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SHORT-RUN EFFECTS OF PARENTAL JOB LOSS ON CHILD HEALTH

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Abstract

Recent research suggests that parental job loss has negative effects on children's outcomes, including their academic achievement and long-run educational and labor market outcomes. In this paper we turn our attention to the effects of parental job loss on children's health. We combine health data from 16 waves of the Medical Expenditure Panel Survey, which allows us to use a fixed effects specification and still have a large sample of parental job displacements. We find that paternal job loss is harmful to children's physical and mental health, particularly among children in low-socioeconomic status (SES) families. By contrast, we find that maternal job loss does not have detrimental effects on child health. Increases in public health insurance coverage compensate for close to half of the loss in private coverage that follows parental displacement, and we find no significant changes in medical care utilization.

JEL Codes: I12, J13, J63, J65.

Keywords: Child health, Job loss, Displacement, Unemployment

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I. INTRODUCTION

During the Great Recession, millions of American workers lost jobs as firms restructured, relocated, downsized, and closed in response to changing demand conditions. From January 2007 through December 2009—a period encompassing the official beginning and end of the recession—nearly one in six US workers experienced job displacement (Farber, 2011). Not only was the rate of job loss significantly higher during this period than during previous postwar recessions, the rate of reemployment was lower and the average duration of unemployment was longer. The severity of the recent economic downturn has generated renewed interest among researchers in the consequences of job displacement for workers and their families.

Though a substantial literature documents the effects of displacement on outcomes such as earnings, employment, health, and fertility for displaced workers, less is known about the consequences of displacement for another group of potential victims—the children of displaced workers. Given that job displacement causes changes in family income, parental time use, and the physical and mental wellbeing of parents, it is likely to alter family dynamics and affect parental investments in children. Recent studies of the effects of job displacement on children's academic outcomes suggest that this is the case, finding that parental job loss is associated with increased likelihood of grade repetition and worse performance on standardized tests (Ananat et al., 2011; Stevens and Schaller, 2009). Parental job loss has also been found to have long-run effects on children from low-income families, reducing their educational attainment and earnings in adulthood (Oreopolous et al., 2008; Page et al., 2009). However, the mechanisms by which parental job loss translates into worse outcomes for children in the short and long run are not well understood.

In this paper, we study the effects of parental job loss on children's physical and mental health. While previous work has shown that job loss is associated with increased mortality and worse physical and mental health among adults,[1] only a few papers have examined the effects of parental job loss on children's health and none have looked at the effects of parental job loss on a broad set of health outcomes.[2] Child health is an important outcome because it is both an indicator of

[1] See, for example, Browning and Heinesen, 2012; Schaller and Stevens, 2015; Sullivan and von Wachter, 2009

[2] To our knowledge there are only three existing papers on the topic: Liu and Zhao (2014) study the effects of mass layoffs on child height and weight in China, Mork et al. (2013) look at the correlation between parental unemployment and children's hospital stays in Sweden, and Lindo (2011) studies the effects of parental job loss on health at birth using US data.

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current welfare and a predictor of future outcomes including adult health, educational attainment, and earnings, and thus a potential mechanism for the intergenerational transmission of economic shocks (Currie, 2009).

We exploit detailed data from the Medical Expenditure Panel Survey (MEPS) that allow us to examine the effects of parental job displacement on many different measures of child health and to investigate potential mechanisms behind these effects. The MEPS is a large-scale representative survey that collects information on health outcomes, health insurance coverage, and health care utilization, as well as demographic characteristics and employment, for each member of responding households over a two-year period. We obtain a large sample of children with displaced parents by combining data from 16 waves of the survey that cover the period from 1996 through 2012—a time span that includes the Great Recession, as well as an earlier, smaller economic downturn. We address concerns about the potential endogeneity of parental displacement in several ways. First, because parental displacement might be correlated with other unobservable family characteristics that are associated with child health in cross-section, we use an individual fixed effects specification. With this approach, our estimates are identified by changes in health status after displacement for a given child rather than comparisons between the children of displaced workers and children of continually employed workers. Second, we limit our sample to workers with at least one year of job tenure and focus on job losses that occur for plausibly exogenous reasons. Finally, we show that there are no measurable changes in child health in the period prior to parental displacement. Because of the large number of potential outcome variables, we address concerns about multiple inference by creating a set of summary health indices,[3] and by implementing a stepdown method for multiple hypothesis testing (Romano and Wolf, 2005).

We find that paternal job loss is harmful to children's mental health, leading to increases the likelihood that mental health is reported to be "fair" or "poor" and in a summary index of mental health problems that includes anxiety and depression. We also find suggestive evidence of increases in the likelihood that physical health is reported to be "fair" or "poor" after paternal job loss, especially among children from low-income, less-educated, and single-earner families. Maternal job loss, by contrast, does not have measurable negative effects on children's physical or mental health. In fact, we find suggestive evidence of maternal job loss resulting in improved mental health in low-

[3]This approach follows Kling et al. (2007), Deming (2009), and Hoynes et al. (2015)

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SES families and single mother households, and in small reductions in the incidence of infectious illness among children in high-income families—effects that may be driven by the substitution of maternal care for market-based childcare following displacement.

Turning to the effects of parental job loss on child health insurance coverage and health care utilization, we find that increases in public insurance coverage partially counteract the loss of private insurance coverage after job loss so that the estimated overall effect on children's insurance coverage after displacement is significant but smaller than the corresponding estimate for adults (see Schaller and Stevens, 2015). We find no significant changes in routine, diagnostic, or emergency medical care following parental job loss.

The findings from this paper have important implications for our understanding of the effects of job loss (and parental employment) on children's outcomes. The finding that the physical and mental health of children in low-SES families is particularly vulnerable following a father's job loss potentially helps to explain the long-run effects of paternal job loss on the education and labor market outcomes of children in disadvantaged families seen in other research. Meanwhile, the heterogeneity in the effects of job losses that we observe by parent gender and socioeconomic status highlights the important point that job loss is more than a shock to family income. In fact, job loss is a complex treatment involving changes in income, time use, and stress, and the relative importance of these different channels depends on the family role of the parent involved and the resources available to the family. Our findings are complementary to those of Page et al. (2016) and Lindo, Schaller and Hansen (2013), who study the effects of aggregate male and female labor demand shocks on child outcomes and also find opposite-signed effects.

The rest of the paper is organized as follows. Section **??** provides theoretical background and discusses the mechanisms through which parental job loss might be expected to affect child health. Section **??** summarizes several strands of related literature. Sections **??** and **??** describe the data and empirical strategy, respectively, and include discussions of endogeneity and multiple inference concerns. Section **??** presents our main results, and Section **??** explores heterogeneity in the effects of parental job loss on child health by socioeconomic status, child age, and gender. Section **??** discusses the robustness of our estimates to different specification and robustness checks, and Section **??** concludes.

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II. THEORETICAL BACKGROUND AND POTENTIAL MECHANISMS

In the standard model of child health production in economics (Grossman, 2000; Currie, 2009), parents are assumed to maximize an inter-temporal utility function whose arguments in each period are the stock of child health, the consumption of other commodities, and leisure. The health stock in any given period is a function of the health stock of the previous period, its depreciation rate, and the health investments made in the previous period. The health production function depends on both exogenous productivity shifters and permanent individual productivity shifters. Finally, the investment inputs in this production function include material inputs (including health care) and parental time inputs.

Within this framework, there are a few ways in which parental job loss can affect a child's health stock. First, the reduction in income associated with job loss can affect consumption and health investments, such as nutritious food, preventive health care, and the practice of physical exercise. Second, the loss of a job can cause the loss of employer-provided health insurance for the worker and his/her dependents. This will affect the price and the quality of available health care and may lead to reduced use of health care, especially related to preventive care, treatment of chronic conditions, and purchase of prescription drugs. For children, however, the effects of job loss on health insurance coverage may be mediated by the availability of the other parent's employer-provided health insurance, as well as the availability and take-up of public health insurance programs such as Medicaid and the State Children's Health Insurance Program (CHIP).

Job loss may also change the availability of parental time and its allocation towards child health production, especially in the short run. A parent who recently lost a job may spend more time caring for the child, increasing non-market time inputs to health production, which may also increase the amount of health care received by the child (doctor visits, for example). Additionally, increased availability of parental time, combined with a reduced income, may cause children to spend less time in daycare, preschool, or after-school activities, which may reduce their exposure to illness or change their likelihood of incurring injuries. A final avenue by which parental job loss might lead to changes in child health is increased parental stress caused by job loss and the associated income shock. Parental stress might affect child health directly by causing children to experience more stress themselves or it might affect the quality of care that children receive.

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The many potential mechanisms discussed above make it unclear whether we should expect job loss to lead to improvement or deterioration in child health on average. We can, however, make predictions about how these effects might vary depending on family, parent, and child characteristics. For one thing, the effects of job loss are likely to depend on the gender of the displaced parent. Theoretical and empirical research in psychology, sociology, and economics suggests that the stress effects of job loss are greater for men than for women (Leana and Feldman, 1988; Waters and Moore, 2002; Eliason and Storrie, 2009; Kuhn et al., 2009) and that the impact of parental job loss on families and children is greater when fathers are displaced (Kalil and Ziol-Guest, 2008; Rege et al., 2011). This has been attributed both to the fact that male job loss often results in a larger income shock and to a cultural emphasis on the role of the men as breadwinners. Meanwhile, it is possible that maternal job displacement may be associated with improved outcomes for children, as maternal employment has been found to have negative effects on health in children and adolescents (Anderson et al., 2003; Ruhm, 2008; Gennetian, 2010; Morrill, 2011) and women are more likely to take on home-production and caregiving roles during periods of joblessness (Aguiar et al., 2013; Lindo, Schaller and Hansen, 2013).

Other important sources of potential heterogeneity in the effects of fathers' and mothers' job losses include family earnings, parental educational attainment, and the number of earners in the family. Families with lower income or less education and single-earner families may experience more stress upon job loss and are likely to have fewer resources with which to moderate shocks to earnings and insurance coverage. Meanwhile, shifts in time use may be greater in high-SES families as displaced parents (particularly secondary earners) may choose to remain unemployed longer. It is also possible that the effects of parental displacement may be heterogeneous by child age and gender, though this type of heterogeneity is difficult to characterize a priori.

III. RELATED LITERATURE

The literature on job displacement has only recently started to look at the consequences on children. Previous papers discuss the effects of parental job displacement on children's future earnings, finding different results for different countries and samples.[4] Some papers have looked at

[4]Oreopoulos et al. (2008) show that fathers' job displacement has a large negative effect on children's young adult earnings, using data for Canada. Page et al. (2009) only find significant effects for children that initially come from

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how parental job displacement affects educational outcomes of children, finding that it increases the likelihood of grade repetition (Stevens and Schaller, 2011; Kalil and Ziol-Guest, 2008), worsens school performance (Ananat et al., 2011; Rege et al., 2011), and reduces the likelihood of enrolling in post-secondary education (Coelli, 2011). Notably, papers that separately examine male and female displacements typically find negative effects following fathers' job losses only (Kalil and Ziol-Guest, 2008; Rege et al., 2011). Meanwhile, those that stratify by income find that the negative effects of parental job displacement are stronger among low-income families (Oreopoulos et al., 2008; Page et al., 2009).

