[16] Alaska Permanent Fund Dividend Division. *Annual Report*. Tech. rep. Juneau, Alaska: Alaska Department of Revenue, 2000.

[17] Kevin Fiscella. "Does prenatal care improve birth outcomes? A critical review". In: *Obstetrics & Gynecology* 85.3 (1995), pp. 468–479.

[18] Christian Gnoth et al. "Time to pregnancy: results of the German prospective study and impact on the management of infertility". In: *Human Reproduction* 18.9 (2003), pp. 1959–1966.

[19] Rita Hamad and David H Rehkopf. "Poverty, pregnancy, and birth outcomes: a study of the Earned Income Tax Credit". In: *Paediatric and perinatal epidemiology* 29.5 (2015), pp. 444–452.

[20] Hilary Hoynes, Doug Miller, and David Simon. "Income, the earned income tax credit, and infant health". In: *American Economic Journal: Economic Policy* 7.1 (2015), pp. 172–211.

[21] Chang-Tai Hsieh. "Do consumers react to anticipated income changes? Evidence from the Alaska permanent fund". In: *American Economic Review* 93.1 (2003), pp. 397–405.

[22] Chris Hughes. *Fair Shot: Rethinking Inequality and how We Earn*. St. Martin's Press, 2018.

[23] Tullio Jappelli and Luigi Pistaferri. "The consumption response to income changes". In: (2010).

[24] Barbara H Kehrer and Charles M Wolin. "Impact of income maintenance on low birth weight: evidence from the Gary Experiment". In: *Journal of Human resources* (1979), pp. 434–462.

[25] Kelli A Komro et al. "The effect of an increased minimum wage on infant mortality and birth weight". In: *American journal of public health* 106.8 (2016), pp. 1514–1516.

[26] Lorenz Kueng. "Excess Sensitivity of High-Income Consumers". In: *The Quarterly Journal of Economics* (2018).

[27] Annie Lowrey. *Give People Money: How a Universal Basic Income Would End Poverty, Revolutionize Work, and Remake the World*. English. New York: Crown, July 2018. ISBN: 978-1-5247-5876-9.

[28] Marian F MacDorman et al. "International comparisons of infant mortality and related factors: United States and Europe, 2010". In: (2014).

[29] Sara Markowitz et al. "Effects of state-level Earned Income Tax Credit laws in the US on maternal health behaviors and infant health outcomes". In: *Social Science & Medicine* 194 (2017), pp. 67–75.

[30] Robert A Moffitt. "The effect of welfare on marriage and fertility". In: *Welfare, the Family, and Reproductive Behavior*. Ed. by Robert A Moffitt. Washington, DC: National Academy Press, 1998.

[31] Dag Moster, Rolv Terje Lie, and Trond Markestad. "Long-term medical and social consequences of preterm birth". In: *New England Journal of Medicine* 359.3 (2008), pp. 262–273.

[32] Charles Murray. *In our hands: A plan to replace the welfare state*. American Enterprise Institute Press, 2016.

[33] OECD. *Health at a Glance 2017*. 2017, p. 216. DOI: https://doi.org/https://doi.org/10.1787/health_glance-2017-en. URL: https://www.oecd-ilibrary.org/content/publication/health_glance-2017-en.

[34] Raj Rai and Lesley Regan. "Recurrent miscarriage". In: *The Lancet* 368.9535 (2006), pp. 601–611.

[35] Loretta Ross and Rickie Solinger. *Reproductive justice: An introduction*. Vol. 1. Univ of California Press, 2017.

[36] Maya Rossin-Slater. "WIC in your neighborhood: New evidence on the impacts of geographic access to clinics". In: *Journal of Public Economics* 102 (2013), pp. 51–69.

[37] Andy Stern. *Raising the floor: How a universal basic income can renew our economy and rebuild the American dream*. Public Affairs, 2016.

[38] Kate W Strully, David H Rehkopf, and Ziming Xuan. "Effects of prenatal poverty on infant health: state earned income tax credits and birth weight". In: *American Sociological Review* 75.4 (2010), pp. 534–562.

[39] Amelia K Wesselink et al. "Age and fecundability in a North American preconception cohort study". In: *American journal of obstetrics and gynecology* 217.6 (2017), 667–e1.

[40] Leslie A. Whittington. "Taxes and the Family: The impact of the tax exemption for dependents on marital fertility". en. In: *Demography* 29.2 (May 1992), pp. 215–226. ISSN: 0070-3370, 1533-7790. DOI: 10.2307/2061728. URL: https://link.springer.com/article/10.2307/2061728 (visited on 06/20/2018).

[41] Leslie A Whittington, James Alm, and H Elizabeth Peters. "Fertility and the personal exemption: implicit pronatalist policy in the United States". In: *The American Economic Review* 80.3 (1990), pp. 545–556.

[42] Andrew Yang. *The War on Normal People: The Truth about America's Disappearing Jobs and why Universal Basic Income is Our Future*. Hachette UK, 2018.

