Financial Distress, Maternal Stress, and Infant Health

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I investigate the effect of financial stress caused by the mortgage crisis, a large and negative exogenous financial shock, on infant health. I use all births in counties with over 100,000 individuals, spanning the entire country, and link these with county-level mortgage delinquency rates. I find that increases in financial stress increase premature births. A 10 percentage point increase in the mortgage delinquency rate, which occurred in roughly 10% of counties considered over this time period, would lead to an increase in premature births of approximately 5%. This result is robust to multiple specifications using different measures of financial stress collected from independent sources. I find evidence that financial stress decreases birth weight and increases NICU (Neo-Natal Intensive Care Unit) admissions. Decreases in prenatal care utilization and increases in cigarette consumption in the third trimester are important mechanisms underlying the negative relationship between financial stress and infant health.

I. Introduction

In 2008, foreclosure filings were up 81% compared to the previous year and up 225% compared to 2006 (Christie, 2009). More than 3.1 million foreclosure filings were issued during 2008 and 861,664 families lost their homes that year, according to RealtyTrac, a leading real estate company that deals in foreclosed homes (Christie, 2009).

This event, which has been called the "foreclosure crisis," was also a large financial shock for families, one that has been used to analyze the causal effect of a negative wealth shock on adult health (Currie and Tekin, 2015). However, there has been no work done looking at the effect of an exogenous negative financial shock on infant health, though there are reasons to suspect that such an effect is likely. Financial stress could increase maternal stress, change access to prenatal care, and impact maternal behaviors such as smoking, among other channels that link negative financial shocks to infant health.

This paper is the first to analyze the effect of a negative financial shock on infant health, using regional variation in financial stress caused by the foreclosure crisis. Using data from 2005 to 2011, I find strong evidence across multiple specifications that financial stress increases the number of infants born prematurely. A 10 percentage point increase in the mortgage delinquency rate, for example, would lead to an increase in premature births of approximately 5%. Additionally, I find some evidence that high rates of mortgage delinquency lead to decreased birth and an increase in admissions to the Neonatal Intensive Care Unit (NICU). I also provide evidence that the negative relationship between mortgage delinquency and infant health is partially driven by worsening prenatal care and increases in the intensity of smoking during the third trimester.

In order to estimate the effect of a large, negative, financial shock, I exploit variation in the county-level percent of individuals with mortgage debt that is 90 or more days delinquent, as a measure of financial stress. The external factors that led to the foreclosure crisis also increased the number of individuals who were delinquent on their mortgage payments, which is a precursor to foreclosure proceedings. An increase in predatory lending practices, the expansion of the subprime mortgage market, and the sudden increases in variable interest rates that were followed by the rapid contraction of credit markets were all factors, exogenous to infant health, which led to large increases in the mortgage delinquency rate (Currie and Tekin, 2015). Additionally, Palmer (2015) finds that delinquency and default were driven to a large degree by a reduction in housing prices that were unrelated to the expansion of the sub-prime market or changes in borrower characteristics. Rather, large housing price decreases were exogenous to family characteristics and led to negative equity, which increased the rate of foreclosure.

Similarly, given that unemployment and mortgage delinquency move in opposite directions for several years covered by the data, it is unlikely that mortgage delinquency was driven by increases in unemployment during this time. The difference between a financial shock and an unemployment shock is important in this context, as unemployment increases maternal leisure time, which has been shown to improve infant health, obscuring a possible wealth effect (Dehejia and Lleras-Muney, 2004). The large changes in mortgage delinquency that occurred over this time period represent an exogenous shock, increasing financial stress and decreasing liquidity for households.

The negative impact that the foreclosure crisis had on infant health is an important contribution to the understanding of the impact of wealth on health, as it shows the impact of a large and exogenous negative financial shock on infant health and also suggests through which

mechanisms this relationship is established. The negative effect of financial stress on infant health also represents another cost of such crises, which should be taken in to consideration when crafting policy and designing programs meant to provide financial relief to families. Additionally, there may be important gaps in programs to provide prenatal care to financially stressed mothers as well as large infant health gains to be made by strengthening smoking cessation programs targeted towards pregnant women.

The rest of the paper is laid out as follows. Section II contains relevant background, including a full discussion of the ways in which an increase in foreclosure could worsen infant health. Section III describes the data, Section IV discusses the empirical specification, and Section V contains the results for the impact on infant health. Section VI contains an exploration of the possible mechanisms underlying the relationship between the foreclosure crisis, and negative wealth shocks in general, on infant health. Section VII concludes.

II. Background

The financial crisis of 2007-2008 was preceded by a large increase in foreclosures, with rates rising by a staggering amount each year. By mid-2008, the share of loans that were seriously delinquent or beginning the foreclosure process was nearly double the previous record, since the Mortgage Bankers Association began collecting such data in the 1970s (USHUD, 2010). Recently, this period of rapid increase in the foreclosure rate was used by Currie and Tekin (2015) in order to evaluate the impact on adult health outcomes. In addition to being a very stressful event for the families being foreclosed on, they viewed the increasing foreclosure rate as a wealth shock, bringing down property values of surrounding homes. While the size of the effect is debated, it has been established that foreclosed homes directly reduce the property

values of surrounding homes (Schuetz et al., 2008; Calomiris et al., 2008; Campbell et al., 2011; Immergluck and Smith, 2006; and Harding et al., 2009).

In addition to being a wealth shock, Currie and Tekin (2015) find that there were large increases in the foreclosure rate that preceded increases in the unemployment rate. In fact, they found that as foreclosure rates were rising between 2005 and 2007, unemployment rates were decreasing, a trend which is also found in my data. This distinction between a wealth shock and an unemployment shock is important, as unemployment and the resulting increase in leisure time has been shown to improve health outcomes by decreasing the mortality rate among adults and by improving physical health (Rhum, 2000; 2003; 2005), and improving health outcomes of infants (Dehejia and Lleras-Muney, 2004). However, Miller et al. (2009) argue that, for adults, the cyclical changes in mortality are unlikely to be related to changes in health behaviors, since they are concentrated primarily among the young and the old, as opposed to adults of working age.

Currie and Tekin (2015) find that increases in the zip code level foreclosure rate reduce adult health. They find increases in unscheduled visits for preventable conditions and a broad array of other conditions such as heart attacks, stroke, urinary tract infections, gastro-intestinal problems, chest pain and dysrythmias. They also find a significant effect on a variety of mental health conditions and suicides. An increase of 100 foreclosures, for example, would increase hospital admissions for anxiety by 9.2% among 20-49 year olds. Given that many individuals who suffer from mental health crises are not admitted to ERs or hospitals, this is quite a large effect.

There has been some work towards understanding wealth shock and the possible effect on infant health. Lindo (2011) looks at paternal job displacement and found that it has a negative

impact on the birth weight of all subsequent children of displaced workers. While Lindo (2011) considers a negative wealth shock, in the sense that paternal unemployment does not directly increase maternal leisure, it uses a relatively small sample and includes all types of job separation, not just those that were exogenous. The analysis presented here is the first to analyze the effect of a plausibly exogenous negative wealth shock on infant health.

Hoynes et al. (2015) use increases in the Earned Income Tax Credit (EITC) as a positive wealth shock and find that increases in the EITC result in increased mean birth weight and a decreased incidence of low birth weight. Their work suggests that the most likely mechanisms are through increased prenatal care and reductions in smoking, though the quality of prenatal care may also have improved through a shift from public to private insurance coverage. While increases in the EITC are likely to reduce stress, the effect of a positive shock on stress is likely to be much less than that of a negative wealth shock. Not only do people generally respond more to negative events than positive ones (Baumeister et al., 2001), but increases in mortgage delinquency could lead to significant financial distress, such as fear of foreclosure. The analysis presented here captures the negative effect on infant health of a negative financial shock as well as maternal stress caused by financial stress. Knowing the effect of such stress could be very useful for estimating the impact of a recession on population health.

There are several channels through which it is possible that financial stress may impact the health of infants. The first is that the physical health of mothers could be impacted, leading to conditions like hypertension and diabetes (Currie and Tekin, 2015), which can complicate pregnancies.

