Discussion Paper Series
No. 1202
Jan 2012

Money Transfer and Birth Weight : A Causal Link from Alaska

Wankyo Chung, and Beomsoo Kim

The Institute of Economic Research - Korea University
Anam-dong, Sungbuk-ku, Seoul, 136-701, South Korea, Tel: (82-2) 3290-1632, Fax: (82-2) 928-4948

Money Transfer and Birth Weight: A Causal Link from Alaska

Wankyo Chung
School of Business
Hallym University
Chuncheon, Korea
Tel: (82) 33 248 1848
Email: wankyo@hallym.ac.kr

Beomsoo Kim
Department of Economics
Korea University
Seoul, Korea 136-701
Tel: (82) 2 3290 2204
Email: kimecon@korea.ac.kr

January 16, 2012

Abstracts

Richer and more educated individuals are known to live longer than poorer and less educated ones. This paper employs the first two years distribution of Alaska Permanent Fund Dividend and examines health outcomes of their newborns. The results indicate that income has a significant positive effect on birth weight but that its magnitude is modest. An income shock in the amount of $3,465 increases birth weight by 13 grams, but does not show any significant impact on low birth weight. We find substantially decreased female labor supply among pregnant women but no significant response of prenatal care.

Keywords: Birth Weight, Income, Labor Supply

JEL Classification: I12, I18

Acknowledgements

We are grateful for helpful suggestions from John Chao, Mark Duggan, William Evans, John Ham, Chirok Han, Judy Hellerstein, Ginger Jin, Jinyoung Kim, Sunbin Kim, Soohyung Lee, Chris Ruhm, John

Rust, Bob Schwab, Donggyu Sul, and seminar participants at Korea University, the University of Texas (Dallas), and the University of Maryland (College Park). We thank Hyungseok Ha for his valuable research assistance.

1. Introduction

Previous studies have found that richer and more educated individuals live longer than poorer and less educated ones. For example, statistics from the 1980 National Longitudinal Mortality Survey demonstrated that individuals whose family income was at least $50,000 lived 25% longer than those whose family income was below $50,000 across all age groups (Deaton, 2003). However, the direction of causality remains unclear, that is, it is unclear whether economic resources influence health or health influences economic resources (Smith, 2004).

To determine causal relationships from correlations, previous studies have resorted to exogenous income shocks such as lottery winnings, Germany's reunification, and inheritances (Lindahl, 2005; Frijters, Haisken-DeNew & Shields, 2005; Meer, Miller & Rosen, 2003; Kim & Ruhm, 2012). However, the true randomness of these shocks casts considerable doubt on the robustness of their findings. Income shocks from lottery winnings are not completely random in that buying lottery tickets is not random. Although the Social Security notch is random, its size, which is proportional to Social Security benefits, may not be random. Inheritances have similar limitations.

Another remaining issue is the stock nature of health, accumulating and/or depreciating over the course of one's life. Therefore, any income shock during adulthood is not likely to influence health instantly, resulting in an income-health gradient that slowly fades away after around the age of 50 (Smith, 2004). It is a new health event that has a substantial impact on the income of an individual nearing the end of his or her life (Smith, 2003, 2004).

To overcome these limitations other studies have shifted their focus onto the relationship between economic resources and children's heath based on the assumption that children's health is not likely to influence family income but more likely to be influenced by family income (Case, Lubotsky & Paxson, 2002, Currie & Stabile 2003). However, without exogenous income shock third factor like "discount rate" of their parents, not income per se, might still be an issue of these studies.

In this paper we would like to exploit the completely exogenous random income shock to shed light on this long lasting question. The present study employs the Alaska Permanent Fund Dividend (APFD) as a source of an income shock to Alaska residents to consistently estimate the effects of the APFD on the health of their newborns. This approach has several advantages over existing methods. First, the APFD is a completely random shock and thus can be used as a source of an exogenous income shock. By design, its eligibility and amount are not related to the recipient's education or income. Although it is now an expected shock, the first two years of APFD distribution was unexpected and sudden because of legal challenges then. Therefore, this period can be used to examine the effects of an unexpected and random income shock on health.

Second, the APFD is large enough to provide an important source of an income shock. The first dividend was $1,000 per person, which was a sizable amount in 1982. On average, the APFD has amounted to 6% of median household income (Goldsmith, 2002).

Third, the health of newborns is used as a measure of health outcomes. This has two advantages. One advantage is that a newborn's health is accumulated only during the pregnancy, which is much shorter than the amount of time for adults. This makes our measure of health outcomes less subject to confounding effects. The second advantage is that the health of newborns is less likely to be subject to reverse causality because their health is not likely to influence parental income.[1]

Fourth, birth weight, which is used in this study as a measure of health outcomes, is a reliable measure of children's health, which has considerable influence on health and socioeconomic outcomes later in life (Rosenzweig & Schultz, 1983; Corman et al., 1987; Rosenzweig & Wolpin, 1991; Case et al., 2002; Almond, Chay & Lee, 2005).

Finally, this study makes extensive use of census data on all births in the U.S. For the purpose of this study, census data represent the best available one for newborns because newborns' citizenship is linked to their birth certificates.[2]

The results show that family income improved newborns' health at birth (but only slightly). The APFD increased birth weight by 13 grams; reduced the likelihood of low birth weight by about 0.1 percentage point; and improved the five-minute APGAR score by 0.01 (0.2% of the sample mean). The income shock improved newborns' health by reducing the labor supply of pregnant women. The results provide, however, no evidence of increased healthcare use.

The rest of this paper is organized as follows: Section 2 reviews the APFD, and Section 3 discusses the empirical methodology. Section 4 presents the results, and Section 5 concludes.

2. Alaska Permanent Fund

The Alaska Permanent Fund traces back to a financial windfall ($900 million) from the auctioning off drilling rights in Prudhoe Bay in 1969. This money was spent on basic community

---

[1] In particular, Case et al. (2002) found no evidence that children's health at birth influences the supply of female labor.