So far, the only paper that has looked at the effects of parental job loss on child health in the US is Lindo (2011). Using data from the Panel Survey of Income Dynamics (PSID), Lindo compares the birth-weight of siblings born before and after a job loss. The results indicate that job displacement of the husband reduces the birth-weight of subsequent children by 4.5%, with larger treatment effects below the median of the birthweight distribution. Other papers have looked at child health effects of job displacements in other countries. Liu and Zhao (2014) look at job displacement in the context of mass layoffs from publicly owned firms in China following the reforms initiated in the 1990s. They find that the father's job loss has a large negative impact on height and weight of children, whereas they don't find evidence of an effect of mother's job loss. Mork et al. (2014) look at the effect of parental unemployment on child health outcomes using administrative data from Sweden. They find that children with unemployed parents are 1 percent more likely to be hospitalized in the same year as the job loss, and 5 percent more likely in the long run. However, due to data limitations they are not able to separately identify the effects of plausibly exogenous job displacement from all causes of job loss.

Evidence on the effects of job displacement on adult health is more abundant. Our paper is closest in methods to Schaller and Stevens (2015). Using data from the MEPS, they look at the effect of involuntary job loss on a worker's health outcomes in the short-run. They find that job loss has substantial negative effects on mental health and that it increases the likelihood of activity limitations and fair or poor self-reported physical health. However, they find no effects on the likelihood of reporting a number of specific chronic health conditions, including arthritis, diabetes,

low income households in the U.S., but their sample is small. Bratberg et al. (2008) use administrative data from Norway, a country with a much lower intergenerational correlation of earnings, and find that job displacement reduces future earnings of the worker but not of their children.

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high cholesterol, and hypertension, and they find reductions in the incidence of infectious illness among adults after job loss. Other papers that look at job displacement and adult health have found significant effects on adult mortality, suicide risk, cardiovascular health, risky behaviors such as alcohol abuse and smoking, traffic accidents and mental illness (Sullivan and Von Wachter, 2009; Deb et al., 2011; Classen and Dunn, 2012; Browning and Heinesen, 2012; Black, Devereux and Salvanes, 2015).

Two recent related papers have studied the effect of aggregate economic conditions on children's health using data from the National Health Interview Survey. Golberstein et al. (2016) and Page et al. (2016) both find that increases in state unemployment lead to worse mental health for children. However, Golberstein et al. do not find that the magnitude of the response is larger among families more likely to experience job loss during an economic downturn, which suggests that the effects are not driven entirely by changes in parental employment status. Importantly, Page et al. (2016) also examine the effects of gender-specific aggregate economic shocks on child health, finding that better labor market conditions facing men are associated with improvements in child mental and physical health, while better labor market conditions facing women have opposite-signed effects.

Another strand of literature related to this paper is that on the stability of health insurance coverage and the effects of unemployment on access to health care. The loss of insurance coverage following displacement could potentially lead directly to changes in health status if it causes individuals to reduce their utilization of medical care. Among adults, Gruber and Madrian (1997) find that job separations (including both layoffs and quits) have a large impact on the probability of having any insurance. Schaller and Stevens (2015) also find significant effects of involuntary job loss on insurance coverage in their study of adults in the MEPS: a 10 percentage point reduction in insurance coverage following job loss among the full adult sample, and a 26 percentage point reduction in coverage among workers that were insured through their employer prior to displacement. They also find negative effects on health care utilization among workers who were insured through their employer prior to displacement.

For children, the effects of job loss on health insurance coverage are likely to be smaller than those for adults. While a majority of both adults and children are insured through an employer-provided policy, there have been large expansions in the eligibility of children for public health insurance. Publicly provided child health insurance has the potential to insulate children from

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the consequences of job instability. Cawley and Simon (2005) and Cawley et al. (2013) study the effects of state unemployment rates on health insurance coverage for both adults and children, and find that an increase in the unemployment rate significantly decreases the probability of being insured for men, but not for women and children, who they argue are relatively insulated from these fluctuations due to public insurance policies. To our knowledge, the only paper that looks at the effects of parental job loss on child health insurance coverage is that of Fairbrother et al. (2010), which finds large increases in children's likelihood of becoming uninsured in the three months after parental displacement. However, the authors categorize any job separation as a job loss, and they do not control for unobserved characteristics that may be correlated with both a job separation and loss of insurance.

Finally, as job displacement constitutes an arguably exogenous shock to both employment and income, studying its effects on child health can provide insight into the nature of the causal effects of parental employment and family income on child health, although it does not allow to disentangle both effects. Existing research has estimated the effects of maternal employment on child health using child fixed effects models and instrumental variables models (based on welfare-to-work program eligibility or kindergarten eligibility of younger siblings), but none of them have used job displacement as a source of identifying variation. This research has documented negative effects of maternal employment on child health outcomes at different ages for children in high socio-economic status families, while the evidence is mixed for children in low socio-economic status families (see, for example, Anderson et al., 2003; Gennetian et al., 2010; Ruhm, 2000, 2008; Morrill, 2011). With regard to income, though there is well documented evidence of a positive cross-sectional correlation between family income and child health (Currie, 2009 provides a review of these studies), it has proven difficult to identify causal effects. It could be that unobserved characteristics of the parents or the environment in which the child is raised are correlated with both family income and child health. So far, the few papers that do try to establish the causal effect of income on child health only look at health at birth.[5]

[5]Conley and Bennett (2000, 2001) use mother fixed effects and find that income at time of birth does not have a significant effect on birth-weight in general, but they do find effects for children whose mothers had low birth-weight themselves. A caveat of these papers is that the data they use from the PSID has a relatively small sample. Hoynes et al. (2013) exploit variations caused by tax reforms in the generosity of the federal Earned Income Tax Credit (EITC) as a source of exogenous variations in family income. They find that an increase in the EITC income increases the mean birth-weight and reduces the incidence of low birth-weight. They also find that it increases the use of prenatal care and reduces smoking by pregnant women.

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In our paper we are able to build significantly on the existing literature by using a dataset that allows us to (i) identify plausibly exogenous sources of job separation, (ii) link parents to their children and follow them over several survey waves, (iii) obtain information on health insurance coverage, health care utilization, and a variety of health outcomes from the same source, and (iv) explore heterogeneity in the treatment effects of parental job displacement on child health along several dimensions, including family income, parental education, and family structure.

IV. DATA

We use data from the Medical Expenditure Panel Survey (MEPS), maintained by the Agency for Healthcare Research and Quality. Since 1996, each year the MEPS selects a new nationally representative subsample of households participating in the previous year's National Health Interview Survey conducted by the National Center for Health Statistics. In each new panel the respondents are interviewed in five rounds spanning two full calendar years. Round length varies across rounds and across households - in our sample, reference periods are between three and five months, with an average duration of 4.2 months. The survey collects data on reported health status and specific medical conditions, as well as health insurance coverage, health care use, demographic and socioeconomic characteristics, and employment. The information provided by the household respondents is complemented with information collected from a sample of medical providers, which is primarily used by the MEPS as an imputation source to supplement or replace household reported information on visits, diagnosis, and expenditures. Our sample includes 16 waves of the MEPS, covering the period 1996-2012. We limit our sample to children who were 1 to 16 years old and had at least one parent employed at the time of the first interview (round) of the survey.[6]

The MEPS is ideally suited for this analysis for several reasons. First, it provides rich information on child health that includes parental ratings of general health and mental health status, as well as specific health conditions and mental disorders, which are documented in conjunction with health care use and expenditures. This provides a broad picture of child health and allows us to identify groups of health conditions that are common and/or costly among children and are likely

[6]We trim 6.4% of the children in the sample because they do not have data for all five rounds of the survey. Another 4.4% of children are dropped from the sample because they have missing data on parental education, mother's marital status, or health outcomes, and 9% of children do not have either parent employed in the first round of the survey.

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to be related to parental job loss in the short run. Second, it allows us to examine potential mechanisms, such as changes in insurance coverage and health care utilization, using the same dataset. Finally, because it is comprised of many short panels, the MEPS provides a relatively large sample of children with displaced parents, which is unusual in studies of displacement that rely on survey data. This enhances our statistical power and allows us to explore heterogeneity in the effects of parental displacement on child health.

Our indicators for involuntary job displacement are constructed from a section of the MEPS survey in which respondents are asked to choose the main reason why they changed jobs since the last interview from a list of possible responses. In our analysis, we define involuntary displacement as displacement for one of two reasons: "business dissolved or sold," or "laid off."[7] Based on this definition, we create a post-displacement indicator variable that turns to one at the interview immediately following displacement and remains "turned on" in all future rounds.

Although both causes for job loss we consider are likely to be involuntary, one potential limitation of this approach is that displacements might be correlated with family characteristics that are also related to child health. Comparing summary statistics between displaced and non-displaced workers in Table **??**, and across the two types of displacement in Table **??**, it is clear that there are differences between the groups. We do several things to address this concern. First, by including child fixed effects in our analysis we are able to remove bias related to any unobservable characteristics that are fixed over time. Second, in the robustness section we discuss estimates of models in which we include indicators for the period prior to displacement to ensure that there are no signs of preexisting trends in child health that are associated with parental displacement, finding none. We also discuss the results of changing the definition of displacement to includes only firm closures—an approach that is common in the literature on job displacement. We note, however, that, limiting the definition of involuntary displacements results in a substantial decrease in the number of displacements that we observe. We also note that individuals displaced in business closure events are generally more-advantaged than laid off workers, which may change the expected treatment effect.

As is standard in the job displacement literature, we restrict our samples so that for the analysis

[7]Other possible responses include: "job ended," "retired," "illness or injury," "quit to have a baby," "quit to go to school," "quit to take care of home or family," "quit because wanted time off," "quit to take another job," "unpaid leave," or "other."

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of fathers' displacements, the at-risk sample includes children whose fathers have at least one year of job tenure in the first round of the survey, and for the analysis of mothers' displacements, the at-risk sample includes children whose mothers have at least one year of job tenure in the first round of the survey. We also exclude children whose parents are self-employed or employed in temporary jobs in Round 1. Defining the samples this way ensures that the displaced parents in the sample are attached to the labor market prior to job loss (i.e. that job loss is, in fact, a "shock" to employment) and that the samples used to help identify the control variables (such as age and seasonal effects) are as similar as possible to the treatment groups. We note, however, that there are differences in baseline characteristics between children in the father-employed sample and children in the mother-employed sample that make direct comparison of the effects of paternal and maternal job displacement more difficult.[8]

A detailed description of the sources and construction of the health-related variables used in this analysis is provided in Appendix B. The outcome variables that we examine can be divided into the following categories:

1. Health Outcomes. We make use of two sources of health information available in the MEPS. First, respondents (usually parents) are asked to rate the health and mental health status of each child in the family according to the following categories: excellent, very good, good, fair, and poor. We generate indicators for whether a child's health and mental health were reported to be fair or poor. Second, we use data from the MEPS Medical Conditions files to construct a set of summary health indices reflecting acute, chronic, and trauma-related physical health conditions, and mental health conditions. The measures of specific health conditions that we use to construct these summary indices are based on responses to multiple survey questions. Respondents are asked about diagnosis of specific priority conditions, about any condition associated to medical events (doctor visits, hospital stays, emergency room visits and prescription drug purchases) or disability (missed school) days, and about whether a condition has bothered the child during the reference period. Once a condition is reported, follow-up questions are asked in subsequent rounds.

[8]Many studies of displaced workers restrict their samples to workers with three or more years of job tenure prior to displacement. We estimated models in which we restricted our analysis to the children of workers with three years of tenure in round 1. The estimates were very similar, though less precise. We have also estimated our results on the sample of children whose mother and father were both employed with at least one year of job tenure in round 1, including indicators for both mothers' and fathers' displacements in the same regression. The results, discussed in Section **??**, are similar to our main results. Additional analyses for children with different family types (single earner, single parent) are discussed in Section **??**.