Infant health may also be affected by increases in maternal stress levels. There is a fairly large medical literature concerning this (see Beydoun and Saftlas, 2008, for a comprehensive

review) and the majority of the studies conducted have found that maternal stress increases the probability that an infant will be born preterm, under weight for gestational age, and is more likely to have low birth weight (less than 2500 grams). More recent work has also shown that prenatal stress and anxiety predicted a considerable amount of the variance in infant illnesses and antibiotic use (Beijers et al., 2010).

There is evidence that mental health worsens as unemployment rises (Charles and DeCicca, 2008; Rhum, 2003) in addition to Currie and Tekin's (2015) findings that the foreclosure crisis, in particular, was bad for mental health. Though, to my knowledge, there are no studies regarding the effect of macroeconomic conditions on maternal stress levels, in particular.

A shock to foreclosures may also impact infant health by changing maternal behaviors, though there is mixed evidence as to whether activities that are detrimental to health are procyclical or countercyclical and all of the literature relies on variation in unemployment as opposed to any credible wealth shock. Alcohol consumption has been shown to decrease among heavy drinkers, while increasing among light drinkers as unemployment rises, (Rhum and Black, 2002). However, Dee (2001) and Deb et al. (2011) found that alcohol consumption significantly increased when unemployment rose and Charles and DeCicca (2008) found no effect of unemployment on alcohol consumption. Similarly, the evidence for whether obesity and physical activity are procyclical or counter cyclical is mixed (Rhum 2005; Charles and DeCicca, 2008; Deb, 2011; Böckerman et al., 2007).

The economics literature regarding the link between cigarette consumption and unemployment is clearer, with several studies concluding that the intensity of smoking increases when employment is high and decreases among heavy smokers when it is low (Charles and DeCicca, 2008; Rhum, 2005; Xu, 2013). Rhum (2005) also concludes that decreases in times of

high unemployment are unlikely to be related to income reductions. The medical literature, however, suggests that smoking increases in times of financial stress (Kouvonen et al., 2005; Siahpush and Carlin, 2006; Steptoe et al., 1996) and when individuals become unemployed (Falba et al., 2005).

A financial shock may also impact access to health care and utilization of prenatal care, though it is unclear whether it would reduce access or increase it. Access to prenatal care could be increased if more women who did not previously have access to health insurance now qualify for public programs, such as Medicaid and the State Child Health Insurance Program (S-CHIP). Prenatal care could be reduced if more women lose private insurance and do not qualify for public insurance or if public insurance provides less intensive coverage than private insurance.

Finally, there could be a selection effect as the foreclosure crisis could impact the decision to become pregnant differentially among women, based on observable characteristics. Dehejia and Lleras-Muney (2004) found that unemployment increased the share of less educated white women and increased the share of black women who were of higher socioeconomic background.

III. Data

Data on infant health outcomes and parental characteristics comes from the National Vital Statistics System (NVSS) Birth Data, which is a 100% census of all birth certificates in the US. My primary outcome variables are very broad measures of infant health, which capture changes in gestation[1], birth weight, 5-minute Apgar score[2], admission to the Neonatal Intensive Care Unit (NICU), and the need for ventilation immediately following birth. I create some categorical variables from these health measures, including low Apgar (scoring less than or equal

[1] Gestation is the period of time spent in the womb, from conception to birth, measured in weeks.
[2] The 5-minute Apgar score is a general measure of infant health and includes measures of heart rate, respiration, and neuromuscular function and is a good indicator of infant mortality (Casey et al. 2001).

to 6 on a scale to 10), low birth weight (less than 2500 grams), very low birth weight (less than 1500 grams), and premature (less than 37 weeks gestation). These definitions come from the NVSS Natality codebook. In addition to infant health outcomes, birth certificates contain data on parental characteristics, such as age, marital status, race, and education, prenatal care, and maternal behavior, such as smoking and drinking.

I was granted access to the limited geography data, which contains county identifiers for all counties with more than 100,000 residents. I use all births in these counties from the years 2005 to 2011, which are the years that cover the financial crisis and contain certain infant health outcomes, like admission to the NICU and ventilator use, that are not contained in earlier years. Data has been aggregated to the county level by either year or quarter and frequency weighted by the number of births.

My primary independent variable is the county-level percent of individuals with mortgage debt that is 90 or more days delinquent, observed in the fourth quarter of each year, which I use as a measure of financial stress. The mortgage delinquency data comes from tables compiled by the Federal Reserve Bank New York using the Consumer Credit Panel, which is a 5% random sample of all individuals in the US who have credit reports with Equifax.[3]

As another measure of the mortgage delinquency and financial stress, I use the quarterly vacancy rate from the US Postal Service (USPS), which began collection of this data in the fourth quarter of 2005. As noted in Currie and Tekin (2015), this variable captures general community disinvestment as well, since there is no way to distinguish between commercial and residential vacancy in the time period under consideration. Community investment is a factor in determining housing values, however, and a large shock to the commercial areas could also reflect a decrease in housing wealth in the area. In order to keep the vacancy variable comparable

[3] This data was downloaded from http://www.newyorkfed.org/ on March 20, 2015, but has since been removed.

to mortgage delinquency, I calculate it as vacancies per person using the population estimates used to calculate delinquency, as opposed to as a percentage of all properties. I only consider properties that are newly vacant for up to one year. This data is also particularly useful because it is observed quarterly, which will allow me to look at the timing of shocks on infant health outcomes more precisely.

A property is designated as vacant by the USPS if mail has gone uncollected for 90 days or more. This data is observed at the zip code level, but was aggregated to the county level using the Geokorr12: Geographic Correspondence Engine program, provided online by the Missouri Census Data Center.[4] Data from the year 2010 has been omitted from the analysis, since the mass mailing of census documents caused a very large spike in the number of properties that were considered vacant.

Data on county-level unemployment was obtained from the Local Area Unemployment Statistics, through the Bureau of Labor Statistics. Nearly all counties with more than 100,000 residents are in the final data set, representing all the states.[5] Despite losing some variation by aggregating at the county level, there is still massive variation in the extent of the foreclosure crisis across the country.

Summary statistics can be found in Table 1. The mean mortgage delinquency rate is 4.13, with a standard deviation of 4.26. Out of 4,089 county-years, approximately 5.5% of them have a mortgage delinquency rate of over 10%. Because these counties tend to be larger, more than 2.3 million births occurred in these high delinquency rate county-years. The vacancy rate is considerably lower, at 1.10%, with a standard deviation of 0.79. This difference may capture the fact that many individuals who are delinquent on their mortgage debt have not been foreclosed

[4] http://mcdc.missouri.edu/websas/geocorr12.html

[5] Four counties were omitted because they had incomplete unemployment data. Of these, three were in Mississippi.

upon and houses that have been foreclosed upon may not be vacant for some time. Because this measure considers commercial properties as well, the true rate of residential vacancies is probably even lower. However, there is significant variation in this measure across counties over time as well, as the foreclosure crisis worsened.

In addition to providing means for the entire sample, I have also broken out racial and ethnic subgroups. It is useful to consider these separately as there are widely known health differences among these groups. Additionally, it is likely that the foreclosure crisis was worse for minority groups, who may have been disproportionately targeted for predatory sub-prime loans (Currie and Tekin, 2015). White mothers fair better in regards to educational attainment and prenatal care utilization, though prenatal care is very high across all groups. White mothers also have the highest rates of smoking during pregnancy. Hispanic infants have better health outcomes, on average, with the lowest rates of being born with low birth weight (under 2500 grams) or very low birth weight (under 1500 grams), as well as low rates of ventilation and admission to the NICU.

IV. Methodology

My primary independent variable of interest is delinquency, which reflects the percentage of individuals with mortgage debt that is 90 or more days delinquent and is observed in the fourth quarter of each year. Mortgage delinquency follows the same trends of the foreclosure rate as described by Currie and Tekin (2015) and increases over the years 2005-2007 while unemployment is still declining, suggesting that increases in county-level mortgage delinquency are not caused by increases in county-level unemployment.