[2] Even illegal immigrants have an incentive to register their newborns for citizenship purposes.

needs such as water, sewage, road, and school systems. However, the entire fund was spent within a few years.[3] With another boom in the mid-1970s from oil-related businesses, Alaska's Constitution was amended in 1976, resulting in the Alaska Permanent Fund, which was established based on at least 25% of all mineral lease rentals, royalties, federal mineral revenue-sharing payments, and bonuses. The fund was invested in income-producing instruments such as stocks, bonds, and real estate. All the income from the fund was deposited in a general fund (unless otherwise provided by law).

The fund received its first deposit of dedicated oil revenues ($734,000) in 1977, when the first barrel of oil from Prudhoe Bay arrived in Valdez through the Trans-Alaska pipeline. There were extensive discussions on the use of the fund. Some wanted to use it for public infrastructure (as they did in 1969), whereas others wanted to distribute it directly to residents (who they believed would know the best way to spend the money) instead of subjecting it to public spending. In April 1980, Governor Jay Hammond signed a bill requiring the dividend to be paid to all Alaska residents 18 years old and above depending on the years of residency since 1959.[4] Each year of residency meant an additional $50 since Alaska became a state, and the maximum amount was $1,050 at that time.

However, the dividend was not distributed until 1982 because of legal challenges. Ron and Penny Zobel, both attorneys, filed a lawsuit against the state of Alaska on two points. The first point was related to abolishing the income tax for those who lived more than three years in Alaska. The second point was about the progressive scale used to calculate the APFD. Alaska's

[3] (http://www.apfc.org/home/Media/publications/2009AlaskansGuide.pdf), captured on March 25, 2011.

[4] (The Pittsburg Press, April 17, 1980, http://news.google.com/newspapers?id=a44qAAAAIBAJ&sjid=SVwEAAAAIBAJ&pg=5776,629859&dq=alaska+permanent+fund+dividend&hl=en).

Supreme Court ruled in favor of Zobel for the income tax in 1980. As a result, Alaska's income tax was abolished completely in 1980.[5] Alaska's Superior Court ruled the Alaska Permanent Fund as unconstitutional in July 1980, but the state's Supreme Court judged it constitutional in October 1980. The case was appealed to the U.S. Supreme Court by Ron and Penny Zobel, and the final ruling was made on June 14, 1982. The U.S. Supreme Court judged it unconstitutional because the amount of APFD depended on the period of residency. In the meantime, the legislature passed a standby bill allowing for a flat payment of $1,000 for everyone who lived more than six months in Alaska. On June 16, 1982, Governor Hammond signed the bill, and the first dividend in the amount of $1,000 was distributed from June 1982 through the end of the year.

However, the debate on the use of oil money was not finished. Some politicians who believed that the money should be used for capital projects to benefit Alaskans as a whole tried to abolish two bills (HB11 and HB85) that allowed the distribution of the dividend in 1982, and supporters of the APFD tried to stop their efforts.[6] Because of these actions, residents were unclear whether the 1983 dividend would be distributed until the state announced a dividend in the amount of $386.15 per person in September 1983. The amount in 1983 was only one third of that in the previous year because the first dividend was the sum of dividends withheld for years.

The application deadline for 1982 was October 15, and the 1983 application was accepted between April and June. The 1983 dividend was mailed from September to November.

---

[5] In this study, we analyzed births from 1980 to 1984 (conceived from Nov. 1979 to Jan. 1984), and thus, this change have no effect on the estimation results.

[6] February 1983, Anchorage Daily News, (http://news.google.com/newspapers?id=3dMhAAAAIBAJ&sjid=ip8FAAAAIBAJ&pg=1359,3796903&dq=alaska+permanent+fund+dividend&hl=en).

Therefore, during the first two years of the APFD, its distribution was uncertain until the last minute, and the amount was uniform regardless of demographic characteristics such as age, race, and education. An infant born in the previous calendar year, for example, was entitled to the same amount as his or her grandfather. This unexpected and exogenous income shock has provided unprecedented opportunities for analyzing the effects of income on health. In addition, 104% and 93% of all Alaska residents applied for the dividend in 1982 and 1983, respectively, and 101% and 92% received it. As a result, there is no need to be concerned with selection issue.

3. Empirical Methodology

3.1. Data

As the main source of data, we employed the Natality Detail File, which includes all live births in the U.S. This data set provides the most complete picture of newborns in the U.S. because each birth is registered for acquiring legal status.[7]

The data set provides detailed demographic information on the mother (e.g., age, education, marital status, and race) and the baby (e.g., gender and siblings) for each birth and records detailed information on the characteristics of pregnancies (e.g., parity and plurality), prenatal care (e.g., the number of prenatal visits and the timing of the first prenatal visit), and pregnancy outcomes (e.g., birth weight and the APGAR score).

The period of analysis was 51 months from conception in November 1979 to conception in January 1984. Babies conceived after January 1984 were exposed to 1984 dividend, and thus

---

[7] By contrast, data from surveys may reflect disproportional responses according to the underlying characteristics of respondents. For example, illegal immigrants may hesitate to participate in surveys but be motivated to complete the birth certificate to provide their children with U.S. citizenship.

excluded from the sample because it is unclear whether the 1984 dividend was an unexpected shock for these babies. By using this period of 51 months, we obtained 23 months for the pretreatment period, 6 months for the uncertain treatment period, and 22 months for the posttreatment period. Babies conceived between October 1981 and March 1982 were born between July and December 1982, when the first dividend was distributed. This group might or might not have received the 1982 dividend depending on individual delivery schedule for these months of distribution. Unfortunately, there is no data on when each individual or family received the dividend. Therefore, this group was exposed to some probability of receiving the dividend. During these periods, individuals might have behaved in many different ways, although there are no data to verify this. Some with liquidity constraints might not have changed anything before actually receiving the dividend, whereas others might have changed their consumption pattern expecting to receive the dividend. Evans and Moore (2009) found some evidence for the sharp change in consumption rightly after receiving the money. In addition, those who did not receive the dividend might have felt deprived, which might have had negative effects on health (Eibner & Evans, 2005). Thus, we excluded these six months from the analysis.[8]

3.2. Outcomes

We used birth weight as a reliable measure of children's health, which is widely known to have considerable influence on health and socioeconomic outcomes later in life (Rosenzweig & Schultz, 1983; Corman et al., 1987; Rosenzweig & Wolpin, 1991; Almond, Chay & Lee, 2005). We measured birth weight in grams and used it in conjunction with low birth weight (1 if

[8] The exclusion of these six months does not change the results.

the birth weight ≤2500 grams), which is significantly related to high medical costs and early death.