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We group child health conditions into four indices.[9] The first includes acute (infectious) conditions, such as acute upper respiratory conditions and intestinal infections. The second index combines chronic respiratory and nutritional/metabolic conditions, including asthma, COPD, diabetes, and anemia. The third includes trauma-related conditions such as injuries, burns, and poisoning. The final index combines mental health conditions, including depression, anxiety, and acute response to stress, with physical symptoms of emotional distress (headaches, malaise and fatigue),[10] and the mental health fair/poor indicator. We focus on health conditions that are (1) observed reasonably frequently among the children in the MEPS sample, (2) might plausibly respond to parental job loss in the short-run, and (3) are likely to be apparent externally or display immediate symptoms, and thus to be diagnosed soon after onset. We include conditions that have been identified as the most costly children's conditions (Soni, 2009), except for developmental disorders and other mental health conditions (such as attention deficit/hyperactivity disorder) that are unlikely to respond to contemporaneous shocks.

2. Health Insurance Status. We look at whether the child is covered by any insurance, private insurance, or public insurance (including Medicaid, CHIP, Tricare, and other public hospital/physician coverage) at the time of interview.

3. Health Care and Prescription Drug Utilization. We use information on the reported reason for each medical visit observed in the MEPS data to create indicators for checkups and well-child visits, diagnostic visits, emergency room visits, mental health visits. We also look at prescription drug use during each round. Studying these different types of medical care utilization helps us to identify any sources for concern for reporting biases due to reduced access to care. In particular, we look at checkups and well-child visits to identify any changes in health care utilization unrelated to the health status of the child. Additionally, our measure of visits to mental health professionals allows us to identify whether any effects on mental health are reflected in health care utilization or if they are solely identified on the basis of perceived measures (such as perceived mental health status or whether a condition is reported to have been bothering the child).

Because of the large array of health outcomes identifiable in the MEPS data and because we

[9] We report the effects of paternal and maternal job loss on each individual component of the summary health indices in Appendix Table **??**.

[10] Due to strong associations between unexplained somatic complaints, such as headache and fatigue, and anxiety and depression, many researchers recommend that children with these complaints undergo psychiatric evaluation (e.g. Campo, 2012; Egger et al.,1999; Masi et al., 2000; Carter et al., 1995).

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are interested in exploring heterogeneous effects of parental job loss for a variety of subgroups, we face a multiple inference problem. One way in which we address this issue is by aggregating health outcomes into a set of summary standardized health indices. As discussed in Anderson (2008), summary indices increase statistical power, which is particularly helpful in analysis of effect heterogeneity across subgroups. Moreover, because each index represents a single test, adding additional outcomes to an index does not increase the probability of a false hypothesis rejection. Following recent empirical studies (Kling et al., 2007; Deming, 2009; Hoynes et al., 2015), we generate our summary indices by normalizing each variable (subtracting the Round 1 sample mean for the treated group and dividing by the standard deviation) and averaging across the variables within each index. We construct indices representing four health categories: (1) acute (infectious) illness, (2) chronic conditions, (3) trauma-related (physical injury) conditions, and (4) mental health. Details about the components of each of these indices are provided in Appendix B.

Before proceeding, we emphasize that, as in most of the existing literature, all measures of child health in the MEPS are reported by survey respondents (usually the mother). As such, it is possible that changes in these measures may result from changes in the respondent's own mental state, rather than changes in the child's actual health. Like Golberstein et al. (2016), who study the effects of aggregate economic downturns on parent-reported child mental health, we have explored this possibility with regressions of both parents' mental health outcomes on both maternal and paternal job displacement. We find only weak evidence (at 10% significance level) of worse mental health of fathers after their own displacement. However, in 79% of our sample the survey respondent is the mother, and we find no evidence of any effects on the mother's mental health after either parental displacement and no evidence of any change in the identity of the respondent after job displacement.[11] As discussed above, another issue is that, because a medical condition is identified in the data when a health event related to the condition occurs, changes in our health indices may be related to changes in the consumption of health care. We explore the potential for changes in the frequency of medical care to influence reporting directly by looking for changes in the use of routine care after displacement, and again find no statistically significant association. Nonetheless, we interpret our findings with these caveats in mind.

Table **??** presents Round 1 summary statistics by parental displacement status for the father-

[11] Results available from the authors upon request.

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employed and mother-employed samples. A number of statistically significant differences between the columns highlight the importance of our empirical approach, which includes individual fixed effects and linear time trends that are allowed to vary depending on baseline health status. Specifically, the children of displaced workers are less likely to be white and their parents are less likely to have a college education. The children of displaced workers also are more likely to come from single-mother families and families with income below 200 percent of the poverty line, and have lower levels of private health insurance coverage and higher levels of public insurance coverage prior to job loss. Looking at health outcomes, Table **??** shows significant differences between the health of children whose fathers were displaced after Round 1 and children whose fathers were not displaced. In particular, children whose fathers are employed and are never displaced are more likely to experience acute health conditions and mental health problems than children with fathers who are later displaced, and children whose mothers are employed and never displaced are more likely to be injured than children with mothers who are later displaced. Finally, the means in Table **??** reveal important differences between the father-employed and mother-employed samples that are important to keep in mind when comparing the effects of paternal and maternal job loss. Specifically, black children and children in families with income below 200 percent of the poverty line make up a larger share of the mother-employed sample.

V. EMPIRICAL APPROACH

We estimate a series of fixed-effects models, each with a different health-related dependent variable. Our main regression equation is as follows:

$$Y_{it} = \alpha_i + \beta D_{it} + \gamma X_{it} + \delta_t + \varepsilon_{it} \tag{1}$$

where Y_{it} is the outcome variable for child i in round t, α_i is a child-specific fixed effect, D_{it} is an indicator for post-parental displacement periods, X_{it} is a vector of time-varying control variables, and δ_t is a set of round dummies. Child fixed effects are included to account for permanent characteristics of children and families that may be related both with child health and the likelihood of parental displacement. The time-varying controls include dummies for child age and the calendar year in which the interview took place, month of interview dummies to control for seasonality in

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both health outcomes and the likelihood of parental displacement, and separate linear time trends for each of the five baseline health categories.[12] We also control for the length of the round in days, which varies across individuals even within the same panel and round due to variation in interview dates across households. Observations are weighted by MEPS individual sample weights.[13] To adjust for correlations across children within families and correlation within families over time, the standard errors are clustered at the household level.

As discussed in the previous section, the large number of outcome variables in our analysis and our interest in exploring heterogeneity across subgroups open us up to a potential concern about multiple inference. While our summary health indices help to address this issue by reducing the number of hypotheses being tested, we still have a large number of outcome variables in our analysis. For this reason, we also control the familywise error rate (FWER)—the probability of rejecting at least one true null hypothesis—using the step-down algorithms described in Romano and Wolf (2005).[14] The details of this method are described in Appendix C. The resulting adjusted p-values, displayed in our results tables, can be interpreted as the probability that a result as extreme as the observed individual test-statistic will appear when there is no causal basis for any effect among the group of hypotheses being tested.

Within this empirical framework, causal identification of the effects of parental job loss relies on the assumption that the job loss is exogenous with respect to family and child outcomes. In other words, there must be no unobservable *time-varying* factors that are correlated both with the probability of worker displacement and with child health outcomes. It must also be the case that changes in child health do not directly cause changes in the likelihood of parental displacement. While we cannot entirely rule out either of these possibilities, we address concerns about endogeneity in several ways. First, we choose our definition of job displacement carefully, focusing on reasons for job changes that are likely to be involuntary and exogenous to child health. Limiting our sample

[12]The results are nearly identical if we do not include linear trends, or if we include separate time trends by parents' educational attainment. The results are also robust to controlling for parent's age and the presence of a father in the household. These results are available from the authors upon request.

[13]Following Solon et al. (2014), we have also conducted our analysis without using sample weights. Though there are some differences between the results from the unweighted analysis and our main results, the discrepancies between the two sets of results are consistent with the known oversampling of minority groups in the MEPS and the heterogeneity in treatment effects that we observe between groups. Unweighted results are available from the authors upon request.

[14]Other recent applications of stepdown methods for FWER correction include Anderson (2008), Barrow et al. (2014), Finkelstein et al. (2012), and Kling et al. (2007).

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to workers with at least one year of job tenure also helps to address potential endogeneity. Finally, we check for a potential red flag by estimating models in which we include an indicator for the survey round *prior* to displacement to look for any changes in child health that might occur prior to the event.

VI. MAIN RESULTS

VI.A. Parental Job Loss and Child Health

We begin, in Table **??**, by estimating the effects of fathers' and mothers' job losses on parent ratings of child health and mental health and on our four summary health indices. The results in the top panel show that paternal job loss has negative effects on reported physical and mental health. In particular, a father's job loss increases the likelihood that a child's physical and mental health are reported to be fair or poor by 1.1 percentage points each—52 and 85 percent increases from the baseline means of the physical and mental health variables, respectively. We also see an increase in the mental health summary index of 0.083 standard deviations. To put the magnitude in context, this coefficient is almost twice as large as the difference between the mean mental health index for children in the top and bottom quintiles of family earnings in our full sample, and more than twice as large as the difference in means between children in two-parent dual-earner families and children in single mother families. This effect is significant even after the multiple hypothesis testing (MHT) adjustment, while the effects on the indicators for fair/poor reported physical and mental health are less robust to the MHT adjustment. We also observe suggestive evidence of a *reduction* in the incidence of trauma (injuries) following paternal job loss—a finding that is potentially consistent with changes in physical activity resulting from a negative income shock. However, this effect is not significant in the full sample after MHT adjustment.

The effects of mothers' job losses, shown in the bottom panel of Table **??**, are quite different from the effects of fathers' job losses. We find that maternal job loss does not have significant negative effects on child physical or mental health. Instead, maternal job loss is associated with a reduction of 0.037 standard deviations in the mental health summary index that is significant at the 10 percent level according to the naive p-value but does not stand up to MHT adjustment.

The differences between the patterns in the effects of fathers' and mothers' job losses in Table **??**

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are perhaps not surprising in light of the existing literature and potential mechanisms at work. As discussed in Section **??**, previous theoretical and empirical research suggests that the stress effects of paternal displacement are likely to be larger than those from maternal job loss. Our finding that children suffer worse mental health following paternal displacement, but not maternal displacement, is consistent with this story. Considering the long-run implications of this finding, short-run changes in mental health following paternal job loss might have broader impacts on children's health and academic achievement that could translate into the long-run effects on educational attainment and labor market outcomes that have been found in other studies (e.g. Oreopoulos et al., 2008). Meanwhile, the opposite-signed effects of maternal job loss on mental health (thought admittedly only weakly significant) are consistent with previous findings on the effects of maternal employment and aggregate female labor market shocks on child outcomes.

VI.B. Parental Job Loss, Health Insurance Coverage, and Health Care Utilization

To investigate the mechanisms behind the health effects observed in Table **??**, we next explore the effects of parental job loss on health insurance coverage and health care utilization in Table **??**. If parents forego treatment for medical conditions as a result of a lack of insurance coverage or a change in the source of coverage, these results have potentially important implications for the interpretation of our main results. While we believe that the acute nature of many of the health conditions that we consider makes it is unlikely that parents would not seek treatment for these conditions even in the absence of health insurance, we acknowledge the possibility that the estimated effects of parental displacement on all of our health indices might be biased downward by reductions in the likelihood of diagnosis and treatment of the specific conditions that contribute to the indices. If we find significant decreases in health insurance coverage and routine healthcare use following displacement, then we have reason to be concerned about this issue.