The external factors that led to the foreclosure crisis also increased the number of individuals who were delinquent on their mortgage payments, which is a precursor to foreclosure

proceedings. An increase in predatory lending practices, the expansion of the subprime mortgage market, and the sudden increases in variable interest rates that were followed by the rapid contraction of credit markets were all factors exogenous to health that led to large increases in the mortgage delinquency rate (Currie and Tekin, 2015).

Though mortgage delinquency in itself is unlikely to affect housing prices in a neighborhood, there is evidence that delinquency and default were driven to a large degree by a reduction in housing prices that were unrelated to the expansion of the sub-prime market or changes in borrower characteristics (Palmer, 2015). Palmer (2015) found that 40% of the difference in default rates between homeowners in 2003-2004 and homeowners in 2006-2007, who were 3 times as likely to default, could be attributed to increases in sub-prime lending and differences in borrower characteristics. Nearly all the remaining cohort difference was attributable to housing price declines that were unrelated to the expansion of the sub-prime mortgage market. In order to account for the endogeneity of housing prices, the author instruments for housing prices with long-run regional variation in house-price cyclicality and constructs a model that explains 95% of the cohort differences. Given the many factors that have been implicated as leading to high rates of mortgage default, it is very unlikely that high county-level mortgage delinquency rates are being driven by changes in infant health. Currie and Tekin (2015) note that it is very unlikely that high foreclosure rates are being driven by "a sudden epidemic of ill health among the U.S. population." They also note that while many have said that the crisis was unavoidable in retrospect, the severity and timing of the financial crisis was a surprise to nearly all (Currie and Tekin, 2015). Changes in mortgage delinquency over this time period represent an exogenous shock, increasing financial stress for households.

I estimate a series of models that relates this measure of financial distress to various infant health outcomes, as well as mother characteristics, behaviors, and prenatal care utilization. The model employed is:

$$Y_{ct} = \alpha + \beta_0 D_{ct} + \beta_1 U_{ct} + \gamma_c + \delta_{st} + \varepsilon_{ct} \quad (1)$$

where Y_{ct} is the outcome of interest aggregated to county *c* and observed at time *t*. For infant health outcomes, as well as maternal behaviors (i.e. smoking, excessive weight gain, etc), *t* is determined by the fourth quarter observation that is closest to the majority of the pregnancy. So, for example, a child born in Feb. 2006 will be linked with the fourth quarter delinquency data for 2005. This is done in order to reflect the consensus in the medical literature that stress and negative health behaviors like smoking most impact health outcomes at birth during the second and third trimesters, however the results very little if simply the year of birth is used. When looking at maternal characteristics, however, *t* will be determined by the date of conception. The primary variable of interest D_{ct}, delinquency, is also observed at the county-year *t* level. U_{ct} is the fourth quarter unemployment rate, linked to infant and mother data in the same way as delinquency.

County fixed effects are captured by γ_c, so identification comes from changes within a county over time. δ_{st} is a vector of indicators for each state and year combination. These fixed effects will control for any time varying state level factors that may be relevant to the foreclosure rate and to health, such as state level relief programs. The idiosyncratic random error term is captured by ε_{ct}. All regressions are weighted by the number of births in a county at time *t* and standard errors are clustered at the county level.

When using quarterly vacancy data collected by the USPS, the model becomes:

$$Y_{cqt} = \alpha + \beta_0 V_{cqt} + \beta_1 U_{cqt} + \gamma_{cq} + \delta_{st} + \varepsilon_{cqt} \quad (2)$$

where the outcome variable is observed in county c in quarter q of year t. V_{cqt} is the primary variable of interest, the county level vacancy rate at the quarter-year level. Unemployment, U_{cqt}, is also observed quarterly at the county level. The vector of county fixed effects, γ_{cq}, now contains an indicator variable for each county-quarter combination, capturing any seasonal component to foreclosures or to infant health outcomes. δ_{st} is a vector of indicators for each state and time combination and $\varepsilon_{cqt}$is the idiosyncratic random error term. Again, standard errors are clustered at the county level and regressions are weighted by the number of births in each county-quarter-year cell.

V. Results

The results of my basic specification can be found in Table 2. I find a significant negative effect of mortgage delinquency on the probability of being born premature, needing to be ventilated for some time after birth (though not for more than 6 hours), and being admitted to the NICU. While these estimates appear very small, they represent large percentage changes, especially given the high variation of mortgage delinquency. The mean difference in the foreclosure rate from the lowest rate observed to the highest rate within a county over time was 5.7 percentage points with a standard deviation of 4.5 percentage points. A 10 percentage point increase in the rate of mortgage delinquency would lead to a 4.6% increase in the number of babies born premature, a staggering 30.7% increase in the number of infants needing ventilation for short periods of time, and a nearly 10% increase in the number of infants admitted to the NICU. While these percentage increases are large due to the relatively small means of these variables, these outcomes are also among the most severe for infant health. Consistent with the results for premature births, the coefficient on delinquency is also significant for gestation.

In order to address concerns about the specification and the possible multicollinearity of delinquency and unemployment, I calculate the variance inflation factor (VIF) (Mansfield and Helms, 1982) and find that it is between 1.5 and 3.5 across all the regressions, which is well below the 10, the traditional cutoff. The correlation between the two variables is 0.68.

I also estimate the model separately for each variable. The results can be found in Table A1. The estimates and the levels of significance do not radically change for the coefficients of delinquency when estimated alone. It is interesting to compare the negative and weakly significant estimates for unemployment to those found in Dehejia and Lleras-Muney (2004), though. The primary difference in specification is that I use county level data, while they employed state level data and found that unemployment improved infant health outcomes. The lack of positive results in my model may stem from the difference in the level of aggregation, or it may be a distinct feature of the financial crisis not found in 1975 to 1999, the years they consider.

In Table 3, I consider the three main racial/ethnic subgroups considered in the summary statistics. There is evidence that subprime loans were targeted more towards low-income minority groups, who may have been more affected by the foreclosure crisis (Bocian, Ernst, and Li, 2008; Mayer and Pence, 2008). The crisis may also have impacted these groups more due to lower savings, higher baseline unemployment, lower rates private insurance coverage, and worse baseline health (Currie and Tekin, 2015).

I find the largest negative impact of delinquency on the health of black infants, with significant negative coefficients for birth weight, very low birth weight, low 5-minute Apgar, gestation, and admittance to the NICU. A 10 percentage point increase in county level delinquency would cause roughly a 5% increase in the number of infants born into the very low

birth weight category. Similarly, the impact on the average 5-minute Apgar score is significant, but small, however there is a relatively large increase in the probability of being in the low 5-minute Apgar category. The 5-minute Apgar score is a general measure of infant health and includes measures of heart rate, respiration, and neuromuscular function and is a good indicator of infant mortality (Casey et al. 2001). The effect on NICU admission is also particularly high and a 10 percentage point increase in mortgage delinquency would result in a 12.8% increase in NICU admissions.

Delinquency coefficients for premature, gestation, and admittance to the NICU were significant or weakly significant across all the subgroups. The estimate for the effect of delinquency on being born premature was especially large for the Hispanic subgroup, suggesting that a 10 percentage point increase in mortgage delinquency would result in a 7.5% increase in the number of infants in this category. Ventilation after birth was significant and relatively large for whites and Hispanics.

I consider my alternative proxy measure for foreclosure, the per capita vacancy rate, in Table 4. Because this data is collected quarterly, I am able to pair it with the different trimesters of pregnancy, using the month of the last menses as the conception month, which is standard medical practice. The large difference in observations stems from the exclusion of much of 2005, which is not in the data, as well as all of 2010, which precluded inclusion of children born in a roughly 9 month timeframe after that as well. The USPS data is a complete zip code level census, however, so there was no systematic exclusion of counties based on other factors.

I am able to generally replicate the results of Table 2, estimating a significant effect of the vacancy rate on being born premature, gestation time, and birth weight. The coefficient estimates on vacancy are much higher, which is reasonable since this measure has a lower

average and varies less than delinquency. The coefficient estimates for ventilation and NICU admission are not significant for any trimester.