The APGAR score indicates the general condition of newborns based on their appearance, pulse, response to stimulation, muscle tone, and breathing. The score ranges from 0 to 2 for each of these five categories. Thus, the total APGAR score ranges from a minimum of 0 to a maximum of 10. The higher the score, the better the newborn's health is.[9] We employ the continuous measure of the APGAR score as another outcome.

3.3. *Econometric Model*

3.3.1. Difference-in-difference estimation

We have data on the pretreatment and posttreatment periods, and the treatment was an unexpected and random shock. The best identification strategy fits into the difference-in-difference estimation naturally:

$$Y_{ism} = Post_{sm}*c1 + Alaska_{is}*Post_{sm}*d1 + State_{is} + X_{ism}b + \mu_{ism} \quad , \quad (1)$$

where Y is the health outcome measured by birth weight or the APGAR score; i denotes the individual; s denotes the state; m denotes the month of the year; and Post indicates those babies conceived between April 1982 and January 1984 (as discussed in the previous section). Importantly, the difference-in-difference estimate d1 captures the APFD effect on the health outcome.

[9] The APGAR score we used is measured five minutes after birth and recorded in the birth certificate and is regarded as critically low if it is below 3; fairly low if it is between 4 and 6; and normal if it is between 7 and 10. See Casey et al (2001).

State is a dummy for each state, and X contains usual demographic information, including the mother's age, race (white, black, and Native American—including Aleuts, Eskimos, and others), and education level (no high school degree, a high school degree, some college, and a college degree or higher). Other variables included are the gender of the child, the birth order, and the season of birth (December-February, March-May, June-August, and September-November).[10] The first child tends to show lower birth weight, and thus, we included a binary indicator variable for the first child (Wilcox et al., 1996). In addition, we included the plurality of the pregnancy as a binary variable because such newborns are more likely to show lower birth weight.

3.3.2. Control group

A difference-in-difference model provides consistent estimates of the treatment effect only if the time path in the outcome is the same in both the treatment and control states in the absence of any intervention, but this can never be guaranteed (Lien & Evans, 2005). The rest of the states in the U.S. did not experience the APFD and thus can be regarded as potential control states. To obtain the best control group, we run the following regression model based on Lien and Evans (2005) using data from Alaska and one potential control state for the 23-month pretreatment period:

$$Y_{ism}=X_{ism}*b+\lambda_m*D_s+\mu_s+\nu_m+\varepsilon_{ism}. \quad (2)$$

Equation 2 includes the same set of covariates used for Equation 1 in the previous section, and U and V denote the dummy variables for the state and the month of conception, respectively. In addition, i denotes the individual; s denotes the state; and m indicates 23 months of conception.

[10] We used the month of birth instead of the season of birth and found no change in the results.

We use 23 months for the pretreatment period to determine whether other states would show the same birth weight pattern as Alaska. Lien and Evans (2005) mentioned that the key term in this regression is the coefficient λ_m, which allows the dummy variables for the month to vary between the treated state and a potential control. According to Equation 2, if we cannot reject the hypothesis that $\lambda_1=\lambda_2=\lambda_3=...= \lambda_{23}=0$, then Alaska and possible control states share the same monthly birth weight pattern, conditional on X. Table 1 presents the F-test results as p-values. Based on the results, Maine is rejected at the 95% confidence level. To be more conservative, we choose the 90% confidence level, and as a result, Connecticut, Maine and Oklahoma are rejected. These three states are indicated as bold in Table 1. There are some small states that might not have a large enough sample to reject the F-test in the selection of control states. Therefore, we sorted the potential control states from the smallest observations to the largest ones. The smallest rejected state is Maine. Eleven states of New Mexico, the District of Columbia, Delaware, Vermont, North Dakota, Wyoming, South Dakota, Rhode Island, New Hampshire, Nevada, and Montana have smaller numbers of observations than Maine. We may not be able to reject the null hypothesis for these states because of the Type II error. Therefore, we also exclude these 11 additional states. These states are shown as bold italic in Table 1.

4. Results

4.1 Main findings

Table 2 summarizes the basic statistics for the births conceived in Alaska from November 1979 to January 1984. We exclude observations from the non-control states listed in the previous section (approximately 1.1 million births). We also exclude observations with a calculated gestation period less than or equal to 21 weeks or more than or equal to 42 weeks. We measure the gestation period in the Natality Detail File based on the first day of last period, which is subject to substantial measurement error. In practice, doctors may wait 2 weeks after the due date but not any longer (http://www.mayoclinic.com/health/inducing-labor/PR00117). In this regard, a gestation period longer than 42 weeks seems abnormal and is subject to likely measurement error. Thus, we exclude such observations. There are only a very small number of observations with a gestation period less than 21 weeks. Some observations with missing information on the variables used are also excluded.[11] As a result, we obtained a total of 7.9 million births for the analysis, of which 31,635 were in Alaska.

Mothers in Alaska are slightly younger and more likely to be Native American. They are also more likely to be educated and married. There were shown no differences in the distribution of newborns' gender and plurality between Alaska and control states. As for birth order, approximately 42% and 43% were the first child in Alaska and control states, respectively. Newborns in Alaska show slightly longer gestation than control states.

Table 3 shows the effects of the APFD on the birth weight of newborns as difference-in-difference estimates. We measured the APFD with the dummy variable Post, which determined the receipt of the 1982 or 1983 dividend by births conceived between April 1982 and January 1984.