The effects of parental job loss on children's health insurance status are shown in the first three columns of Table **??**. The results show that both paternal and maternal job losses lead to reductions in private insurance coverage and increases in public insurance coverage. We see that while the effects of parental job loss on private insurance coverage are fairly substantial (decreases of 12.9 percentage points in the father-displaced sample and 13.8 percentage points in the mother-displaced sample), these effects are counteracted by increases in the likelihood of public coverage that make

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up 40 to 50 percent of the loss. As a result, the likelihood of having insurance coverage from any source is reduced by only 6.8 and 7.4 percentage points following paternal and maternal job loss, respectively. These effects, which translate to 7.4 to 8.4 percent of the baseline means, are smaller than the effects found by Schaller and Stevens (2015), who use the MEPS to study the effects of job displacement on adult health outcomes, insurance, and utilization.[15] Thus, our results suggest that families are making use of the public safety net following involuntary displacement.

In the remaining columns of Table **??**, we explore whether parental job loss results in changes in children's medical care utilization. We acknowledge that changes in utilization may be driven simultaneously by changes in family income, changes in insurance status and source of coverage, and changes in health status, and interpret our findings with caution. Perhaps not surprisingly, given the relatively small changes in insurance coverage that we observe, we find no significant effects of parental displacement on the likelihood of receiving a checkup or well-child visit during the survey round. Thus, it appears that family income shocks and changes in insurance coverage do not substantially affect the use of routine medical care in the short run. This finding is reassuring, as it suggests that our health effects are unlikely to be driven by changes in the likelihood of diagnosis.[16] We also find no significant effects of parental displacement on diagnostic or emergency visits. We do see an increase in the probability of a mental health visit following paternal displacement, which is consistent with the mental health results from the previous table. This effect, though small in absolute terms, is large in relative terms, representing an increase of about 78 percent from the baseline mean in the displaced sample. However, its significance drops after MHT adjustment.

[15]Schaller and Stevens (2015) find that job displacement results in a 14.4 percent reduction in the likelihood of having any insurance for adults in the MEPS sample. Part of this difference can be explained by differences in the availability of public insurance coverage to adults; only 8 percent of displaced adults in their sample had public coverage in round 1.

[16]To further alleviate the concern that sick children might be less likely to visit the doctor and thus less likely to be diagnosed with a particular medical condition following parental displacement, we additionally investigated the raw and regression-adjusted correlations between parent-reported general health ratings, which are not mechanically related to specific medical events, and the likelihood of checkup or diagnostic visits. We wanted to see if these correlations are different for children whose parents were recently displaced than for other children. The idea behind this exercise is that parents' ratings of their child's overall health status should reflect not only conditions for which the child visited a doctor, but also conditions that the family chose to treat at home or opted not to treat. If the relationship between reported general health and doctor visits is weaker following displacement, we might worry that some conditions are not being officially "diagnosed" in our data. We find that the correlations seen immediately following parental displacement are very similar to those for the rest of our sample. Though they do not necessarily reflect causal relationships, the fact that these correlations don't change following parental displacement suggests that the likelihood of getting treated for a particular health condition also does not change dramatically.

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VII. EFFECT HETEROGENEITY

As discussed in Section **??**, it is possible that the effects of parental job displacement seen in the full sample are masking important heterogeneity in the treatment effects along a number of dimensions. In this section, we explore heterogeneity in the treatment effects of parental displacement by family earnings, parental education, family structure, child age, and child gender. Before proceeding, we note that in this section and the next section, we conduct our heterogeneity analysis by interacting parental job displacement separately with a set of family or child characteristics in order to test for differences in the response of child health to job displacement across groups. However, all of the patterns that we discuss are robust to an alternative approach in which we stratify our sample by the same family characteristics in order to allow the effects of the control variables to vary between the groups.

VII.A. Socioeconomic Status (SES) and Family Structure

One of the notable findings from studies of the long-run effects of parental job displacement is that the effects tend to be concentrated among relatively disadvantaged households. Oreopoulos et al. (2008) and Page et al. (2009) find that the strongest effects of parental job loss on children's labor market and educational outcomes in adulthood are found at the bottom of the income distribution. Differences in the short-run health impacts of parental displacement by family income could potentially contribute to this result. Thus, in Tables **??** and **??**, we explore whether the effects of fathers' and mothers' job losses on child health differ depending on the family's socioeconomic status prior to displacement, using family earnings and parents' educational attainment as proxies for socioeconomic status.

We also investigate differences by family structure and the number of earners, comparing the effects of paternal displacement in dual-earner and single-earner families and comparing the effects of maternal displacement in two-parent versus single-mother families. A priori, it is difficult to predict how the effects will differ by family type. Single earner families may have fewer resources with which to respond to an earnings shock, and displacement is more likely to cause a child to lose private health insurance coverage when only one parent is employed. On the other hand, Kalil and Ziol-Guest (2008) provide evidence that the negative effects of paternal displacement on children's

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academic outcomes are more pronounced in two-earner households and suggest that this is because fathers are distressed at losing their "breadwinner" status. Meanwhile, mothers in two-parent families may be more likely to remain out of the labor force longer following displacement than single mothers, so it may be more likely to observe reductions in infectious illness and other effects related to changes in childcare arrangements in these families.

Though the estimated coefficients do not remain individually significant after MHT adjustments, the patterns in Table **??** consistently suggest that the negative effects of paternal job loss on child physical, and to some extent also mental health, seen in Table **??** are larger in low-SES families. In particular, children in families with income below 200 percent of the federal poverty line, children whose highest-educated parent has not attended college, and children in single-earner families all experience increases in fair/poor physical health, acute (infectious) illness, fair/poor mental health and the mental health summary index after paternal job loss. While children in high-SES families also experience worse mental health after paternal job loss, they do not experience worse physical health. We also see that the reduction in injuries associated with paternal job loss observed in the full sample is concentrated among children in high-income, college-educated families. Importantly, this result also seems to be driven by single-earner families, which suggests that it may result from changes in time use (reduced sports participation, for example) following the job loss of the primary earner.

Examining heterogeneity in the effects of maternal displacement, presented in Table **??**, we find two striking patterns. First, we find suggestive evidence of *positive* effects of maternal job loss on mental health among low-SES families. Specifically, children in low-income and less-educated families and children in single-mother households experience reductions in fair/poor mental health and reductions in the summary mental health problems index, though each individual estimate is not robust to MHT adjustment. We also find suggestive evidence of reductions in acute (infectious) illness in high-income families. This pattern, which is echoed by negative but statistically insignificant effects of maternal job loss on acute illness among the college-educated and two-earner samples, is consistent with the idea that mothers in high-SES families might be choosing to substitute home care for market-based childcare during unemployment.

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VII.B. Child Age and Gender

Next, in Table **??**, we estimate the effects of parental job loss on child health by the age and gender of the child. Recall from Section **??** that we might expect to see improvements in health among the pre-school-aged children if parents are substituting home care for market-based childcare after job loss, but otherwise it is difficult to predict how the effects should vary by age or gender. To check for heterogeneity by age, we separate our data into three age groups: age 1-5 (pre-school aged), age 6-12 (primary and middle school), and age 13-18 (teens). We do see evidence that suggests that the physical health of the youngest children (ages 1-5) might improve slightly following maternal job loss, however most of the differences across age groups are not statistically significant. We do not find statistically significant differences in the coefficients by child gender for any outcome, though both the increase in fair/poor physical health and the reduction in trauma after paternal displacement appear larger for boys than for girls.

VIII. SPECIFICATION AND ROBUSTNESS CHECKS

VIII.A. Timing of the Effects

Next, we estimate models in which we include three separate displacement indicators: one for the period prior to displacement, one for the period in which displacement occurs, and one for the periods after displacement. There are two reasons to do this. The first reason is that previous research has shown that the earnings losses associated with job displacement may begin as early as two years before the displacement occurs (Jacobson et al. 1993). Though the reasons for the pre-displacement decline in earnings are unknown, this pattern could mean that child health may be affected by changes in income, parental time use, and stress *before* displacement. This could affect the magnitude of our estimated coefficients if our pre-period is contaminated with treatment effects. For example, if the pre-period treatment effects on a health outcome are negative, then we will be underestimating the total treatment effect in our main specification. The second reason for estimating these models is to use the pre-displacement indicators as a placebo test to reduce concerns about the endogeneity of parental displacement. However, this relies on the assumption that there are *no* treatment effects in the pre-period. If we were to find significant deterioration in child health in the period prior to parental displacement, it would be difficult to sort out the

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reasons for this—we may be able to attribute it to early treatment effects, as described above, but we would also be concerned that the health shock is related to the reason for the subsequent job displacement.

Estimates showing the timing of the health effects of fathers' and mothers' job losses are presented in Table **??**. We do not see any significant health effects in the period prior to displacement. Moreover, the patterns of the coefficients for both the physical and mental health effects of fathers' job loss are consistent with effects that show up in the round of displacement and persist in the rounds after displacement. This suggests that any decreases in income, increases in stress levels and changes in time use associated with job loss do not measurably affect children's health before job loss occurs and mitigates concerns about reverse causality and omitted variable bias.

VIII.B. Economic Conditions

A factor not yet considered is the state of the local economy at the time of displacement. A large literature has shown that macroeconomic conditions are associated with health, mental health, time use, and other outcomes for adults. Recent studies have also shown that aggregate economic downturns are associated with worse mental health for children (Golberstein et al., 2016; Page et al., 2016). As displacements are more likely to occur when macroeconomic conditions are bad, it is possible that our displacement indicator is picking up the effects of experiencing an economic downturn, rather than the direct effects of involuntary job loss.

Another way in which macroeconomic conditions might play a role in our analysis is as a source of heterogeneity in our estimated coefficients. In particular, it is possible that the effects of job displacement on child health might vary depending on the state of the local economy at the time that the displacement occurs. However, the direction of the change is unclear. It is possible that job displacement might carry less stigma during an economic downturn, as displacement is widespread when the economy is suffering, but displacement may also result in more financial strain and a longer period of unemployment during an economic downturn. It is also important to keep in mind that selection into job displacement is also likely to be different during an economic downturn, so any differences in the estimated coefficients may be the result of a change in the composition of the treated group.

To explore the link between parental job loss and local economic conditions, we use restricted

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information on the geographic location of the MEPS respondents, obtained with special permission from the AHRQ. First, we estimate our health regressions with an additional control for the state monthly unemployment rate at the time of each interview. The results, presented in the first section of each panel of Table **??**, show that while increases in local unemployment rates are associated with increases in the incidence of acute and chronic conditions, the effects of parental displacement are unchanged when local economic conditions are included in the regressions. Next, we examine whether the treatment effects of parental job displacement are different during an economic downturn by interacting the displacement variables with indicators for whether the state unemployment rate is high (above 5) or low at the time of the displacement. The results again show no clear role for local economic conditions in mediating the effects of parental job displacement on child health. Although there are some differences in the point estimates and their statistical significance,with generally estimates when the unemployment rate is high, the estimated effects are usually of the same sign when unemployment is high or low, and the differences are not statistically significant.

As an alternative way of exploring whether macroeconomic conditions matter for the effects of parental displacement on child health, we split our sample into two parts, separating panels that begin prior to 2008 (the start of the Great Recession) from panels that begin in 2008 or later. This approach is somewhat crude, given that there may be changes in health behaviors, sample composition, survey methodology, or other unobservable factors over the time period that contribute to differences in the estimated effects. However, it gives us some idea of whether the health effects of parental displacement are substantially different in the later years of our data, when the national economy was in the midst of a severe downturn and slow recovery. These results, shown in the last section of each panel of Table **??**, show that our main results are not different in the two time periods, with the only exception of the effects of paternal job loss on the summary trauma index, which suggest that paternal job loss leads to reductions in the incidence of injuries only in the period before 2008.