While this proxy for foreclosure is not perfect, for the reasons described in the data section, it is reassuring that I estimate a negative effect on some infant health outcomes using a different independent variable collected in a different way by a different source. Additionally, the quarterly data allows one to see if the results are sensitive to the timing of the shock. Table 4 shows that the results are robust across several specifications linking the vacancy data to different points in pregnancy. Breaking the results down by racial/ethnic subgroups, there is a generally large negative impact of delinquency on the health of Hispanic infants, for whom the coefficient for low 5-minute Apgar is also significant.[6]

VI. Mechanisms

Financial stress could impact infant health through several channels. Infant health may be affected by increases in maternal stress levels, which has been shown to increase the probability that an infant will be preterm and under weight for gestational age (Beydoun and Saftlas, 2008). Though, without any data on individual stress levels, there is no way to separate out this effect. Changes in infant health could also be driven by a selection effect if the foreclosure crisis impacted the decision to become pregnant differentially among women, based on observable characteristics. A financial shock may also impact access to health care and utilization of prenatal care, though it is unclear whether it would reduce access or increase it. The physical health of mothers could be also be impacted, leading to conditions like hypertension and diabetes (Currie and Tekin, 2015), which can complicate pregnancies. Finally, financial stress may impact infant health by changing maternal behaviors such as cigarette consumption, though there is

[6] Tables available upon request to jachett1@illinois.edu.

mixed evidence as to whether activities that are detrimental to health are procyclical or countercyclical.

Below, I explore the different mechanisms through which financial stress may impact infant health. However, I am unable to identify a single underlying mechanism as there may be more than one impacting infant health.

a) Selection

In Tables 5 and 6, I consider whether high rates of mortgage delinquency affected fertility decisions. If the foreclosure crisis led to healthier or better educated women delaying or foregoing pregnancy, for example, the results would be biased upwards due to this selection effect. In order to test for this, I look at the total number of births at the county level, across racial/ethnic subgroups and across education levels, so the unit of observation is at the county-year level. Again, I include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level. In Table 5, I include results for all births, all births by racial/ethnic subgroup, and births across educational attainment subgroups. I do not find a statistically significant effect of mortgage delinquency on total births or on total births by racial/ethnic subgroups. However, unemployment has a large negative effect on total births by black mothers. These results are consistent if I control for mortgage delinquency or unemployment separately. Further splitting the subgroups by education level, I find that there are only statistically significant increases in births to black and Hispanic women with some college. It is not clear what effect an increase in births to women in these groups would have on my results.

In Table 6, I consider how mortgage delinquency affects fertility decisions by age groups. I find that there is a significant effect. Births to black and Hispanic mothers over 35 years old

significantly increase, while births to white mothers in the same age group significantly decrease. There is also an increase in births to black women aged 25 to 35. Given that infants born to older mothers have a higher risk of negative health outcomes, this selection effect may be driving the results.

In Table 7.a), I include all available demographic controls, including indicators for maternal race/ethnic groups, age groups, and educational attainment. While I still estimate significant effects of mortgage delinquency on premature birth and gestation time, I lose significance across the other variables. However, not all birth certificates contain maternal education data and the sample contains roughly 10 million fewer observations than in Table 2. Collection of this data does not systematically differ at the state or even county level and it is unclear what potential sample differences exist between mothers who choose to give this information and those who choose not to. Table 7.b) contains results from running the basic analysis, without controls, but using the same sample as in Table 7.a). With demographic controls, there is still a large significant effect of mortgage delinquency on the number of premature infants and on gestation time more generally, further pointing to the robustness of these particular results. The results are very consistent across the two specifications, with unchanged levels of significance and nearly identical point estimates. This suggests that the loss of significance across the other variables may be due to differences in the sample as opposed to the inclusion of controls for demographic characteristics. Given these results, it is unlikely that selection effects are driving the primary results shown in Table 2.

b) Changes in medical care

Financial stress could also change the level of prenatal care received by women. It could increase if more women qualify for public coverage through Medicaid and the State Children's

Health Insurance Program (SCHIP). Benefits vary by state, however, and there are likely to be gaps in coverage. It could also decrease if women are losing private insurance without going on public plans, receiving less care, or receiving less intensive care if they are on public plans.

Looking at the top of Table 8, which contains the results for the whole sample, there is little effect of mortgage delinquency on prenatal care utilization, when demographic controls are omitted. If we include them, however, there are relatively large and significant coefficients for delinquency on the number of women foregoing all prenatal care and those who are receiving insufficient care, defined as fewer than 5 prenatal visits over the course of a pregnancy. These results suggest that a 10 percentage point increase in delinquency would increase the number of women foregoing prenatal care by more than 24%.

Looking at the effect of mortgage delinquency on prenatal care usage across racial/ethnic subgroups, we see similar results for black mothers. While there are significant estimates for delinquency on foregoing prenatal care and on receiving insufficient prenatal care in specifications without demographic controls, these become very significant when these controls are included. The coefficients for late prenatal care, defined as beginning care in the third trimester, and negative coefficients for beginning care in the first trimester are significant for white mothers across both specifications as well. While the sample difference across the specifications with and without demographic controls may be important, there is evidence that mortgage delinquency reduces the use of prenatal care under either specification.

Running separate regressions for delinquency and unemployment, I find that the effects of delinquency are roughly similar and there are no significant estimates for unemployment when run separately, across any subgroups.

c) Maternal health

Since the foreclosure rate is known to impact adult health (Currie and Tekin 2015), then worsened maternal health could account for worsening infant health. In table 8, I look at the impact of the mortgage delinquency rate on various maternal health indicators that are also risk factors for birth. These include pre-pregnancy diabetes, hypertension (both pre-pregnancy and during pregnancy), and eclampsia, which is a serious complication that stems from high blood pressure and results in convulsions that may lead to coma. Currie and Tekin (2015) find that both the rates of diabetes and hypertension significantly increase for the age group most likely to become pregnant (20-49) as the foreclosure rate increases. However, I find no evidence of a negative impact on maternal health, regardless of whether or not demographic controls are included.

d) Maternal behavior

While there is mixed evidence in the literature on how financial stress influences risky behaviors such as smoking and drinking, I find some evidence that mortgage delinquency increases daily cigarette consumption as shown in Tables 10. a) and 10. b). Without demographic controls, I find significant effects of mortgage delinquency on smoking throughout the pregnancy. However, for these regressions, inclusion of demographic controls alters the results substantially. With these controls, I find a positive significant effect on the number of cigarettes smoked per day in the third trimester for all mothers. I find weakly significant effects on the number of cigarettes smoked per day in the first two trimesters. Mortgage delinquency does not increase the share of women who smoke at all during pregnancy, suggesting that it increases the intensity of cigarette consumption among women who are already smokers. Among all mothers and with controls included in the regression, a 10 percentage point increase in the delinquency

rate would increase the number of cigarettes smoked per day by nearly 18% in the third trimester.

In Table 10.b), I look at the impact of mortgage delinquency on maternal behaviors across racial/ethnic subgroups and find that these results are being driven by increases in smoking among white mothers. I find that I lose significance across all variables for black and Hispanic mothers when demographics are included. There is a significant effect on smoking in the first and third trimesters for white women and a weakly significant effect on smoking in the second trimester.

Maternal smoking during pregnancy has been associated with a number of negative infant health outcomes, primarily reduced birth weight, reduced birth length, and reduced head circumference (Abel, 1980; Vik et al., 1996; Agrawal et al., 2010; Shankaran et al., 2004; Gilman et al., 2008). Causation has been difficult to establish in this literature and one of the most credible attempts occurred in the 80s, when Sexton and Hebel randomly assigned mothers to receive smoking cessation aids and found that infants of mothers in that group had significantly higher birth weight.

Interestingly, the timing of smoking and smoking cessation seems to matter tremendously. Lieberman et al. (1994) found that infants of women who quit smoking by the third trimester were not more likely to be small-for-gestational-age compared to nonsmokers, while women who began smoking in the second or third trimesters had infants with an elevated risk of being underweight for their gestational age. Several studies have found that smoking in the third trimester most increases the risk of delivering infants with low birth weight and that the risk of being underweight increases with the number of cigarettes smoked per day (Bernstein et

al., 2005; England et al., 2001; and Lieberman et al., 1994). Given this, the results regarding daily cigarette consumption are particularly worrying.