The first column shows results using birth weight as an outcome variable. Birth weight increases by 13 grams when the APFD is received. Standard errors are clustered at the state level with an assumption that births within a state during the data period may be correlated even when time-invariant and state-specific characteristics were controlled for. The estimate is statistically significant at the 95% confidence level. On average Alaska households with a

[11] Excluding observations with missing data (e.g., the level of education) does not change the results qualitatively.

newborn received $3,465 until 1983.[12] Thus, an additional $1,000 increases birth weight by 3.8 grams.

Birth weight is a good composite indicator of newborns' health. However, it remains unclear whether an increase in birth weight means improved health outcomes across the whole birth weight range. In this regard, some studies have focused on low birth weight, which is defined as birth weight less than or equal to 2,500 grams. Low birth weight has been shown to increase infant mortality (McCormic, 1985). The second column of Table 3 shows low birth weight as an outcome. Approximately 5% of all newborns in Alaska had low birth weight. The APFD reduced the incidence of low birth weight by about 0.1 percentage point. However, this decrease was small (1.6% of the sample mean) and not statistically significant. The last column presents another measure of health: the five-minute APGAR score. The higher the APGAR score, the better the newborn's health is. The average five-minute APGAR score was 8.85, and the APFD increased the APGAR score by 0.01 point. This increase was significant but modest in size.

4.2. Mechanisms

We examine the mechanisms underlying the causal relationship between income and birth weight. Typical inputs in a birth weight production function are nutritional intake, prenatal care, cigarette/alcohol consumption, and parent/neighborhood characteristics such as education and the availability of medical care (Currie & Cole, 1991). We examine such channels to identify the mechanisms.

[12] The average household size was 2.85, and the APFD payments were $1,000 for 1982 and $386.15 for 1983 per recipient. We calculated that 1983 birth family received both 1982 and 1983 dividends.

We first determine whether the increase in birth weight was due to an increased gestation period. The gestation period is measured in weeks. The first column of Table 4 shows the results for the gestation period. The estimated coefficient is -0.0084 and not significant at conventional 95 % confidence level and shows an unexpected sign.

We check prenatal care use by determining the month prenatal cares begin and the number of prenatal care visits. The second and third columns of Table 4 shows the months prenatal care begin and the number of prenatal care visits, respectively. All births showed delayed prenatal care by 0.8 day (0.0276*30) and 0.04 fewer prenatal care visits (base=10.25 visits). This indicates that every one-day delay in prenatal care reduced the number of prenatal visits by 0.07 (1.43 per month/20 working days in a month).

We also check the supply of labor. According to the target income hypothesis, individuals may leave the labor market based on an exogenous income shock (Camera et al., 1997; Chou, 2000).[13] The best source of data on labor supply is the Current Population Survey (CPS). The March CPS asked about labor force participation, weeks worked the previous year, hours worked the previous week, usual hours worked per week in the previous year, full-time work in the previous year, and weeks worked part-time in the previous year. We employed the observations from 1982 and 1984 and chose those whose youngest child was aged one or below to construct similar sample with the one we examined using census of birth data. The March 1982 CPS asked about labor supply in the previous year (1981) and weeks worked/hours worked in March 1982, which was immediately before the distribution of the APFD. The March 1984

[13] There is no consensus between the intertemporal substitution and target income hypotheses. Camera et al. (1997) and Farber (2005) reached different conclusions using the same data, a sample of New York taxi drivers.

CPS asked about labor decisions in 1983, which was immediately after the distribution of the APFD.

Table 5 presents the results for both years for Alaska and control states separately. The upper block shows the results for the female sample, and the lower block, for the male sample. The results indicate a clear pattern. As shown in the first row, labor force participation dropped from 53% to 40%. At the same time, female participation in control states increased by 3 percentage points. As shown in the last column, female participation decreased by 16 percentage points after the APFD. As shown in the second row, weeks worked in the previous year decreased from 20 weeks to 15 weeks in Alaska. At the same time, females in control states worked 1.8 more weeks. As shown in the third row, hours worked in the previous week decreased by 4 hours after the APFD. In addition, hours worked per week decreased by 6 hours for females in Alaska, and those with a full-time job decreased by 13 percentage points when there is an income shock. Females appear to reduce their labor supply both externally and internally but males reduce their labor supply only internally. The size of decline is greater for females than males similarly to previous literature (Farber 2005).

Table 6 shows the difference-in-difference estimates, which were obtained after adjusting for observable characteristics in the data. We include the age group (≤25, 26-40, and ≥40), race (white, African American, and others), the education level (no high school degree, a high school degree, some college, and a college degree or higher), marital status, and the number of children aged five or below in the regression as control variables. The tables show the results for the female sample in the upper panel and those for the male sample in the lower panel. For the female sample, all the estimates for the key independent variable were significant at the 99% confidence level and sizable. Females reduced their labor force participation by 16 percentage points, a 30% drop from the baseline (0.53). They also worked 6 weeks less, a 30% drop from the baseline (20.11). Females working full-time declined by 15.7 percentage points. On the other hand, for males, there were decreases only in hours worked the previous week and usual hours worked per week, and there was little change in labor force participation.[14]

We cannot check other potential mechanisms such as grocery consumption, drinking, and smoking because of data limitations. The Consumer Expenditure Survey provides consumption data but does not identify the state.[15] In addition, although these data sets can facilitate the measurement of recurring monthly expenditures such as house and car payments pretty well, they might be quite limited in the measurement of goods like alcohol and food away from home (Meyer & Sullivan, 2009). Birth certificates after 1989 and the Behavioral Risk Factor Surveillance System after 1984 provide information on health behaviors such as drinking, smoking, juice consumption, and green salad consumption, but unfortunately they offer no data for our sample period.

4.3. Robustness check

[14] The 1979 oil shock may have had different impacts on the labor market of oil producing states. To address this concern we used Texas as only control state since both states are major oil producing states. When Texas alone is used for the control state, the results remain qualitatively same although the standard errors shrink due to smaller sample size. Detailed results are available on request.