VIII.C. Other Robustness Checks

One of the caveats of comparing our main estimates for the effects of paternal and maternal job losses is that these effects are estimated over different at-risk samples (children with father

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employed and mother employed in the first round, respectively). For example, as discussed in Section **??**, the at-risk sample for maternal job loss is relatively less advantaged. In this context, part of the differences in the estimated effects across the gender of the parent may be related to heterogeneous effects of parental job loss across the two samples. To check if this is the case, we have also estimated the effects of paternal and maternal job losses on the sample of children whose mother and father were both employed with at least one year of job tenure in round 1, including indicators for both mothers' and fathers' displacements in the same regression. The results, shown in Appendix Table **??**, are similar to our main results; we still find no significant effects of maternal job loss on child health and negative effects of paternal job loss on mental health, but we do not find a significant effect of paternal job loss on reported physical health. Although this sample is smaller than the samples used for our main estimates, the difference between the effects of fathers' and mothers' job losses on the mental health problems index is significant at a 10% confidence level.

To further check the robustness of our results, in particular to potential threats to the identification due to potentially endogenous job separations, we also present in the Appendix our main results using a definition of displacement that includes only firm closures—an approach that is common in the literature on job displacement. We note, however, that individuals displaced in business closure events are generally more-advantaged than laid off workers, which may change the expected treatment effect (see Appendix Table **??**). Appendix Table **??** shows the estimated effects of parental job losses on the six health outcomes, using this alternative definition of job displacement. Although limiting the definition of involuntary displacements substantially reduces the number of displacements that we observe, we still find a statistically significant effect of paternal job loss on the summary mental health index that is very similar to our main estimate. In addition, we find a larger and statistically significant reduction in the summary trauma index after this type of paternal displacements. However, the statistical significance of these estimates is not robust to MHT adjustment. Our point estimate for the effect of paternal job loss on physical health being reported as fair or poor is virtually the same as our main estimate, but it is not statistically significant. In sum, our main takeaways from the analysis with job displacements caused by both business closures and lay-offs are not changed when we limit job displacements to business closures only.

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Finally, to further improve the comparability of the treatment and control groups, we estimate regression models that are weighted for an estimate of the propensity of having a parent that is displaced. To do this, we first estimate a logit model of the probability of having a displaced father as a flexible function of parental and job characteristics in round one. In particular, the model includes a cubic function of in job tenure, full time status, employer-provided health insurance status, whether a worker is salaried, a cubic function of hourly earnings, union status, employer size dummies, industry and occupation dummies, parent health, mental health, educational attainment, marital status, race, ethnicity, a quadratic function of parent age, and dummies for missing observations for each job characteristic. Following Hirano, Imbens, and Ridder (2003), we estimate average treatment effects for the treated by assigning weights of 1 to treated observations (children with parent ever displaced) and weights of $\frac{p}{(1-p)}$ to all control observations (children with parent never displaced), where p is the predicted propensity score. Given that our main estimates use MEPS sample weights, we multiply these propensity-score weights by the MEPS sample weights (DuGoff, Schuler, and Stuart, 2014). The results from this analysis are presented in Appendix Tables **??** (health outcomes) and **??** (health insurance and utilization outcomes). Although the estimates are less precise, the point estimates of the effects of both fathers' and mothers' job losses are very similar to our main estimates.

IX. DISCUSSION AND CONCLUSION

This study examines the short-run effects of involuntary parental job loss on children's health. We find that the health effects of parental job loss depend on the gender of the displaced parent. In particular, for children of all ages and socioeconomic backgrounds, we find that paternal job loss has robust detrimental effects on child mental health, while maternal job loss does not. These findings are in line with theoretical and empirical work in psychology and sociology on differences between men and women in the psychological impacts of job separation (e.g. Leana and Feldman, 1988; Waters and Moore, 2002; Kalil and Ziol-Guest, 2008), with research on the psychological effects of plant closures (Eliason and Storrie, 2009; Kuhn, Lalive, and Zweimuller, 2009), and with research on the effects of gender-specific aggregate labor market shocks on child health (Page et al., 2016). They are also consistent with studies showing that paternal job loss has negative impacts

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on children's academic achievement, while maternal job loss does not (Kalil and Ziol-Guest, 2008; Rege et al., 2011).

Our results also show that the effects of both fathers' and mothers' job losses on child health depend substantially on the socioeconomic status of the family in which the displacement occurs. In families with low earnings or parental educational attainment, the negative effects of paternal job loss are not limited to mental health status—we additionally find suggestive evidence that a father's job loss increases the likelihood that parents report their child's health to be fair or poor and the incidence of infectious illness (acute conditions index). By contrast, among children in high-SES families, paternal job displacement does not have negative effects on children's physical health, and is actually found to reduce the incidence of physical injuries. Turning to maternal job loss, we find that a mother's displacement reduces the incidence of mental health problems among children in low-SES families. This is not the case in high-income families. However, we do find suggestive evidence that maternal displacement is associated with small reductions in infectious illness.

Another important finding from this study is that public health insurance programs such as Medicaid and the CHIP are serving as a safety net for children following job loss. It does not appear that the changes in health status that we observe are due to reduced diagnosis resulting from changes in insurance coverage, as we find only limited effects of job loss on children's health insurance coverage and no effects on the utilization of routine and diagnostic medical care. When we look at health insurance coverage by source, we find a substantial increase in the probability of having public insurance coverage following displacement, which largely counteracts the decrease in private coverage. As a result, the estimated effects of job displacement on the likelihood of children having coverage from any source are substantially smaller than the corresponding estimates for adults using the MEPS data (Schaller and Stevens, 2015).

One limitation of our study is that we cannot extend our observation period beyond the scope of the MEPS panel, which is only two years in length. As a substantial fraction of displaced workers regain employment soon after displacement (72 percent of displaced dads and 62 percent of displaced moms in our samples are reemployed by the end of the panel), it is possible that some of the health changes associated with the initial shock to income and time use will diminish over time. It is also possible that the effects of job displacement related to income loss and stress will

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become larger over time. Job displacement is associated with permanent decreases in earnings and increased likelihood of future displacement (Jacobson et al., 1993; Stevens, 1997), so an initial displacement may be only the beginning of a tumultuous period for a family. Increased stress in the period immediately following displacement may also take time to translate into worse physical health. We also acknowledge that it is difficult to foresee whether temporary changes in contagious illness in childhood translate into any changes in longer-term health, human capital, or labor market outcomes.[17]

Though we cannot draw any firm conclusions about the long-term welfare effects of parental job displacement from our findings due to these limitations, the results from this study highlight the importance of considering not only changes in income, but also of changes in family mental health, parental time use, and childcare arrangements, when studying the effects of job displacement on individuals and families.

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[17] According to the "cohort morbidity phenotype" theory of Finch and Crimmins (2004), the inflammatory processes that result from early life exposure to infectious illness persist from early age into adulthood and may ultimately be related to old-age mortality. On the other hand, a substantial literature in medicine and public health is dedicated to exploring the hypothesis that daycare attendance and early exposure to infectious disease in fact protect against the development of asthma, allergy, and other diseases later in life (see, e.g. Ball et al., 2000 and Nafstad et al., 2005).

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TABLES

Table 1: Round 1 Summary Statistics

	Father Employed Sample			Mother Employed Sample		
	Father Not Displaced	Father Displaced	P-Value (Difference)	Mother Not Displaced	Mother Displaced	P-Value (Difference)
Child Health Outcomes						
Health Fair/Poor	0.022	0.021	0.840	0.024	0.032	0.240
Mental Health Fair/Poor	0.014	0.013	0.680	0.018	0.025	0.238
Acute Index	0.030	0.000	0.055	-0.002	0.000	0.898
Chronic Index	0.001	0.000	0.963	-0.018	0.000	0.465
Trauma Index	-0.019	0.000	0.271	0.078	0.000	0.000
Mental Index	0.059	0.000	0.003	-0.034	0.000	0.216
Health Insurance Coverage and Utilization						
Any Insurance	0.930	0.914	0.059	0.919	0.876	0.000
Private Insurance	0.818	0.762	0.000	0.796	0.673	0.000
Public Insurance	0.134	0.173	0.000	0.141	0.232	0.000
Checkup Visit	0.154	0.158	0.738	0.146	0.146	0.988
Diagnostic Visit	0.308	0.299	0.581	0.304	0.300	0.825
ER Visit	0.030	0.031	0.895	0.035	0.030	0.487
Mental Health Visit	0.012	0.009	0.436	0.016	0.020	0.458
Prescription Drug	0.340	0.331	0.566	0.336	0.350	0.469
Demographic and Socioeconomic						
Male	0.516	0.506	0.586	0.506	0.514	0.687
Age	8.446	8.427	0.905	9.109	8.896	0.261
Black	0.077	0.118	0.000	0.149	0.191	0.002
Hispanic	0.168	0.214	0.000	0.139	0.191	0.000
Parents HS or Less	0.312	0.385	0.000	0.322	0.459	0.000
Below 200% Poverty	0.255	0.372	0.000	0.366	0.551	0.000
Single Earner	0.444	0.439	0.758	–	–	–
Single Mother	–	–	–	0.228	0.314	0.000
State Unemployment Rate	5.709	5.745	0.604	5.720	5.643	0.469
Observations	22239	1381		19336	1049	

Note: Data are from the 1996-2012 waves of the Medical Expenditure Panel Survey (MEPS). The sample includes children who were 1-16 years old and whose father (columns 1-3) or mother (columns 4-6) was employed with at least one year of job tenure in the first round in a non-temporary job. Estimates are weighted using MEPS sampling weights.

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Table 2: Effects of Parental Job Loss on Child Health

Father's Job Loss						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Father Displaced	0.011**	0.003	0.019	-0.031*	0.011***	0.083***
	(0.005)	(0.017)	(0.021)	(0.016)	(0.004)	(0.028)
Naive p-value	0.026	0.880	0.376	0.054	0.010	0.003
Adj. p-value	0.143	0.874	0.627	0.152	0.083	0.047
Mother's Job Loss						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Mother Displaced	-0.001	-0.014	0.007	0.011	-0.005	-0.037*
	(0.004)	(0.015)	(0.018)	(0.022)	(0.005)	(0.020)
Naive p-value	0.691	0.347	0.674	0.612	0.266	0.072
Adj. p-value	0.937	0.821	0.937	0.937	0.781	0.349

Notes: Data are from the 1996-2012 waves of the Medical Expenditure Panel Survey (MEPS). The sample includes children who were 1-16 years old and whose father (top panel) or mother (bottom panel) was employed with at least one year of job tenure in the first round. Construction of health indices is described in Appendix B. All regressions include individual fixed effects, dummies for age, calendar year of interview, month, and survey round, a control for the length of the round in days, and linear time trends specific to the health status reported in the first round. Standard errors (in parentheses) are clustered at the household level (* $p < .10$, ** $p < .05$, and *** $p < .01$). Adjusted p-values reflect familywise error control for the group of hypotheses of each panel as discussed in Section **??** and Appendix C. Estimates are weighted using MEPS sampling weights.