Overall, considering the possible mechanisms that underlie the relationship between financial stress and infant health, I find that there is some evidence that suggests a shift in the age of mothers, with more women over 35 giving birth in times of high mortgage delinquency. However, even if all demographic controls are included in the regressions, I still find a significant effect of mortgage delinquency on premature births. I find strong evidence that high rates of mortgage delinquency reduce utilization of prenatal care and also increase smoking intensity during pregnancy. I find no evidence that high rates of mortgage delinquency reduced maternal health.

VII. Conclusion

This paper is the first to analyze the effect of a plausibly exogenous negative financial shock, the foreclosure crisis, on infant health outcomes. I find that my measures of financial stress, the mortgage delinquency rate and the USPS collected vacancy rate, have a significant and large negative effect on infant health. The impact of financial stress on increasing the probability of being born prematurely is robust across many specifications. I also find evidence of an effect on birth weight and admissions to the NICU, among other indicators of poor health. The negative impact on health is largest for infants of black mothers, who may have been more negatively affected by the forces that led to the foreclosure crisis.

The primary mechanisms behind the relationship between the foreclosure crisis and worsened infant health outcomes are reduced utilization of prenatal care and increases in the intensity of smoking during the third trimester. Interestingly, these are the same mechanisms identified by Hoynes et al. (2015) that led to an improvement in infant health, given an increase

in the EITC. Given that these effects were larger for white mothers, there may be other important, unobserved, mechanism that impact black mothers more, such as stress.

While I do find negative and significant effects on infant health, it is likely that these effects are understated to the level of aggregation to the county level, which will bias the results towards zero. Currie and Tekin (2015) find that their results for the impact of foreclosure on adult health, while still significant at the county-level, are considerably smaller than their estimates at the zip code level. There is further work to be done analyzing the effect of the foreclosure crisis and negative wealth shocks in general at both smaller levels of aggregation, capturing more variation, and at the individual level.

The analysis presented in this paper may also understate the total effect of foreclosure on infant health due to the omission of infant death data. Not only are infants who die after birth excluded entirely, but increases in smoking in particular leads to an increased chance of miscarriage (Abel, 1980). Given the multiple sources of downward bias, the persistent effect of financial stress on premature births is particularly compelling.

My findings suggest that though there are government programs in existence to provide financially stressed expecting mothers with adequate prenatal care, such as Medicaid and S-CHIP, there are still important gaps that lead to reduced prenatal care utilization and worsened infant health outcomes. Without improvements to these programs in terms of coverage, large financial shocks to the economy will continue to have a negative effect on infant health and there is evidence that these effects may last well in to child hood (Vik et al., 1996; Agrawal et al., 2010; Gilman et al., 2008), further disadvantaging these infants.

The negative effect of the foreclosure crisis on infant health also represents another cost of such crises, which can be taken in to consideration when crafting policy and designing programs meant to provide financial relief to families.

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Table 1: Summary Statistics

	Mean	SD	N	Black		White		Hispanic	
Education				Mean	SD	Mean	SD	Mean	SD
Mortgage delinquency	4.130	4.257	24,170,735						
Vacancy	1.103	.786	13,964,248						
Black	0.154	0.361	24,170,735						
White (non Hispanic)	0.506	0.500	24,170,735						
Hispanic	0.270	0.444	24,170,735						
Less than high school	0.192	0.161	14,957,983	0.212	0.074	0.085	0.053	0.421	0.113
High school	0.264	0.094	14,957,983	0.351	0.073	0.229	0.084	0.300	0.061
Some college	0.246	0.083	14,957,983	0.289	0.071	0.271	0.076	0.182	0.064
4+ years college	0.300	0.201	14,957,983	0.148	0.080	0.415	0.153	0.097	0.053
Less than 25 years old	0.293	0.455	24,170,735	0.412	0.492	0.240	0.427	0.362	0.481
25-35 years old	0.522	0.500	24,170,735	0.422	0.494	0.568	0.495	0.470	0.499
Greater than 35 years old	0.154	0.361	24,170,735	0.112	0.315	0.177	0.381	0.120	0.325
Married	0.609	0.203	24,170,735	0.293	0.106	0.743	0.096	0.485	0.087
% prenatal in 1st trimester	0.868	0.100	15,514,409	0.797	0.101	0.908	0.069	0.831	0.112
% no prenatal	0.028	0.060	15,514,409	0.047	0.076	0.021	0.053	0.030	0.060
% late prenatal	0.049	0.067	15,514,409	0.081	0.080	0.034	0.058	0.059	0.069
% insufficient prenatal	0.050	0.047	24,169,909	0.090	0.051	0.032	0.028	0.066	0.053
Smoked during pregnancy	0.076	0.069	13,510,874	0.078	0.053	0.109	0.068	0.020	0.025
5 minute apgar	8.823	0.174	23,074,246	8.722	0.196	8.829	0.167	8.862	0.156
% apgar = 6 or less	0.017	0.015	23,074,246	0.029	0.019	0.016	0.013	0.013	0.011
Gestation (weeks)	38.535	0.351	24,170,735	38.062	0.346	38.634	0.296	38.604	0.234
% premature (< 37 weeks)	0.127	0.037	24,170,735	0.179	0.038	0.116	0.029	0.121	0.024
Birth weight (grams)	3259.0	109.6	24,170,699	3067.8	76.3	3317.8	66.0	3276.0	56.4
% very low birth weight (< 1500g)	0.016	0.012	24,170,699	0.033	0.014	0.014	0.009	0.013	0.006
Any assisted ventilation	0.041	0.049	15,468,806	0.051	0.054	0.046	0.051	0.031	0.042
Admission to NICU	0.074	0.036	15,468,806	0.099	0.040	0.076	0.035	0.062	0.030

Table 2: The Effect of Mortgage Delinquency on Infant Health

Variables	(1) 5 min apgar	(2) low 5 min apgar	(3) premature	(4) gestation	(5) birth weight	(6) very low birth weight	(7) ventilation	(8) NICU
delinquency	-0.00264*	0.00020	0.00059**	-0.00717***	-0.456*	0.00001	0.00126**	0.00069**
	(0.00150)	(0.00014)	(0.00023)	(0.00197)	(0.239)	(0.00003)	(0.00050)	(0.00028)
unemployment	-0.00364	0.00006	-0.00032	-0.00025	-0.527	0.00012	0.00018	-0.00045
	(0.00314)	(0.00027)	(0.00037)	(0.00370)	(0.536)	(0.00007)	(0.00133)	(0.00080)
% effect	0.03	1.11	0.46	0.02	0.01	0.06	3.07	0.93
Observations	23,074,294	23,074,294	24,170,735	24,170,735	24,170,973	24,170,973	15,469,040	15,469,040
R-squared	0.726	0.557	0.524	0.570	0.383	0.466	0.729	0.682

*** p<0.01, ** p<0.05, * p<0.1 All regressions include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level. % effect refers to the percentage change in the outcome variable given a 1 percentage point increase in delinquency.

Table 3: The Effect of Mortgage Delinquency on Infant Health by Racial/Ethnic Subgroups