[15] Hsieh (2003) employed a restricted use Consumer Expenditure Survey to compare third-quarter consumption with fourth-quarter consumption but found no significant difference. However, Evans and Moore (2009) found increased mortality shortly after the dividend and suggested the increase in consumption as a possible underlying mechanism.

Although infant mortality itself is an important outcome (i.e., it can be the final outcome), there were no linked data of vital statistics to infant mortality for our study period.[16]

Change in the composition of mothers may generate spurious relationships. In this regard, Brown (2011) suggested that the findings of Almond (2006) may not be robust. The results in this study may be subject to the same concern, and thus, we examined whether there were some compositional changes in mothers. Figure 1 and 2 shows that this was not a serious concern.

There might have been some other changes that led to positive income shocks. For example, the earned income tax credit (EITC) became available in several states in the late 1980s and 1990s. However, there was no change in the EITC in Alaska during the study period.

We also employ a dummy variable for the season in the regression. Table 7 present the regression results obtained using a dummy for the month, not for the season. The results are robust to this change. Carrington (1996) examined the effects of pipeline construction on the labor market in Alaska, but the pipeline was completed in 1977, which was before the APFD. Therefore, this study's results are not subject to this confounding factor. In addition, although Alaska typically shows large seasonal variations in the labor market, we employ the same March CPS, and thus, such seasonal variations are not a serious concern either.

5. Conclusion

We employed the Alaska Permanent Fund Dividend (APFD) as a source of an unexpected income shock to Alaska residents to consistently estimate its effects on the health of their newborns. The APFD increased birth weight by 13 grams, which was modest in size. We also considered low birth weight and the five-minute APGAR score as other health outcomes.

[16] The linked data are available from 1983 to 1991 and from 1995 to 2002.

The APFD led to a slight increase in the five-minute APGAR score, but it had no significant effect on low birth weight.

It is difficult to compare this study's results with the findings of previous studies. One possible example may be the cash transfer program in Mexico, which increased birth weight by 127.3 grams (Barber & Gertler, 2008). However, it was conditional cash transfer and occurred in a developing country, and thus, it is difficult to directly compare this study's results with their findings.

We examined the mechanisms underlying the causal relationship between income and birth weight. Although there was no change in the prenatal care use, the supply of female labor decreased sharply both externally (e.g., labor force participation and full-time work) and internally (e.g., weeks worked and hours worked the previous week).

This study has several limitations. We could not measure infant mortality, which may be the final health outcome, because the Natality Detail File provides no information on infant mortality. In addition, according to anecdotal data, it is likely that individuals spent the APFD on daily expenses such as groceries. However, we do not have sufficient data to capture the change in grocery spending in Alaska during the study period.

References

Almond, Douglas, Kenneth Chay and David Lee, "The Cost of Low Birth Weight," *Quarterly Journal of Economics* 120 (2005), 1031-1083.

Almond, Douglas, "Is the 1918 Influenza Pandemic Over? Long-term Effects of In Utero Influenza Exposure in the Post-1940 U.S. Population," *Journal of Political Economy* 114 (2006), 672-712.

Barber, Sarah and Paul Gertler, "The impact of Mexico's conditional cash transfer program, *Oportunidades*, on birth weight," *Trop Med Int health* 13 November (2008), 1405-1414.

Brown Ryan, "The 1918 U.S. Influenza Pandemic as a Natural Experiment, Revisited," Working paper (2011).

Carrington, William, "The Alaskan Labor Market During the Pipeline Era," *Journal of Political Economy* 104 (1996), 186-218.

Camerer, Colin, Linda Babcock, George Loewenstein, and Richard Thaler, "Labor Supply of New York City Cabdrivers: One Day at a Time," *Quarterly Journal of Economics* 112 May (1997), 407–41.

Case, Anne, Darren Lubotsky, and Christina Paxson, "Economic Status and Health in Childhood: The Origins of the Gradient," *American Economic Review* 92 December (2002), 1308-1334.

Casey, B. M., D. D. McIntire, and K. J. Leveno, "The Continuing Value of the APGAR Score for the Assessment of Newborn Infants," *New England Journal of Medicine* 344 (2001), 467-471.

Corman, Hope, Theodore J. Joyce, and Michael Grossman, "Birth Outcome Production Functions in the U. S.," *Journal of Human Resources* XXII (1987), 339–360.

Chou, Yuan K., "Testing Alternative Models of Labor Supply: Evidence from Taxi Drivers in

Singapore," Research Paper no.768, Dept. Econ., Univ. Melbourne (2000).

Currie, Janet and Mark Stabile, "Socioeconomic Status and Child Health: Why is the Relationship Stronger for Older Children?" *American Economic Review* 93 December (2003), 1813-1823.

Currie, Janet and Nancy Cole, "Does participation in transfer programs during pregnancy improve birth weight?" NBER working paper 3832 (1991).

Deaton, Angus, "Health, Income, and Inequality," NBER reporter Spring (2003), 9-12.

Diana S. Lien, and Evans William N., "The benefits of prenatal care: evidence from the PAT bus strike," *Journal of Econometrics* 125 (2005), 207–239.

Eibner, C., and W. N. Evans, "Relative Deprivation, Poor Health Habits, and Mortality," *Journal of Human Resources* 40 (2005), 591-620.

Energy Information Administration, http://tonto.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_m.htm captured on March 2 (2011).

Evans, William and Timothy Moore, "The short-term mortality consequences of income receipt," NBER Working Paper No. 15311 (2009).

Farber, Henry, "Is tomorrow another day? The labor supply of New York cabdrivers?" *Journal of political economy* 113 (2005), 46-82.

Frijters P, Haisken-DeNew JP, Shields M., "The causal effect of income on health: Evidence from german unification," *Journal of Health Economics* 24 (2005), 997–1017.

Goldsmith, Scott, "The Alaska Permanent Fund Dividends: An Experiment in Wealth Distribution," Working paper (2002).