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Table 3: Effects of Parental Job Loss on Insurance Coverage and Health Care Utilization

Father's Job Loss								
	Health Insurance			Health Care Utilization				
	Any	Private	Public	Any Rx	Checkup	Diagnostic	Emergency	Psych
Father Displaced	-0.068***	-0.129***	0.063***	-0.018	-0.001	-0.008	-0.006	0.007**
	(0.014)	(0.017)	(0.012)	(0.015)	(0.014)	(0.015)	(0.007)	(0.003)
Naive p-value	0.000	0.000	0.000	0.235	0.960	0.598	0.393	0.047
Adj. p-value	0.000	0.000	0.000	0.634	0.958	0.828	0.762	0.225
Mother's Job Loss								
	Health Insurance			Health Care Utilization				
	Any	Private	Public	Any Rx	Checkup	Diagnostic	Emergency	Psych
Mother Displaced	-0.074***	-0.138***	0.055***	-0.013	0.013	0.005	-0.000	-0.003
	(0.017)	(0.019)	(0.014)	(0.017)	(0.016)	(0.017)	(0.008)	(0.007)
Naive p-value	0.000	0.000	0.000	0.457	0.422	0.761	0.998	0.683
Adj. p-value	0.000	0.000	0.000	0.930	0.930	0.965	0.997	0.965

Notes: Data are from the 1996-2012 waves of the Medical Expenditure Panel Survey (MEPS). The sample includes children who were 1-16 years old and whose father (top panel) or mother (bottom panel) was employed with at least one year of job tenure in the first round. All regressions include individual fixed effects, dummies for age, calendar year of interview, month, and survey round, a control for the length of the round in days, and linear time trends specific to the health status reported in the first round. Standard errors (in parentheses) are clustered at the household level (* $p < .10$, ** $p < .05$, and *** $p < .01$). Adjusted p-values reflect familywise error control for the group of hypotheses of each panel as discussed in Section **??** and Appendix C. Estimates are weighted using MEPS sampling weights.

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Table 4: Effects of Father's Job Loss on Child Health, by Family Socioeconomic Status

By Family Earnings						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Disp*Low	0.029***	0.067**	0.028	0.027	0.019**	0.120**
	(0.011)	(0.026)	(0.025)	(0.021)	(0.009)	(0.056)
	[0.183]	[0.183]	[0.617]	[0.602]	[0.250]	[0.256]
Disp*High	0.001	-0.034	0.013	-0.064***	0.006	0.063**
	(0.004)	(0.022)	(0.029)	(0.022)	(0.004)	(0.030)
	[0.882]	[0.536]	[0.882]	[0.141]	[0.556]	[0.256]
P-value Earnings	0.014	0.003	0.709	0.002	0.184	0.362
By Parental Education						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Disp*Less than HS	0.013	0.089***	0.032	0.027	0.019**	0.121**
	(0.008)	(0.030)	(0.039)	(0.021)	(0.008)	(0.055)
	[0.739]	[0.253]	[0.739]	[0.739]	[0.497]	[0.497]
Disp*HS Grad	0.017**	0.037	-0.042	0.061**	0.014	0.107
	(0.008)	(0.025)	(0.031)	(0.024)	(0.011)	(0.073)
	[0.535]	[0.739]	[0.739]	[0.376]	[0.739]	[0.739]
Disp*College	0.008	-0.028	0.042	-0.081***	0.008*	0.066**
	(0.007)	(0.025)	(0.030)	(0.023)	(0.004)	(0.031)
	[0.739]	[0.739]	[0.739]	[0.126]	[0.616]	[0.497]
P-value Education	0.697	0.009	0.114	0.000	0.466	0.636
By Family Type						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Disp*Two Earner	0.003	-0.009	0.033	-0.012	0.008	0.074*
	(0.004)	(0.019)	(0.028)	(0.020)	(0.006)	(0.039)
	[0.946]	[0.953]	[0.812]	[0.953]	[0.720]	[0.408]
Disp*Single Earner	0.021**	0.017	0.000	-0.057**	0.014**	0.095**
	(0.009)	(0.030)	(0.031)	(0.026)	(0.006)	(0.039)
	[0.333]	[0.953]	[1.000]	[0.333]	[0.257]	[0.257]
P-value Family Type	0.087	0.468	0.428	0.166	0.438	0.697

Notes: Subgroup estimates are obtained in each panel by interacting the parental displacement indicator with each subgroup. Otherwise, the father employed sample and specification are the same as those in Table 2. Family earnings categories are defined by earnings (in 2010 dollars) above/below 200 percent of the 2010 federal poverty line. Parental education categories are defined by the educational attainment of the parent with the most education. Single earner families include those in which the father but not the mother was employed in the first round. Standard errors (in parentheses) are clustered at the household level (* $p < .10$, ** $p < .05$, and *** $p < .01$). Adjusted p-values for each coefficient, presented in square brackets, reflect familywise error control for the group of hypotheses of each panel as discussed in Section **??** and Appendix C. Estimates are weighted using MEPS sampling weights.

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Table 5: Effects of Mother's Job Loss on Child Health, by Family Socioeconomic Status

By Family Earnings						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Disp*Low Earnings	-0.003	0.020	0.013	0.003	-0.016**	-0.049*
	(0.004)	(0.020)	(0.022)	(0.028)	(0.007)	(0.028)
	[0.987]	[0.932]	[0.987]	[0.999]	[0.405]	[0.623]
Disp*High Earnings	0.001	-0.056**	0.000	0.021	0.007	-0.021
	(0.006)	(0.023)	(0.028)	(0.034)	(0.005)	(0.030)
	[0.999]	[0.300]	[0.999]	[0.987]	[0.840]	[0.987]
P-value Earnings	0.615	0.011	0.719	0.684	0.011	0.493
By Parental Education						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Disp*Less than HS	-0.003	0.004	-0.049	0.012	-0.019**	-0.088**
	(0.008)	(0.030)	(0.071)	(0.041)	(0.010)	(0.039)
	[1.000]	[1.000]	[1.000]	[1.000]	[0.629]	[0.467]
Disp*High School	-0.006	0.010	0.028	0.006	-0.005	-0.049
	(0.006)	(0.024)	(0.023)	(0.045)	(0.007)	(0.034)
	[0.995]	[1.000]	[0.981]	[1.000]	[1.000]	[0.924]
Disp*More than HS	0.002	-0.034	0.008	0.014	-0.002	-0.017
	(0.005)	(0.022)	(0.024)	(0.026)	(0.007)	(0.030)
	[1.000]	[0.899]	[1.000]	[1.000]	[1.000]	[1.000]
P-value Education	0.575	0.350	0.551	0.986	0.333	0.343
By Family Type						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Disp*Two Parent	0.002	-0.026	0.006	0.035	0.003	-0.010
	(0.004)	(0.018)	(0.021)	(0.027)	(0.006)	(0.023)
	[0.998]	[0.761]	[0.998]	[0.812]	[0.998]	[0.998]
Disp*Single Mom	-0.009	0.011	0.011	-0.040	-0.023***	-0.094**
	(0.006)	(0.027)	(0.032)	(0.035)	(0.008)	(0.039)
	[0.760]	[0.998]	[0.998]	[0.858]	[0.108]	[0.206]
P-value Family Type	0.142	0.240	0.880	0.089	0.012	0.066

Notes: Subgroup estimates are obtained in each panel by interacting the parental displacement indicator with each subgroup. Otherwise, the regression sample and specification are the same as those in Table 2. Family earnings categories are defined by earnings (in 2010 dollars) above/below 200 percent of the 2010 federal poverty line. Parental education categories are defined by the educational attainment of the parent with the most education. Single mother families include those in which there is no father present in the first round. Standard errors (in parentheses) are clustered at the household level (* $p < .10$, ** $p < .05$, and *** $p < .01$). Adjusted p-values for each coefficient, presented in square brackets, reflect familywise error control for the group of hypotheses of each panel as discussed in Section **??** and Appendix C. Estimates are weighted using MEPS sampling weights.

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Table 6: Effects of Parental Job Loss on Child Health, by Child Age and Gender

Father's Job Loss						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Disp*Age 1-5	0.022*	-0.030	-0.012	-0.036	0.013**	0.062
	(0.012)	(0.041)	(0.041)	(0.033)	(0.006)	(0.041)
	[0.815]	[0.980]	[0.988]	[0.935]	[0.682]	[0.917]
Disp*Age 6-12	0.008	0.025	0.014	-0.033	0.012**	0.104**
	(0.005)	(0.021)	(0.025)	(0.024)	(0.006)	(0.045)
	[0.917]	[0.935]	[0.988]	[0.928]	[0.680]	[0.541]
Disp*Age 13-18	0.003	0.005	0.064	-0.022	0.005	0.074
	(0.007)	(0.024)	(0.050)	(0.026)	(0.009)	(0.060)
	[0.988]	[0.988]	[0.928]	[0.962]	[0.988]	[0.928]
P-value age	0.389	0.471	0.494	0.937	0.711	0.783
Disp*Male	0.016**	0.002	0.010	-0.049*	0.014**	0.073*
	(0.008)	(0.022)	(0.021)	(0.027)	(0.005)	(0.037)
	[0.372]	[0.994]	[0.955]	[0.490]	[0.183]	[0.408]
Disp*Female	0.006	0.003	0.028	-0.012	0.007	0.094**
	(0.005)	(0.023)	(0.035)	(0.017)	(0.006)	(0.040)
	[0.823]	[0.994]	[0.950]	[0.950]	[0.823]	[0.240]
P-value gender	0.200	0.975	0.662	0.265	0.409	0.694
Mother's Job Loss						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Disp*Age 1-5	-0.012**	-0.034	0.017	-0.044	-0.001	-0.027*
	(0.005)	(0.034)	(0.040)	(0.037)	(0.004)	(0.016)
	[0.264]	[0.990]	[0.999]	[0.983]	[1.000]	[0.805]
Disp*Age 6-12	-0.001	-0.005	0.007	-0.005	-0.006	-0.047*
	(0.005)	(0.020)	(0.026)	(0.028)	(0.006)	(0.026)
	[1.000]	[1.000]	[1.000]	[1.000]	[0.990]	[0.753]
Disp*Age 13-18	0.008	-0.011	-0.002	0.092	-0.008	-0.030
	(0.009)	(0.023)	(0.027)	(0.057)	(0.014)	(0.059)
	[0.991]	[0.998]	[1.000]	[0.837]	[0.997]	[0.998]
P-value age	0.063	0.753	0.919	0.145	0.678	0.802
Disp*Male	0.003	-0.021	0.017	-0.001	-0.005	-0.036
	(0.005)	(0.021)	(0.026)	(0.026)	(0.006)	(0.026)
	[0.989]	[0.963]	[0.989]	[0.997]	[0.983]	[0.878]
Disp*Female	-0.006	-0.007	-0.002	0.024	-0.005	-0.038
	(0.005)	(0.021)	(0.022)	(0.036)	(0.007)	(0.029)
	[0.925]	[0.989]	[0.997]	[0.989]	[0.983]	[0.925]
P-value gender	0.210	0.637	0.560	0.584	0.959	0.964

Notes: Subgroup estimates are obtained in each panel by interacting the parental displacement indicator with each subgroup. Otherwise, the regression sample and specification are the same as those in Table 2. Standard errors (in parentheses) are clustered at the household level (* $p < .10$, ** $p < .05$, and *** $p < .01$). Adjusted p-values for each coefficient, presented in square brackets, reflect familywise error control for the group of hypotheses of each panel as discussed in Section **??** and Appendix C. Estimates are weighted using MEPS sampling weights.