Variables	(1) 5 min apgar	(2) low 5 min apgar	(3) premature	(4) gestation	(5) birth weight	(6) very low birth weight	(7) ventilation	(8) NICU
Black								
delinquency	-0.00686**	0.00062**	0.00063*	-0.00754***	-1.215***	0.00017**	0.00110	0.00127***
	(0.00276)	(0.00027)	(0.00033)	(0.00250)	(0.401)	(0.00008)	(0.00067)	(0.00042)
unemployment	-0.00802	0.00050	-0.00001	0.00543	-1.265	0.00014	0.00135	0.00154
	(0.00660)	(0.00057)	(0.00075)	(0.00701)	(1.062)	(0.00023)	(0.00208)	(0.00184)
% effect	0.08	2.11	0.35	0.02	0.04	0.52	2.17	1.28
Observations	3,658,719	3,658,719	3,722,299	3,722,299	3,722,332	3,722,332	2,236,888	2,236,888
R-squared	0.756	0.660	0.697	0.735	0.807	0.643	0.825	0.718
White								
delinquency	-0.00177	0.00013	0.00043**	-0.0048**	-0.533*	0.00000	0.00137**	0.000659**
	(0.00159)	(0.00014)	(0.00022)	(0.00212)	(0.314)	(0.00003)	(0.00056)	(0.00032)
unemployment	-0.00311	0.00002	-0.00010	-0.00465	-0.280	0.000168*	-0.00031	-0.00067
	(0.00349)	(0.00029)	(0.00039)	(0.00376)	(0.616)	(0.00009)	(0.00121)	(0.00063)
% effect	-0.02	0.81	0.37	0.01	0.02	0.01	3.00	0.87
Observations	11,905,485	11,905,485	12,225,432	12,225,432	12,225,619	12,225,619	7,580,199	7,580,199
R-squared	0.785	0.678	0.800	0.838	0.873	0.735	0.837	0.854
Hispanic								
delinquency	-0.00131	-0.00005	0.000914***	-0.00569**	0.102	-0.00004	0.00116**	0.000528*
	(0.00127)	(0.00015)	(0.00027)	(0.00240)	(0.359)	(0.00005)	(0.00058)	(0.00031)
unemployment	-0.00250	-0.00015	-0.00037	0.00096	-1.112	0.00012	0.00059	-0.00103
	(0.00325)	(0.00034)	(0.00052)	(0.00536)	(0.898)	(0.00010)	(0.00223)	(0.00119)
% effect	0.01	0.40	0.75	0.01	0.00	-0.34	3.73	0.85
Observations	5,886,232	5,886,232	6,458,502	6,458,502	6,458,503	6,458,503	4,577,822	4,577,822
R-squared	0.809	0.668	0.71	0.79	0.881	0.645	0.795	0.776

Table 4: The Effect of Vacancy on Infant Health

	Variables	(1) 5 min apgar	(2) low 5 min apgar	(3) premature	(4) gestation	(5) birth weight	(6) very low birth weight	(7) ventilation	(8) NICU
Quarter:									
Conception	vacancy	0.00252	-0.00088	0.00215***	-0.0245***	-2.877***	0.00032*	-0.00271	-0.00258*
		(0.00744)	(0.00061)	(0.00072)	(0.00676)	(1.075)	(0.00019)	(0.00193)	(0.00148)
	unemployment	-0.00352	0.00016	0.00026	-0.00567	-0.522	0.00002	0.00092	-0.00020
		(0.00276)	(0.00028)	(0.00044)	(0.00399)	(0.570)	(0.00009)	(0.00105)	(0.00068)
	% effect	0.03	5.18	1.69	0.06	0.09	2.00	6.61	3.49
	Observations	13,828,232	13,828,232	13,964,248	13,964,248	13,964,199	13,964,199	9,550,511	9,550,511
	R-squared	0.557	0.277	0.113	0.114	0.201	0.082	0.695	0.375
First trimester	vacancy	0.00227	-0.00093	0.00281***	-0.0275***	-2.625**	0.00038*	-0.00162	-0.00084
		(0.00672)	(0.00057)	(0.00081)	(0.00733)	(1.144)	(0.00022)	(0.00201)	(0.00134)
	unemployment	-0.00372	0.00015	0.00023	-0.00511	-0.454	0.00009	0.00096	0.00009
		(0.00275)	(0.00029)	(0.00044)	(0.00398)	(0.609)	(0.00009)	(0.00086)	(0.00073)
	% effect	0.03	5.44	2.21	0.07	0.08	2.38	3.95	1.14
	Observations	13,001,259	13,001,259	13,137,270	13,137,270	13,137,214	13,137,214	8,882,531	8,882,531
	R-squared	0.546	0.268	0.108	0.109	0.196	0.079	0.695	0.36
Second trimester	vacancy	-0.00068	-0.00068	0.00300***	-0.0211***	-3.068**	0.00025	-0.00184	-0.00078
		(0.00625)	(0.00056)	(0.00090)	(0.00751)	(1.284)	(0.00025)	(0.00196)	(0.00160)
	unemployment	-0.00285	0.00009	0.00005	-0.00384	-0.323	0.00009	0.00107	0.00054
		(0.00251)	(0.00024)	(0.00041)	(0.00400)	(0.608)	(0.00010)	(0.00083)	(0.00072)
	% effect	0.01	3.98	2.36	0.05	0.09	1.55	4.49	1.05
	Observations	12,216,637	12,216,637	12,352,636	12,352,636	12,352,603	12,352,603	8,263,337	8,263,337
	R-squared	0.558	0.277	0.105	0.107	0.194	0.08	0.696	0.349
Third trimester	vacancy	0.00202	-0.00040	0.00315**	-0.0187*	-3.777**	0.00023	-0.00227	-0.00023
		(0.00747)	(0.00063)	(0.00122)	(0.01030)	(1.730)	(0.00031)	(0.00273)	(0.00176)
	unemployment	-0.00321	0.00022	0.00012	-0.00331	-0.044	0.00014	0.00144*	0.00033
		(0.00248)	(0.00024)	(0.00044)	(0.00431)	(0.607)	(0.00010)	(0.00084)	(0.00067)
	% effect	0.02	2.38	2.48	0.05	0.12	1.41	5.54	0.31
	Observations	11,444,565	11,444,565	11,580,555	11,580,555	11,580,525	11,580,525	7,664,136	7,664,136
	R-squared	0.569	0.287	0.121	0.119	0.21	0.09	0.71	0.386

*** p<0.01, ** p<0.05, * p<0.1 All regressions include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level. % effect refers to the percentage change in the outcome variable given a 1 percentage point increase in delinquency.

Table 5: The Effect of Mortgage Delinquency on Total Births by Education

	(1)	(2)	(3)	(4)	(5)
		total births by maternal education level			
VARIABLES	total births	less than high school	high school	some college	4+ years college
All					
delinquency	2.880	9.622	1.704	45.47**	-28.89
	(17.59)	(29.16)	(35.81)	(19.76)	(27.52)
unemployment	-100.5	-3.266	2.516	-11.73	4.107
	(64.70)	(21.57)	(24.21)	(22.96)	(27.49)
Observations	4,125	2,956	2,961	2,968	2,965
R-squared	0.942	0.916	0.911	0.903	0.907
Black					
delinquency	4.952	-0.713	-8.836	12.35***	-0.645
	(4.556)	(7.061)	(11.38)	(4.773)	(3.437)
unemployment	-44.86***	-4.314	1.407	-4.334	1.533
	(13.38)	(4.691)	(6.872)	(4.903)	(3.096)
Observations	4,101	2,827	2,884	2,878	2,755
R-squared	0.940	0.894	0.894	0.903	0.902
White					
delinquency	-6.984	-1.824	-12.96	3.114	-26.01
	(7.842)	(2.760)	(9.097)	(6.889)	(16.02)
unemployment	-10.26	-0.225	4.748	2.863	13.06
	(21.63)	(2.401)	(6.511)	(8.879)	(17.24)
Observations	4,125	2,954	2,957	2,966	2,965
R-squared	0.944	0.913	0.910	0.917	0.907
Hispanic					
delinquency	-2.100	6.491	21.15	28.50***	5.956
	(10.79)	(21.33)	(16.59)	(9.887)	(5.470)
unemployment	-36.01	1.966	-6.974	-11.41	-2.029
	(34.46)	(18.09)	(14.55)	(10.88)	(4.721)
Observations	4,103	2,918	2,931	2,910	2,853
R-squared	0.941	0.921	0.917	0.892	0.914

*** p<0.01, ** p<0.05, * p<0.1 All regressions include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level.

Table 6: The Effect of Mortgage Delinquency on Total Births by Age

Variables	(1) age < 25 years	(2) age 25 - 35	(3) age > 35 years
All			
delinquency	-9.116	10.59	6.094
	(7.292)	(9.162)	(3.896)
unemployment	-31.59	-54.54*	-10.68
	(21.67)	(31.85)	(10.47)
Observations	4,118	4,125	4,119
R-squared	0.936	0.944	0.944
Black			
delinquency	0.662	4.529**	1.573**
	(2.083)	(2.232)	(0.707)
unemployment	-17.20***	-20.39***	-5.777***
	(5.537)	(5.856)	(1.704)
Observations	4,064	4,071	3,846
R-squared	0.938	0.942	0.943
White			
delinquency	-1.661	-0.959	-4.068*
	(2.152)	(4.519)	(2.410)
unemployment	-6.522	-11.74	8.607
	(5.802)	(11.99)	(5.378)
Observations	4,114	4,124	4,117
R-squared	0.940	0.946	0.940
Hispanic			
delinquency	-8.714*	2.089	6.585***
	(4.862)	(5.232)	(1.580)
unemployment	-6.219	-18.17	-9.515**
	(13.69)	(15.73)	(3.739)
Observations	4,092	4,093	3,991
R-squared	0.937	0.942	0.946