Hsieh, Chang-Tai, “Do Consumers React to Anticipated Income Changes: Evidence from the Alaska Permanent Fund,” *American Economic Review* 93 March (2003), 397-405.

Kim, Beomsoo and Christopher Ruhm, “Inheritances, Health and Death,” *Health Economics* 21 February (2012), 127-144.

Lindahl M, “Estimating the effect of income and health and mortality: Using lottery prizes as an exogenous source of variation in income,” *Journal of Human Resources* 40 (2005), 144–168.

McCormick, Marie C., “The Contribution of Low Birth Weight to Infant Mortality and Childhood Morbidity,” *New England Journal Medicine* 312 January (1985), 82-90.

Meyer, Bruce D. and James X. Sullivan, “Five Decades of Consumption and Income Poverty,” NBER Working Paper No. 14827 (2009).

Meer J, Miller DL, Rosen H., “Exploring the health–wealth nexus,” *Journal of Health Economics* 22 (2003), 713–720.

Rosenzweig, Mark R., and T. Paul Schultz, “Estimating a Household Production Function: Heterogeneity and the Demand for Health Inputs, and Their Effects on Birth Weight,” *Journal of Political Economy* XCI (1983), 723–746.

Rosenzweig, Mark R., and Kenneth I. Wolpin, “Inequality at Birth: The Scope for Policy Intervention,” *Journal of Econometrics* (1991), 205–228.

Smith, James P., “Consequences and Predictors of New Health Events,” NBER Working Paper No. 10063 (2003).

Smith, James P., “Unraveling the SES-Health Connection,” in Waite Linda J. (ed.), *Aging, Health, and Public Policy: Demographic and Economic Perspectives*, Supplement to *Population and Development Review*, Population Council, New York, (2004).

Wilcox, M. A., A. M. Z. and I. R. Johnson, "The effects of Parity on Birthweight Using Seccessive *Pregnancies*," *Acta Obstet. Gynecol. Scand.* 75 (1996), 459-463.

Table 1. Control states

Alaska	Count	P-value (F_test)	Alaska	Count	P-value (F_test)
New Mexico	5,090	0.162	South Carolina	210,599	0.173
District of Columbia	19,339	0.030	Colorado	216,717	0.660
Delaware	20,111	0.499	Kentucky	216,796	0.120
Vermont	32,860	0.331	**Oklahoma**	223,979	0.100
North Dakota	37,231	0.425	Maryland	238,813	0.792
Wyoming	43,486	0.349	Alabama	244,866	0.321
South Dakota	51,406	0.589	Minnesota	255,045	0.709
Rhode Island	51,678	0.327	Tennessee	266,097	0.312
New Hampshire	57,567	0.463	Washington	275,032	0.386
Nevada	57,664	0.463	Indiana	297,544	0.311
Montana	58,412	0.360	Massachusetts	302,992	0.569
Maine	66,720	0.000	Wisconsin	303,340	0.694
Idaho	75,171	0.567	Missouri	313,571	0.314
Hawaii	76,475	0.441	Virginia	326,438	0.632
Arizona	106,814	0.188	Louisiana	338,088	0.133
West Virginia	108,978	0.468	North Carolina	350,772	0.465
Nebraska	110,351	0.700	New Jersey	403,189	0.835
Connecticut	122,182	0.000	Michigan	557,032	0.654
Arkansas	135,166	0.199	Florida	595,875	0.390
Utah	162,043	0.215	Pennsylvania	639,599	0.398
Kansas	166,726	0.608	Ohio	663,503	0.712
Oregon	166,732	0.739	Illinois	750,566	0.672
Georgia	179,164	0.580	California	861,059	0.304
Iowa	182,515	0.686	New York	1,017,322	0.816
Mississippi	188,226	0.396	Texas	1,187,289	0.390

Note: For births, we considered twenty three months period before the distribution of the Alaska Permanent Fund (i.e., pregnancies that started between November 1979 and October 1981). Some gestation periods ($\leq$21 and $\geq$42 weeks) are not included due to measurement error concern. The dependent variable was birth weight, and the independent variables were the male sex, the age of the mother, race, plurality, marital status, the mother's education level, the birth order (first, second, third, and fourth or higher), summer (June, July, and August by birth month), fall (September, October, and November by birth month), winter (December, January, and February by birth month), the state fixed effect, the calendar month fixed effect, and the interaction between calendar month and state fixed effects. For the estimation, we employed the OLS method. We conducted an F-test for the interaction between the state and the month. State names in bold type are those states that could not reject the null hypothesis at the 90% confidence level. States with smaller number of observations than Maine (the smallest rejected state) are also excluded due to type II error possibility. Those states are shown as bold italic.

Table 2. Descriptive statistics,

Pregnancies conceived between November 1979 and January 1984*

	Alaska		Control**	
	Mean	Standard Deviation	Mean	Standard Deviation
Outcomes				
Birth weight (gram)	3,457.65	571.30	3,342.09	588.72
Low birth weight (≤2500 grams)	0.05	0.21	0.07	0.25
Five-minute APGAR	8.85	0.89	9.07	0.95
Month prenatal care begin	2.81	1.48	2.71	1.49
Number of prenatal care visits	10.28	3.78	10.65	3.69
Demographic variables				
Male	0.51	0.50	0.51	0.50
Age of the mother	25.92	5.11	25.51	5.29
White	0.75	0.44	0.81	0.40
Black	0.03	0.18	0.17	0.38
Native American	0.19	0.39	0.00	0.06
Other	0.03	0.17	0.02	0.14
Plurality	0.02	0.14	0.02	0.14
No high school diploma	0.14	0.35	0.21	0.41
High school diploma	0.44	0.50	0.43	0.50
Some college	0.25	0.43	0.19	0.40
College diploma or higher	0.17	0.38	0.16	0.37
Married	0.84	0.37	0.81	0.39
Pregnancy conditions				
Plurality	0.02	0.14	0.02	0.14
Gestation period	39.27	2.23	39.07	2.41
First child	0.42	0.49	0.43	0.49
Second child	0.32	0.47	0.33	0.47
Third child	0.15	0.36	0.15	0.36
≥ Fourth child	0.11	0.31	0.09	0.29
Obs	31,635		7,871,386	

* Some gestation periods (≤ 21 and ≥ 42 weeks) are not included due to measurement error concern. Pregnancies that started between November 1981 and March 1982 are excluded because we do not know whether they received the dividend during the pregnancy or not.
** Connecticut, District of Columbia, Delaware, Maine, Montana, New Hampshire, Nevada, New Mexico, North Dakota, Oklahoma, Rhode Island, South Dakota, Vermont, and Wyoming are not included based on the results in Table 1.