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Table 7: Timing of the Effects of Parental Job Loss on Child Health

Father's Job Loss						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Before Dad Displaced	0.007	-0.011	0.005	0.022	0.002	-0.000
	(0.009)	(0.021)	(0.021)	(0.026)	(0.004)	(0.029)
	[0.983]	[0.985]	[0.985]	[0.983]	[0.985]	[0.996]
Round Dad Displaced	0.022**	-0.030	0.037	0.015	0.005	0.063
	(0.009)	(0.024)	(0.029)	(0.027)	(0.007)	(0.044)
	[0.342]	[0.919]	[0.919]	[0.985]	[0.983]	[0.861]
After Dad Displaced	0.017*	0.014	0.026	-0.023	0.012**	0.070**
	(0.009)	(0.022)	(0.025)	(0.022)	(0.006)	(0.034)
	[0.659]	[0.985]	[0.970]	[0.966]	[0.476]	[0.490]
Mother's Job Loss						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Before Mom Displaced	-0.003	0.004	-0.014	0.031	0.001	0.018
	(0.006)	(0.021)	(0.023)	(0.037)	(0.006)	(0.030)
	[1.000]	[1.000]	[1.000]	[0.997]	[1.000]	[1.000]
Round Mom Displaced	0.001	-0.025	0.014	0.022	-0.001	-0.008
	(0.008)	(0.025)	(0.027)	(0.034)	(0.007)	(0.041)
	[1.000]	[0.994]	[1.000]	[1.000]	[1.000]	[1.000]
After Mom Displaced	-0.002	-0.012	-0.002	0.032	-0.002	-0.032
	(0.005)	(0.021)	(0.028)	(0.031)	(0.006)	(0.028)
	[1.000]	[1.000]	[1.000]	[0.991]	[1.000]	[0.984]

Notes: Data are from the 1996-2012 waves of the Medical Expenditure Panel Survey (MEPS). The sample includes children who were 1-16 years old and whose father (top panel) or mother (bottom panel) was employed with at least one year of job tenure in the first round. Construction of health indices is described in Appendix B. All regressions include individual fixed effects, dummies for age, calendar year of interview, month, and survey round, a control for the length of the round in days, and linear time trends specific to the health status reported in the first round. Standard errors (in parentheses) are clustered at the household level (* $p < .10$, ** $p < .05$, and *** $p < .01$). Adjusted p-values for each coefficient, presented in square brackets, reflect familywise error control for the group of hypotheses of each panel as discussed in Section **??** and Appendix C. Estimates are weighted using MEPS sampling weights.

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Table 8: Parental Job Loss and Local Economic Conditions

		Physical Health			Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Dad Displaced	0.011**	0.002	0.018	-0.031*	0.011***	0.083***
	(0.005)	(0.017)	(0.021)	(0.016)	(0.004)	(0.028)
Unemployment Rate	0.000	0.008**	0.012***	0.004	-0.000	0.005
	(0.001)	(0.004)	(0.005)	(0.004)	(0.001)	(0.006)
Dad Displaced * Low UR	0.002	-0.002	0.075**	-0.039	0.007	0.034
	(0.006)	(0.030)	(0.032)	(0.035)	(0.010)	(0.061)
Dad Displaced * High UR	0.013**	-0.010	0.018	-0.024	0.012**	0.103***
	(0.006)	(0.022)	(0.034)	(0.025)	(0.006)	(0.036)
P(high = low)	0.180	0.815	0.220	0.722	0.656	0.321
Dad Displaced * Pre 2008	0.011*	-0.004	0.012	-0.050**	0.011**	0.081**
	(0.006)	(0.022)	(0.022)	(0.021)	(0.005)	(0.033)
Dad displaced * Post 2008	0.010	0.019	0.032	0.012	0.010	0.089*
	(0.008)	(0.027)	(0.047)	(0.023)	(0.008)	(0.053)
P(pre = post)	0.883	0.510	0.697	0.049	0.864	0.903
Mother's Job Loss		Physical Health			Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Mom Displaced	-0.001	-0.015	0.007	0.010	-0.005	-0.037*
	(0.004)	(0.015)	(0.018)	(0.022)	(0.005)	(0.020)
Unemployment Rate	0.000	0.010***	0.010**	0.013**	0.002*	0.008*
	(0.001)	(0.004)	(0.005)	(0.006)	(0.001)	(0.004)
Mom Displaced * Low UR	-0.002	-0.006	0.003	0.015	0.004	-0.010
	(0.007)	(0.030)	(0.043)	(0.052)	(0.006)	(0.036)
Mom Displaced * High UR	0.004	-0.019	0.007	-0.017	-0.009	-0.057*
	(0.006)	(0.026)	(0.024)	(0.027)	(0.007)	(0.034)
P(high = low)	0.521	0.749	0.951	0.582	0.166	0.340
Mom Displaced * Pre 2008	0.001	-0.038**	-0.001	0.013	-0.001	-0.027
	(0.004)	(0.019)	(0.022)	(0.030)	(0.004)	(0.022)
Mom displaced * Post 2008	-0.006	0.028	0.021	0.005	-0.013	-0.056
	(0.007)	(0.026)	(0.029)	(0.030)	(0.011)	(0.042)
P(pre = post)	0.406	0.038	0.558	0.849	0.301	0.544

Notes: Heterogeneous effects by low and high unemployment rate are obtained by interacting the parental displacement indicator with an indicator for the state unemployment rate being below or above 5%, respectively. Heterogeneous effects before and after 2008 are obtained by interacting the parental displacement indicator with an indicator for the first interview of the panel occurring before or after 2008, respectively. All regressions include the state unemployment rate at the time of interview as a control variable. Otherwise, the regression sample and specification are the same as those in Table 2. Standard errors (in parentheses) are clustered at the household level (* $p < .10$, ** $p < .05$, and *** $p < .01$). Estimates are weighted using MEPS sampling weights.

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APPENDIX A. SUPPLEMENTAL TABLES

Table A1: Round 1 Summary Statistics, Children with Displaced Parent by Reason for Job Loss

	Father Displaced Sample			Mother Displaced Sample		
	Not Disp.	Sold/Closed	Laid Off	Not Disp.	Sold/Closed	Laid Off
Parent and Job Characteristics						
Years of Tenure	8.731	8.175	5.328	6.804	6.090	4.709
Hourly Earnings	18.064	18.553	16.556	14.882	12.868	13.747
Insurance Coverage	0.786	0.735	0.705	0.599	0.561	0.553
Full Time	0.952	0.909	0.856	0.678	0.611	0.621
Receives Salary	0.487	0.482	0.350	0.381	0.334	0.299
Receives Wages	0.458	0.435	0.610	0.580	0.619	0.683
Unionized	0.189	0.132	0.128	0.149	0.055	0.109
Small Business (1-50 emp.)	0.375	0.383	0.437	0.392	0.594	0.437
Medium Business (51-500 emp.)	0.370	0.348	0.378	0.393	0.271	0.369
Construction	0.094	0.058	0.188	0.010	0.032	0.035
Manufacturing	0.221	0.402	0.284	0.089	0.181	0.216
Professional	0.116	0.051	0.114	0.229	0.170	0.188
Sales	0.134	0.134	0.153	0.125	0.180	0.129
Insurance Covearage Missing	0.011	0.003	0.008	0.004	0.006	0.002
Form of Payment Missing	0.009	0.019	0.002	0.008	0.019	0.003
Hourly Earnings Missing	0.203	0.167	0.158	0.138	0.170	0.113
Hourly Earnings Top Coded	0.030	0.030	0.018	0.012	0.007	0.023
Unionized Missing	0.017	0.011	0.015	0.006	0.003	0.002
Business Size Missing	0.065	0.086	0.068	0.035	0.021	0.024
Reported Health	2.012	2.012	2.245	2.061	2.169	2.336
Reported Mental Health	1.691	1.759	1.886	1.779	1.893	1.980
Black	0.080	0.071	0.155	0.143	0.185	0.191
Hispanic	0.159	0.161	0.212	0.132	0.166	0.170
Age	39.354	39.011	38.816	37.744	37.423	36.533
Less than High School	0.127	0.150	0.231	0.080	0.156	0.108
High School Graduate	0.302	0.284	0.334	0.250	0.233	0.273
Observations	21475	500	853	19218	341	702

Note: Data are from the 1996-2012 waves of the Medical Expenditure Panel Survey (MEPS). The sample includes children who were 1-16 years old and whose father (columns 1-3) or mother (columns 4-6) was employed with at least one year of job tenure in the first round in a non-temporary job. Observations with missing values in parental age, education, reported health or reported mental health were excluded from the sample. When job characteristics have missing values, a zero is imputed. For observations with top-coded earnings, the maximum value allowed is imputed. Estimates are weighted using MEPS sampling weights.

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Table A2: Effects of Parental Job Loss on Components of Health Indices

Father's Job Loss								
	Acute Index					Chronic Index		
	Acute Resp	Otitis	Flu/Pneum	Intestinal	Other Infect	Chronic Resp	Asthma/COPD	Nutrit/Metab
Father Displaced	-0.011	0.001	-0.010	0.012	0.011	0.007	0.000	0.004
	(0.015)	(0.008)	(0.008)	(0.011)	(0.009)	(0.009)	(0.007)	(0.005)
Individuals	23619	23619	23619	23619	23619	23619	23619	23619
Displacements	1381	1381	1381	1381	1381	1381	1381	1381
	Trauma Index					Mental Health Index		
	Fract/Disloc	Sprains	Wounds	Burns/Pois	Other	Fair/Poor	Depr/Anx	Headache
Father Displaced	-0.009**	-0.004	-0.002	-0.002	-0.000	0.011***	0.009**	0.005
	(0.004)	(0.006)	(0.004)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
Individuals	23619	23619	23619	23619	23619	23619	23619	23619
Displacements	1381	1381	1381	1381	1381	1381	1381	1381
Mother's Job Loss (Mother Employed Sample)								
	Acute Index					Chronic Index		
	Acute Resp	Otitis	Flu/Pneum	Intestinal	Other Infect	Chronic Resp	Asthma/COPD	Nutrit/Metab
Mother Displaced	0.016	-0.010	0.003	-0.014	-0.015	-0.003	0.001	0.003
	(0.014)	(0.008)	(0.006)	(0.014)	(0.010)	(0.010)	(0.008)	(0.002)
Individuals	20384	20384	20384	20384	20384	20384	20384	20384
Displacements	1049	1049	1049	1049	1049	1049	1049	1049
	Trauma Index					Mental Health Index		
	Fract/Disloc	Sprains	Wounds	Burns/Pois	Other	Fair/Poor	Depr/Anx	Headache
Mother Displaced	0.003	0.003	-0.002	-0.001	0.003	-0.005	-0.005	-0.006
	(0.005)	(0.004)	(0.004)	(0.002)	(0.004)	(0.005)	(0.005)	(0.004)
Individuals	20384	20384	20384	20384	20384	20384	20384	20384
Displacements	1049	1049	1049	1049	1049	1049	1049	1049

Notes: Data are from the 1996-2012 waves of the Medical Expenditure Panel Survey (MEPS). The sample includes children who were 1-16 years old and whose father (top panel) or mother (bottom panel) was employed with at least one year of job tenure in the first round. Health condition definitions are outlined in Appendix B. All regressions include individual fixed effects, dummies for age, calendar year of interview, month, and survey round, a control for the length of the round in days, and linear time trends specific to the health status reported in the first round. Standard errors (in parentheses) are clustered at the household level (* $p < .10$, ** $p < .05$, and *** $p < .01$). Estimates are weighted using MEPS sampling weights.

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Table A3: Effects of Parental Job Loss on Child Health, Including Both Parents' Job Losses in the Same Regressions (Two-Earner Families Sample)

	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Post dad's displacement	0.003	0.001	0.006	-0.008	0.009	0.117**
	(0.005)	(0.024)	(0.027)	(0.025)	(0.008)	(0.050)
Post mom's displacement	-0.001	-0.022	-0.006	0.044	0.003	0.003
	(0.004)	(0.029)	(0.026)	(0.027)	(0.004)	(0.038)
P(Dad disp = Mom disp)	0.546	0.564	0.747	0.180	0.503	0.087
Individuals	8995	8995	8995	8995	8995	8995
Dad Displacements	455	455	455	455	455	455
Mom Displacements	323	323	323	323	323	323
Both Displacements	46	46	46	46	46	46

Notes: Data are from the 1996-2012 waves of the Medical Expenditure Panel Survey (MEPS). The sample includes children who were 1-16 years old and whose father and mother were both employed with at least one year of job tenure in the first round at non-temporary jobs. Construction of health indices is described in Appendix B. All regressions include individual fixed effects, dummies for age, calendar year of interview, month, and survey round, a control for the length of the round in days, and linear time trends specific to the health status reported in the first round. Standard errors (in parentheses) are clustered at the household level (* $p < .10$, ** $p < .05$, and *** $p < .01$). Estimates are weighted using MEPS sampling weights.