*** p<0.01, ** p<0.05, * p<0.1 All regressions include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level.

Table 7 a): The Effect of Mortgage Delinquency on Infant Health with Controls

Variables	(1) 5 min apgar	(2) low 5 min apgar	(3) premature	(4) gestation	(5) birth weight	(7) very low birth weight	(8) ventilation	(10) NICU
delinquency	-0.00285	0.00025	0.00064***	-0.00895***	-0.06820	-0.00005	0.00103	-0.00070
	(0.00300)	(0.00024)	(0.00018)	(0.00237)	(0.35800)	(0.00005)	(0.00087)	(0.00061)
unemployment	-0.00294	-0.00016	-0.00046	0.00209	-0.29400	0.00009	0.00027	0.00145*
	(0.00509)	(0.00041)	(0.00047)	(0.00484)	(0.69900)	(0.00010)	(0.00155)	(0.00080)
demographic controls	yes	yes	yes	yes	yes	yes	yes	yes
% effect	0.03	1.46	0.50	0.02	0.00	0.31	2.51	0.94
Observations	13,995,132	13,995,132	14,520,478	14,520,478	14,520,542	14,520,542	7,777,631	7,777,631
R-squared	0.495	0.214	0.298	0.376	0.537	0.185	0.529	0.346

*** p<0.01, ** p<0.05, * p<0.1 All regressions include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level. Demographic controls include indicator variables for race/ethnic groups, age groups, and maternal education level. % effect refers to the percentage change in the outcome variable given a 1 percentage point increase in delinquency.

Table 7 b): The Effect of Mortgage Delinquency on Infant Health without Controls

Variables	(1) 5 min apgar	(2) low 5 min apgar	(3) premature	(4) gestation	(5) birth weight	(7) very low birth weight	(8) ventilation	(10) NICU
delinquency	-0.00291	0.00026	0.00067***	-0.00935***	-0.33500	-0.00004	-0.00007	-0.00070
	(0.00303)	(0.00025)	(0.00018)	(0.00234)	(0.36400)	(0.00005)	(0.00010)	(0.00061)
unemployment	-0.00307	-0.00015	-0.00040	0.00173	-0.40600	0.00012	-0.00002	0.00147*
	(0.00510)	(0.00041)	(0.00046)	(0.00486)	(0.72500)	(0.00011)	(0.00022)	(0.00080)
demographic controls	no	no	no	no	no	no	no	no
Observations	13,995,132	13,995,132	14,520,478	14,520,478	14,520,542	14,520,542	7,777,631	7,777,631
R-squared	0.458	0.176	0.160	0.215	0.191	0.111	0.248	0.289

*** p<0.01, ** p<0.05, * p<0.1 All regressions include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level. % effect refers to the percentage change in the outcome variable given a 1 percentage point increase in delinquency.

Table 8: The Effect of Mortgage Delinquency on Prenatal Care

Variables	(1) prenatal care in 1st trimester	(2)	(3) late prenatal	(4)	(5) no prenatal	(6)	(7) insufficient prenatal	(8)
All								
delinquency	-0.00148	-0.00135	0.00268*	0.00267*	0.00019	0.00068***	0.00020	0.00080**
	(0.00203)	(0.00205)	(0.00153)	(0.00155)	(0.00016)	(0.00024)	(0.00027)	(0.00039)
unemployment	0.00639	0.00802**	-0.00264	-0.00414	-0.00085	-0.00137*	-0.00127	-0.00207**
	(0.00389)	(0.00379)	(0.00320)	(0.00323)	(0.00067)	(0.00083)	(0.00083)	(0.00095)
demographic controls	no	yes	no	yes	no	yes	no	yes
% effect	0.17	0.16	5.50	5.48	0.70	2.44	0.43	1.59
Observations	15,514,544	14,520,081	15,514,544	14,520,081	24,155,570	14,515,588	24,169,986	14,515,588
R-squared	0.527	0.579	0.615	0.523	0.277	0.368	0.536	0.471
Black								
delinquency	-0.00240	-0.00236	0.00196	0.00202	0.00039**	0.00071**	0.00103*	0.00215***
	(0.00427)	(0.00446)	(0.00309)	(0.00320)	(0.00019)	(0.00029)	(0.00056)	(0.00082)
unemployment	0.00784	0.00854	-0.00613	-0.00695	-0.00173	-0.00249*	-0.00163	-0.00339**
	(0.00882)	(0.00907)	(0.00720)	(0.00740)	(0.00116)	(0.00146)	(0.00153)	(0.00171)
demographic controls	no	yes	no	yes	no	yes	no	yes
% effect	0.30	0.30	2.42	4.25	0.48	0.88	1.20	2.39
Observations	2,432,921	2,326,154	2,432,921	2,326,154	3,719,481	2,325,086	3,721,938	2,325,086
R-squared	0.732	0.556	0.707	0.542	0.298	0.391	0.793	0.474
White								
delinquency	-0.00354**	-0.00332*	0.00369***	0.00352**	0.00013	0.00032**	0.00013	0.00040
	(0.00177)	(0.00178)	(0.00138)	(0.00139)	(0.00010)	(0.00014)	(0.00022)	(0.00033)
unemployment	0.00663**	0.00812**	-0.00168	-0.00360	-0.00043	-0.00043	-0.000948*	-0.00094
	(0.00332)	(0.00315)	(0.00279)	(0.00257)	(0.00041)	(0.00043)	(0.00055)	(0.00070)
demographic controls	no	yes	no	yes	no	yes	no	yes
% effect	0.39	0.37	17.27	16.47	0.38	0.93	0.44	1.26
Observations	7,838,677	7,500,603	7,838,677	7,500,603	12,220,016	7,498,436	12,225,228	7,498,436
R-squared	0.646	0.56	0.631	0.531	0.203	0.325	0.694	0.45
Hispanic								
delinquency	-0.00075	-0.00111	0.00167	0.00182	0.00030	0.00106*	0.00021	0.00065
	(0.00262)	(0.00246)	(0.00165)	(0.00161)	(0.00039)	(0.00056)	(0.00049)	(0.00061)
unemployment	0.00093	0.00407	-0.00115	-0.00288	-0.00120	-0.00274	-0.00182	-0.00336
	(0.00500)	(0.00475)	(0.00350)	(0.00366)	(0.00170)	(0.00247)	(0.00193)	(0.00242)
demographic controls	no	yes	no	yes	no	yes	no	yes
% effect	0.09	0.13	5.59	6.09	0.51	1.81	0.35	0.99
Observations	4,048,091	3,681,187	4,048,091	3,681,187	6,458,161	3,679,767	6,458,504	3,679,767
R-squared	0.834	0.660	0.766	0.578	0.495	0.518	0.810	0.539

*** p<0.01, ** p<0.05, * p<0.1 All regressions include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level. % effect refers to the percentage change in the outcome variable given a 1 percentage point increase in delinquency.

Table 9: The Effect of Mortgage Delinquency on Maternal Health

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	pre-pregnancy diabetes		pre-pregnancy hypertension		gestational hypertension		eclampsia	
delinquency	-0.00003	0.00024	0.00004	0.00012	0.00008	0.00025	0.00004	0.00007
	(0.00025)	(0.00052)	(0.00021)	(0.00015)	(0.00008)	(0.00024)	(0.00004)	(0.00009)
unemployment	-0.00006	-0.00060	-0.00043	-0.00021	-0.00013	-0.00069	-0.00020**	-0.00034**
	(0.00054)	(0.00074)	(0.00040)	(0.00021)	(0.00016)	(0.00050)	(0.00009)	(0.00015)
demographic controls	no	yes	no	yes	no	yes	no	yes
Observations	24,170,886	14,520,339	24,170,886	14,520,339	24,170,886	14,520,339	24,170,886	14,520,339
R-squared	0.495	0.349	0.644	0.199	0.473	0.232	0.618	0.162

*** p<0.01, ** p<0.05, * p<0.1 All regressions include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level. Demographic controls include indicator variables for race/ethnic groups, age groups, and maternal education level. % effect refers to the percentage change in the outcome variable given a 1 percentage point increase in delinquency.