6 Supporting Information: S1

Table 2: Comparison of United States and Alaska Demographics

Measure	United States	Alaska
Education (Age 25+)[1]		
Percent High School	28.2	27.1
Percent College Degree	28.5	27.6
Median Age[1]	37.2	33.8
Race/Ethnicity[1]		
Non-Hispanic White	63.7	63.9
Black	12.2	3.2
Amer. Ind. or Alaska Nat.	0.7	13.6
Asian	4.8	5.3
Hispanic	16.4	5.7
Other Race	2.4	8.3
Median HH Income[1]	$53,046	$69,917
Percent HH income above $200K^1$	4.6	5.3
Poverty Rate[1]	10.9	6.6
Percent Urban[2]	80.7	66.0
Percent Foreign Born[1]	12.9	6.9
Percent Single-Parent HH[1]	17.5	17.2
Birth Rate per 1,000 women 15-44[3,4]	64.1	80.1
Percent Pre-Term Birth[5]	12.0	9.8
Percent Low Birthweight[6]	8.2	5.7

Notes:

(1) Source: 2008-2012 American Community Survey.

(2) Source: 2010 Census.

(3) Source: National Vital Statistics Reports, Vol. 61, No. 1, 2012.

(4) Source: AK Bureau of Vital Statistics.

(5) Source: "Preterm Births: all Alaskans, Alaska Native People, and U.S., 1980-2016." AK Department of Health and Social Services.

(6) Source: "Percentage of Live Born Infants with Low Birthweight: all Alaskans, Alaska Native People, and U.S., 1980-2016." AK Department of Health and Social Services.

7 Supporting Information: S2

Alaskan women primarily do not change their smoking or drinking behavior when pregnant. If they do, they tend to quit those behaviors.

Table 3: Smoking and Drinking Behavior Of Pregnant Women in Alaska 1990-2010

	Smoking (%)	Drinking (%)
Never	69	47
Always	24	31
Quit	7	23
Began	.008	.11

N = 27,094

Note: Data are the Pregnancy Risk Assessment Monitoring System data. The measures are whether the woman smoke or drank 3 months prior to getting pregnant and during the third trimester.

8 Supporting Information: S3

Table 4: Birth Rate Model With Covariates

Covariate	IRR	S.E.
DIV_{t-1} (Thous.)	1.159064***	.0106706
DIV_{t-2} (Thous.)	1.123403***	.0085517
DIV_{t-1}*DIV_{t-2} (Thous.)	.9808748***	.0011182
Year	1.006957***	.0011479
Married	1.592152***	.0291931
Parity		
Parity 2	1.270514***	.0296856
Parity 3	.8440817***	.0255224
Parity 4+	1.039719	.0375343
Race		
Native Alaskan	1.62128***	.0294531
Other Race	.9874992	.0182176
Education		
High School	.8911793***	.0181853
Some College	.7248431***	.0156766
Bachelor's or more	.9168342**	.0231941
Age		
20-24	1.154468***	.034928
25-29	.8992731***	.0272134
30-34	.5503822***	.0170797
35-39	.2411619***	.0077553
40-44	.0530535***	.0019431
US. birth rate	1.03663***	.0042104
Constant	.000***	.000

Notes:

(1) Birth count source: U.S. Natality Detail File, 1984-2010.

(2) Population count sources: 1980-2000 Decennial Censuses and 2006-2010 American Community Survey.

(3) Total N = 11,696 category IDs; 240,285 births.

(4) *p<.05; ** p<.01; *** p<.001

(5) Reference groups are: Parity 1, Non-Hispanic White, Less than High School, and Age 15-19.

9 Supporting Information: S4

Abortion data are state-level abortion rates obtained from the Centers for Disease Control. Models predicting the abortion rate with various lag structures and controlling for a time-trend indicate there is no relationship between the dividend and the abortion rate.

Assessing the Dividend's Effects on the Abortion Rate	(1)	(2)	(3)
	No Lag	One Year Lag	Two Year Lag
Dividend	-0.00030	0.00000	0.00000
	(0.00)	(0.00)	(0.00)
Year	-0.00010	-0.00018	-0.00015
	(0.00)	(0.00)	(0.00)
Constant	0.32860	0.49897	0.42545
	(0.58)	(0.59)	(0.64)
N	35	35	35

10 Supporting Information: S5

When a cash transfer occurs every year, it is possible that after an initial period of adjustment individuals come to expect the dividend and anticipate it each year, removing its effect as an income "shock." The Alaskan dividend's variation over time allows us to assess whether normalization occurs by measuring jumps or dips in the dividend that can be thought of as unanticipated.

We performed a series of analyses assessing whether birth rates are more responsive to changes in the dividend amount than the absolute magnitude of the dividend itself. These analyses used two types of measures. First, we measured a given year's dividend amount as a deviation from prior years' average payment amounts. We created measures using multiple lags: one, three, and five years. Second, we regressed dividend payments on year for the previous three and five years and used the model results to predict the dividend amount in a given year. We then calculated the residual by subtracting the observed payment from the predicted payment.

We replicated our birth rate analysis using the measures described above – deviations from averages and residuals from predictions – with one - and two-year lags to predict birth rates instead of the lagged dividend amounts used in the main analyses. Overall, these measures did not significantly predict the birth rate, suggesting that the actual magnitude of the dividend payment matters more than the portion of the payment that might be unanticipated and provides evidence against the normalization hypothesis. Exceptions were models using a measure of deviation from the average of the prior three years and the residual of a model predicting payments for the prior five years: These measures showed positive and significant effects on birth rates, but their coefficients were smaller in magnitude than the coefficient of the actual dividend amount (presented in S3). The lack of evidence for adjustment or smoothing comports with the contemporary assessment of consumption responses to income changes [23].