Table 3. Effects of the Alaska Permanent Fund on birth outcomes

Dependent Variable	Birth Weight	Low Birth Weight	Five-Minute APGAR
Alaska*Post	13.1018***	-0.0008	0.0144***
	(1.3154)	(0.0005)	(0.004)
Post	2.6418*	0.0008	-0.0648***
	(1.3697)	(0.0005)	(0.0041)
R^2	0.1208	0.0814	0.0427
Obs	7,903,021	7,903,021	7,903,021

Note: See note in Table 2 for sample constructions. Post as a dummy variable capture the period after April 1982. The male sex, age, race (white, black, Native American, and other), plurality, the birth order (first, second, third, and fourth or higher), the education level (no high school diploma, a high school diploma, some college, and a college diploma or higher), a dummy variable for the season of birth, and dummy variables for states were included as independent variables. Standard errors in parentheses were clustered at the state level.
*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 4. Effects of the Alaska Permanent Fund on birth outcomes

Dependent Variable	Gestation Period (in Weeks)	Month prenatal cares begin	Number of Prenatal Care Visits
Alaska*Post	-0.0084*	0.0276**	-0.0351*
	(0.0046)	(0.0112)	(0.0194)
post	-0.0568***	-0.0122	0.1635***
	(0.0049)	(0.0112)	(0.0201)
R^2	0.0583	0.1114	0.1211
obs	7,903,021	7,903,021	7,903,021

Note: See the note in Table 3.

Table 5. Alaska Permanent Fund dividends and labor supply

	Alaska		Control		Diff	Diff	Diff-in-Diff
	1982	1984	1982	1984			
	(1)	(2)	(3)	(4)	(5)=(2)-(1)	(6)=(4)-(3)	(5)-(6)
				Female Sample			
Labor force participation	0.53	0.40	0.42	0.46	-0.13	0.03	-0.16
Weeks worked in the past year	20.11	15.26	17.82	19.70	-4.85	1.88	-6.74
Hours worked in the past week	13.70	11.20	10.07	11.50	-2.50	1.43	-3.93
Usual hours worked per week*	22.29	16.05	17.80	18.00	-6.24	0.20	-6.43
Worked full-time the past year	0.68	0.57	0.61	0.63	-0.11	0.02	-0.13
Weeks worked part-time in the past year	4.13	4.45	6.00	5.97	0.32	-0.02	0.35
				Male Sample			
Labor force participation	0.93	0.95	0.97	0.97	0.02	0.00	0.02
Weeks worked in the past year	33.62	29.51	45.33	43.78	-4.11	-1.55	-2.56
Hours worked in the past week	27.12	24.19	36.63	37.12	-2.92	0.49	-3.41
Usual hours worked per week*	35.20	28.42	40.95	40.18	-6.79	-0.77	-6.01
Worked full-time the past year	0.95	0.95	0.96	0.96	0.00	0.00	0.00
Weeks worked part-time in the past year	2.05	2.68	2.45	2.34	0.62	-0.12	0.74

Note. We employed the March Current Population Survey from the IPUMS for 1982 and 1984 and used the 40 states listed in Table 1 as control states. We restricted the sample to households whose youngest child is aged one or below to construct similar one with the census of birth data. We used individual weight for all calculations. We excluded those observations with missing information (approximately 0.3%).

Table 6. Effects of the Alaska Permanent Fund on labor supply

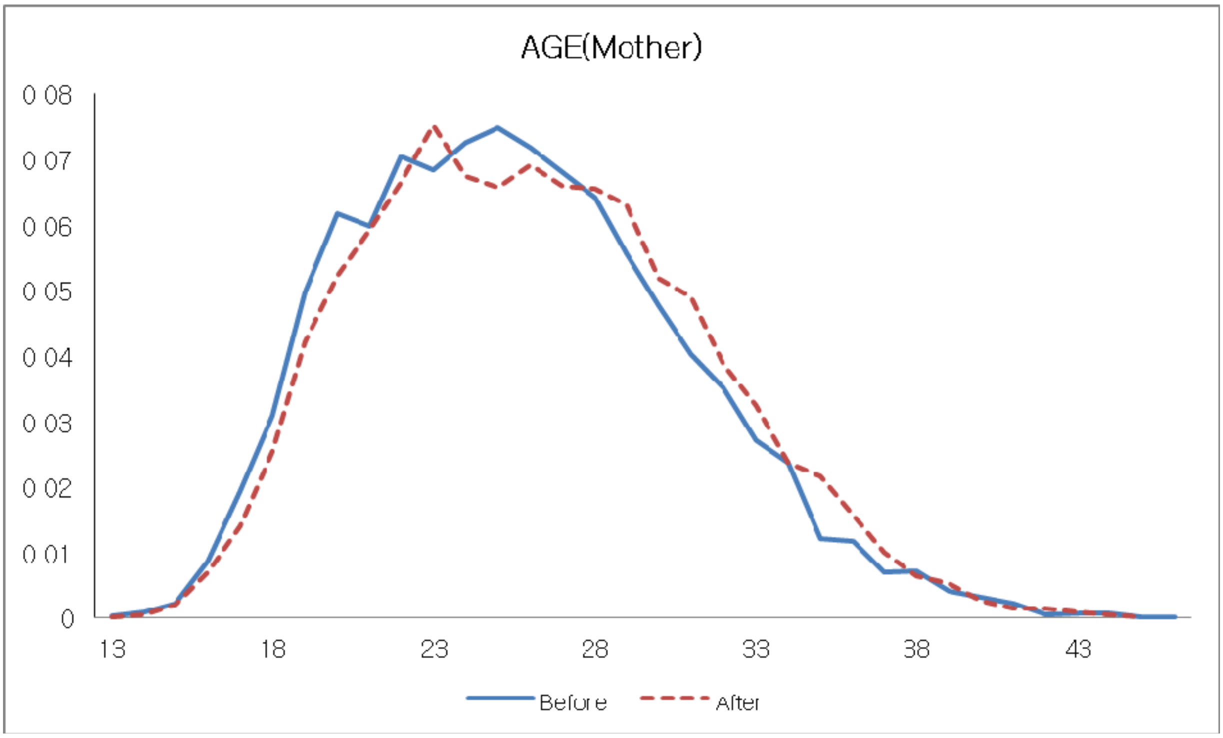
	Regression (Adjusted)					
	Labor Force Participation	Weeks Worked in the Past Week r	Hours Worked in the Past Week	Usual Hours Worked Per Week*	Worked Full-Time in the Past Year**	Weeks Worked Part-Time in the Past Year
	Female Sample					
Alaska*Post	-0.163	-5.923	-3.918	-6.837	-0.157	0.794
	(0.013)***	(0.559)***	(0.379)***	(0.564)***	(0.017)***	(0.254)***
Obs	7670	7670	7670	7670	4253	7670
	Male Sample					
Alaska*Post	0.001	-0.497	-2.649	-3.399	-0.007	1.389
	(0.005)	(0.607)	(0.674)***	(0.492)***	(0.006)	(0.234)***
Obs	6761	6761	6761	6761	6257	6761