Table 10.a): The Effect of Mortgage Delinquency on Maternal Behavior

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variables	weight gain		cigartettes/day 1st trimester		cigartettes/day 2nd trimester		cigartettes/day 3rd trimester		any tobacco use	
All										
delinquency	0.00133*	0.00208	0.0169***	0.0106*	0.0161***	0.00994*	0.0162***	0.0101**	0.00043	0.00017
	(0.00074)	(0.00154)	(0.00503)	(0.00607)	(0.00364)	(0.00551)	(0.00340)	(0.00511)	(0.00041)	(0.00043)
unemployment	-0.00093	-0.00222	-0.01380	-0.0217***	-0.0164**	-0.0171***	-0.0168**	-0.0136***	0.00009	-0.00022
	(0.00184)	(0.00241)	(0.00945)	(0.00735)	(0.00707)	(0.00565)	(0.00661)	(0.00511)	(0.00071)	(0.00063)
demographic controls	no	yes	no	yes	no	yes	no	yes	no	yes
% effect	0.40	0.63	2.02	1.25	2.58	1.58	2.89	1.79	0.57	0.21
Observations	24,171,200	14,520,601	12,809,631	6,888,912	12,809,633	6,888,887	12,809,633	6,888,884	13,510,973	13,106,430
R-squared	0.824	0.767	0.765	0.489	0.756	0.458	0.744	0.444	0.744	0.556

*** p<0.01, ** p<0.05, * p<0.1 All regressions include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level. Demographic controls include indicator variables for race/ethnic groups, age groups, and maternal education level. % effect refers to the percentage change in the outcome variable given a 1 percentage point increase in delinquency.

Table 10.b): The Effect of Mortgage Delinquency on Maternal Behavior by Racial/Ethnic Subgroups

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	variables	weight gain		cigartettes/day 1st trimester		cigartettes/day 2nd trimester		cigartettes/day 3rd trimester		any tobacco use	
Black	delinquency	0.00189*	0.00335	0.0203*	-0.00189	0.0141**	0.00067	0.0142***	-0.00104	0.00112	0.00090
		(0.00110)	(0.00250)	(0.01160)	(0.01430)	(0.00588)	(0.00782)	(0.00540)	(0.00748)	(0.00113)	(0.00111)
	unemployment	-0.00070	-0.00165	0.02590	-0.01420	0.01060	-0.01110	0.01150	-0.01190	0.00229	0.00230
		(0.00203)	(0.00304)	(0.02470)	(0.01450)	(0.01590)	(0.01160)	(0.01540)	(0.01050)	(0.00184)	(0.00172)
	demographic controls	no	yes	no	yes	no	yes	no	yes	no	yes
	% effect	0.59	1.05	2.87	0.25	2.70	0.12	2.99	0.21	1.43	1.14
	Observations	3,722,411	2,326,452	1,700,484	950,563	1,700,484	950,541	1,700,484	950,538	2,136,441	2,068,351
	R-squared	0.837	0.55	0.775	0.353	0.755	0.331	0.725	0.31	0.878	0.476
White	delinquency	0.00076	0.00153	0.0164**	0.0215**	0.0180***	0.0183*	0.0183***	0.0194**	0.00053	0.00047
		(0.00078)	(0.00146)	(0.00707)	(0.01010)	(0.00538)	(0.00952)	(0.00492)	(0.00860)	(0.00046)	(0.00039)
	unemployment	-0.00220	-0.00469**	-0.0316***	-0.0431***	-0.0291***	-0.0311***	-0.0298***	-0.0245***	-0.00072	-0.00101
		(0.00152)	(0.00209)	(0.01210)	(0.01080)	(0.00941)	(0.00839)	(0.00899)	(0.00799)	(0.00087)	(0.00070)
	demographic controls	no	yes	no	yes	no	yes	no	yes	no	yes
	% effect	0.22	0.45	1.19	1.55	1.75	1.76	1.97	1.47	0.49	0.43
	Observations	12,225,741	7,500,894	6,372,299	3,413,792	6,372,299	3,413,793	6,372,299	3,413,790	7,050,586	6,889,930
	R-squared	0.854	0.739	0.933	0.657	0.927	0.628	0.913	0.609	0.949	0.749
Hispanic	delinquency	0.00202**	0.00261	0.00489**	-0.00081	0.00422**	0.00075	0.00409**	0.00103	0.00011	0.00006
		(0.00094)	-0.00167	(0.00246)	-0.00257	(0.00167)	-0.00196	(0.00169)	-0.00194	(0.00015)	-0.000147
	unemployment	0.00114	0.00236	0.00442	0.00607	-0.00186	0.00137	-0.00133	0.00137	0.00001	-0.00001
		(0.00336)	-0.0042	(0.00607)	-0.00378	(0.00424)	-0.00319	(0.00365)	-0.00267	(0.00040)	-0.000375
	demographic controls	no	yes	no	yes	no	yes	no	yes	no	yes
	% effect	0.63	0.82	3.25	0.54	4.21	0.75	4.72	1.19	0.56	0.28
	Observations	6,458,504	3,681,316	3,815,508	2,032,185	3,815,508	2,032,185	3,815,508	2,032,185	3,301,415	3,233,664
	R-squared	0.878	0.876	0.831	0.244	0.811	0.201	0.74	0.182	0.897	0.34

*** p<0.01, ** p<0.05, * p<0.1 All regressions include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level. Demographic controls include indicator variables for race/ethnic groups, age groups, and maternal education level. % effect refers to the percentage change in the outcome variable given a 1 percentage point increase in delinquency.

Appendix

Table A1.a): The Effect of Mortgage Delinquency on Infant Health

Variables	(1) 5 min apgar	(2) low 5 min apgar	(3) premature	(4) gestation	(5) birth weight	(6) very low birth weight	(7) ventilation	(8) NICU
delinquency	-0.00305**	0.00020	0.00056**	-0.00723***	-0.52800**	0.00003	0.00128**	0.00064**
	(0.00152)	(0.00014)	(0.00022)	(0.00191)	(0.23900)	(0.00003)	(0.00051)	(0.00027)
% effect	0.03	1.19	0.44	0.02	0.02	0.16	3.12	0.86
Observations	23,115,165	23,115,165	24,211,606	24,211,606	24,211,851	24,211,851	15,469,040	15,469,040
R-squared	0.725	0.557	0.523	0.569	0.383	0.466	0.729	0.682

*** p<0.01, ** p<0.05, * p<0.1 All regressions include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level. % effect refers to the percentage change in the outcome variable given a 1 percentage point increase in delinquency.

Table A1.b): The Effect of Unemployment on Infant Health

Variables	(1) 5 min apgar	(2) low 5 min apgar	(3) premature	(4) gestation	(5) birth weight	(6) very low birth weight	(7) ventilation	(8) NICU
unemployment	-0.00559*	0.00021	0.00020	-0.00657*	-0.92900*	0.00013*	0.00139	0.00023
	(0.00339)	(0.00029)	(0.00035)	(0.00380)	(0.54300)	(0.00007)	(0.00136)	(0.00082)
% effect	0.063	1.22	0.02	0.02	0.03	0.81	3.38	0.31
Observations	23,074,294	23,074,294	24,170,735	24,170,735	24,170,973	24,170,973	15,469,040	15,469,040
R-squared	0.725	0.557	0.524	0.569	0.383	0.466	0.728	0.682

*** p<0.01, ** p<0.05, * p<0.1 All regressions include county fixed effects and state by year fixed effects. Standard errors are clustered at the county level. % effect refers to the percentage change in the outcome variable given a 1 percentage point increase in delinquency.