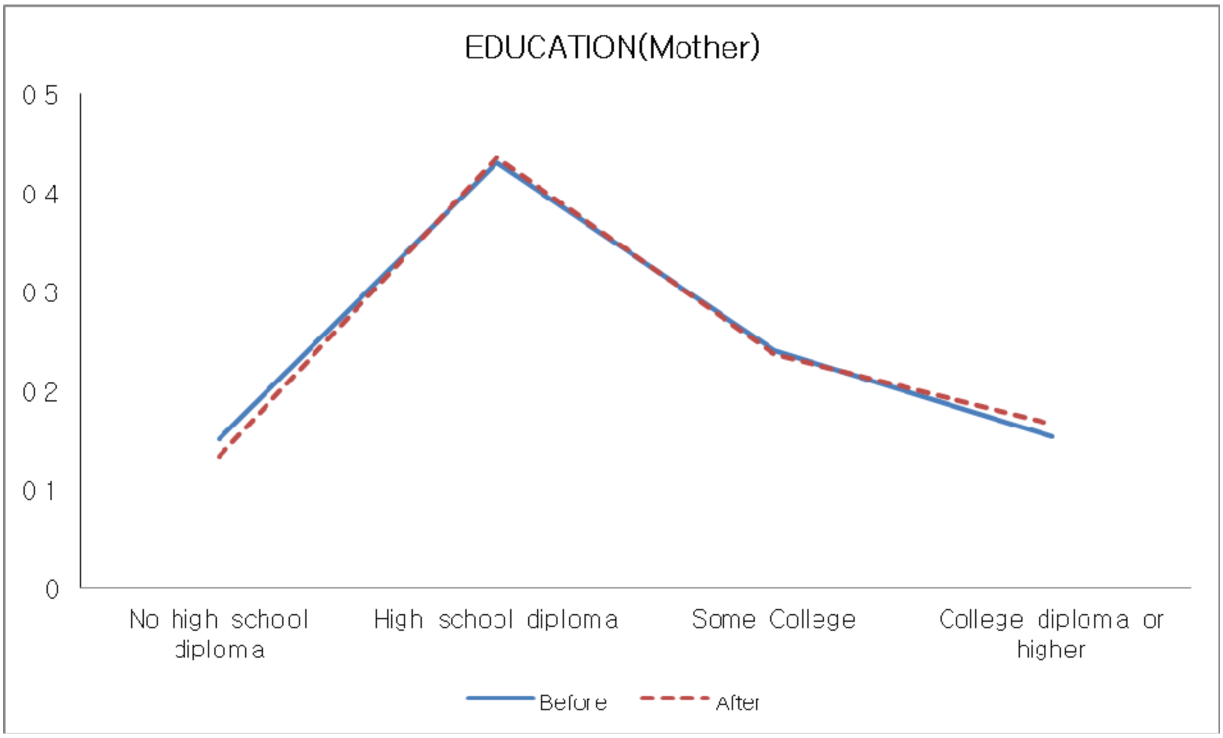
Note: See note in the Table 5 for sample constructions. The age group (≤25, 26-40, and ≥40), race (white, African American, and other), the education level (no high school diploma, a high school diploma, some college, and a college diploma or higher), marital status, and the number of children less than or equal to 5 were included as independent variables in each regression. The state fixed effect was included in all models. Standard errors were clustered at the state level.
*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 7. Robustness check

Dependent Variable	Birth Weight	Low Birth Weight	Five-Minute APGAR
Alaska*Post	13.0325***	-0.0008	0.0144***
	(1.3213)	(0.0005)	(0.004)
Post	2.5376*	0.0009	-0.0652***
	(1.3944)	(0.0006)	(0.0041)
R^2	0.121	0.0815	0.0427
Obs	7,903,021	7,903,021	7,903,021

Note: We included calendar month dummies instead of season dummies.
*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.


AGE(Mother)
0 08
0 07
0 06
0 05
0 04
0 03
0 02
0 01
0
13
18
23
28
33
38
43
Before
After


EDUCATION(Mother)
0 5
0 4
0 3
0 2
0 1
0
No high school diploma
High school diploma
Some College
College diploma or higher
Before
After