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Table A4: Effects of Parental Job Loss on Child Health, Business Sold or Closed Only

Father's Job Loss						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Father Firm Closure	0.012	0.018	-0.011	-0.070**	0.004	0.068**
	(0.009)	(0.031)	(0.032)	(0.029)	(0.006)	(0.035)
Naive p-value	0.189	0.556	0.741	0.016	0.564	0.048
Adj. p-value	0.593	0.928	0.928	0.215	0.928	0.308
Mother's Job Loss (Mother Employed Sample)						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Mother Firm Closure	-0.001	-0.010	-0.005	0.037	0.001	-0.031
	(0.005)	(0.027)	(0.029)	(0.046)	(0.005)	(0.025)
Naive p-value	0.769	0.705	0.875	0.426	0.781	0.225
Adj. p-value	0.993	0.993	0.993	0.940	0.993	0.790

Notes: Data are from the 1996-2012 waves of the Medical Expenditure Panel Survey (MEPS). The sample includes children who were 1-16 years old and whose father (top panel) or mother (bottom panel) was employed with at least one year of job tenure in the first round. Construction of health indices is described in Appendix B. All regressions include individual fixed effects, dummies for age, calendar year of interview, month, and survey round, a control for the length of the round in days, and linear time trends specific to the health status reported in the first round. Standard errors (in parentheses) are clustered at the household level (* $p < .10$, ** $p < .05$, and *** $p < .01$). Adjusted p-values reflect familywise error control as discussed in Section **??** and Appendix C. Estimates are weighted using MEPS sampling weights.

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Table A5: Effects of Parental Job Loss on Child Health, Propensity Score Weighting

Father's Job Loss						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Father Displaced	0.009*	-0.008	0.009	-0.031*	0.008*	0.078***
	(0.005)	(0.017)	(0.021)	(0.017)	(0.004)	(0.030)
Mother's Job Loss (Mother Employed Sample)						
	Physical Health				Mental Health	
	Fair/Poor	Acute Index	Chronic Index	Trauma Index	Fair/Poor	Mental Index
Mother Displaced	-0.002	-0.014	0.009	-0.003	-0.005	-0.036*
	(0.004)	(0.016)	(0.016)	(0.024)	(0.005)	(0.020)

Notes: Data are from the 1996-2012 waves of the Medical Expenditure Panel Survey (MEPS). The sample includes children who were 1-16 years old and whose father (top panel) or mother (bottom panel) was employed with at least one year of job tenure in the first round. Construction of health indices is described in Appendix B. All regressions include individual fixed effects, dummies for age, calendar year of interview, month, and survey round, a control for the length of the round in days, and linear time trends specific to the health status reported in the first round. Estimates are weighted using MEPS sample weights for children of displaced workers, and $\frac{p}{1-p}$ multiplied by MEPS sample weights for children from non-displaced workers, where p is the predicted probability of parental job displacement. Bootstrap standard errors (in parentheses) are clustered at the household level (* $p < .10$, ** $p < .05$, and *** $p < .01$).

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Table A6: Effects of Parental Job Loss on Insurance Coverage and Health Care Utilization, Propensity Score Weighting

Father's Job Loss								
	Health Insurance			Health Care Utilization				
	Any	Private	Public	Any Rx	Checkup	Diagnostic	Emergency	Psych
Father Displaced	-0.078***	-0.126***	0.050***	-0.020	0.004	-0.009	-0.004	0.008**
	(0.015)	(0.016)	(0.012)	(0.015)	(0.015)	(0.016)	(0.007)	(0.003)
Mother's Job Loss								
	Health Insurance			Health Care Utilization				
	Any	Private	Public	Any Rx	Checkup	Diagnostic	Emergency	Psych
Mother Displaced	-0.083***	-0.134***	0.046***	-0.012	0.023	0.006	0.002	-0.003
	(0.017)	(0.018)	(0.013)	(0.017)	(0.017)	(0.017)	(0.008)	(0.007)

Notes: Data are from the 1996-2012 waves of the Medical Expenditure Panel Survey (MEPS). The sample includes children who were 1-16 years old and whose father (top panel) or mother (bottom panel) was employed with at least one year of job tenure in the first round. All regressions include individual fixed effects, dummies for age, calendar year of interview, month, and survey round, a control for the length of the round in days, and linear time trends specific to the health status reported in the first round. Estimates are weighted using MEPS sample weights for children of displaced workers, and $\frac{p}{1-p}$ multiplied by MEPS sample weights for children from non-displaced workers, where p is the predicted probability of parental job displacement. Bootstrap standard errors (in parentheses) are clustered at the household level (* $p < .10$, ** $p < .05$, and *** $p < .01$).

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APPENDIX B. DESCRIPTION OF HEALTH VARIABLES

This appendix provides additional details on the health outcome variables used in our analysis and describes the construction of the summary health indices.

B.A Perceived Health

Our measures of a child's general physical and mental health are based on responses to questions about perceived health and mental health status that are part of the MEPS full-year consolidated data files. In these questions, the respondent (typically the child's mother) is asked to rate the health and mental health of each person in the family according to the following categories: excellent, very good, good, fair, and poor. Subjective categorical ratings of health like these are common in survey data, and have previously been found to be correlated with the incidence of specific health conditions among children (Case, Lubotsky, and Paxson, 2002). In our setting, these variables are useful because they are available for every child in the sample and are likely to pick up changes in health status that may not result in observed medical conditions, either because they are associated with health conditions that are not included in our set of outcome variables or because they are not associated with a specific medical event, and thus do not show up in the MEPS conditions file.

Our choice to focus on an indicator for fair or poor health is consistent with previous studies (Case, Lubotsky, and Paxson, 2002; Schaller and Stevens, 2015) and is motivated by a desire to identify changes in health at the lower end of the health distribution that are potentially costly to families, both financially and in welfare terms. Descriptive analysis of our data (available from the authors upon request) supports this choice. In particular, the differences in the average frequency of diagnostic health visits and prescription drug use, as well as the incidence of several specific health conditions, are larger between children reported to be in "good" health and children reported to be in "fair" health than those between any of the other adjacent categories.

One potential issue with the use of parent-reported health ratings as a proxy for child health is that these reports are subjective and may be influenced by the state-of-mind of the respondent. In fact, several studies have found that responses to these types of questions by mothers in particular are correlated with the respondent's own health and mental health. For example, Waters et al. (2000) find that a mother's self-reported health is strongly associated with her reporting of her

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child's health, and Pastor and Reuben (2011) find that the relationship between mother-reported child health status and objectively-measured child health conditions is weaker among children whose mothers were in worse health. Focusing on mental health, Davis et al. (2008) find that maternal depression is negatively associated with maternal reports of child health. Interestingly, these same relationships do not hold when fathers are reporting. Given these findings, we acknowledge the possibility that declines in our parent-reported health measures may be due to the direct effects of job displacement on maternal health status and rely also on health measures that are likely to be more objectively measured.

B.B Health Conditions

Our measures of specific health conditions come from the MEPS Medical Conditions data files. Conditions in these files are reported from multiple questions in the MEPS questionnaires. First, respondents are asked if a person has been diagnosed with certain specific priority conditions, and then are asked follow up questions about them (for children, asthma is a priority condition). Second, medical conditions are reported by respondents as the reason for a particular medical event, such as a doctor visit, emergency room visit, hospital stay, home health episode, or prescription drug purchase. Third, conditions can be reported as the reason for episodes of disability days (missed school days for children). Finally, the condition may be reported as a condition "bothering" the person during the reference period. Conditions are reported verbatim by the interviewer and then coded by professional coders to ICD-9-CM codes. These codes were then mapped to clinically meaningful categories using the Clinical Classification System (CCS) software and also collapsed to 3-digit ICD-9-CM conditions codes, so that each record in the MEPS file has two different codes associated with it. We use the clinical classification codes to define most of our condition variables, using the ICD-9-CM codes only to identify some smaller subgroups of conditions (for example, to isolate certain mental health conditions) and to help determine how to assign the clinical classification codes to even broader groups.

Table B1 provides the classification codes associated with each health condition that we consider. We focus on health conditions that are prevalent among children and are likely to vary in the short-run in response to economic shocks. Though the health conditions are arguably more objective than parent ratings of child health, there is an important source of potential bias in these

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measures as well. In particular, because a medical condition is identified in the data when a health event related to the condition occurs, changes in the observed incidence of certain health conditions may be related to changes in the consumption of health care. Though we are reassured by the relatively minimal changes in insurance status and routine health care utilization, we interpret our results with this caveat in mind.

B.C Summary Health Indices

Because we have a large number of outcomes, we follow Deming (2009), Hoynes et al. (2015), and Katz et al. (2007) in constructing standardized summary indices that aggregate information from multiple outcome variables. Using the health conditions described above, we create four summary health indices. The first includes acute (infectious) conditions. Collectively these make up the most common diagnosis category among children in our sample by far, with over 20 percent of children experiencing an acute upper respiratory condition in round one and 13 percent of children experiencing an intestinal infection. The second index combines chronic respiratory and nutritional/metabolic conditions, including asthma, COPD, diabetes, and anemia. The third includes trauma-related conditions such as injuries, burns, and poisoning. The final index combines mental health conditions including depression, anxiety, and acute responses to stress, with headaches, malaise and fatigue (physical symptoms that, when they present independently, are often associated with emotional distress), and the mental health fair/poor indicator. We exclude developmental disorders and other mental health conditions that are unlikely to respond to contemporaneous shocks from the mental health index. The health conditions that contribute to each summary index are outlined in Table B1. To create the indices we standardize each variable by subtracting the round 1 (pre-displacement) mean for the treated group, divide by the standard deviation, and then take the simple average across the standardized variables.

B.D Health Insurance and Health Care Utilization

Health insurance information is available at the monthly level in the MEPS full-year consolidated files for each individual in the survey. We construct variables indicating coverage (any, private, or public) at any time during the month of the interview. Health care utilization variables are from the Hospital Inpatient Stays, Emergency Room Visits, Outpatient Visits, and Office-Based

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Medical Provider Visits files. Each observation in each of these files represents a single visit or hospital stay. We use responses to questions identifying the reason for each visit or stay to categorize each visit or stay as a checkup, diagnostic visit, emergency visit, or mental health visit. We additionally use the Prescribed Medicines files to create an indicator for the use of any prescription drug during the round.

Table B1: Health Conditions - Sample Means and Classification Codes

Condition	Round 1 Sample Mean	Classification Codes
Acute Index		
Acute Respiratory	0.202	125, 126
Otitis	0.071	92
Flu/Pneumonia	0.044	122, 123
Intestinal	0.130	135, 140, 141, 154, 155, 250, 251
Other Infectious	0.075	3, 4, 7, 8, 90, 246
Chronic Index		
Chronic Respiratory	0.081	133, 134
Asthma/COPD	0.057	127, 128
Nutritional and Metabolic	0.010	48-59
Trauma Index		
Fractures and Dislocations	0.013	225-231
Sprains, Strains, and Superficial	0.020	232, 239
Open Wounds	0.011	235, 236
Burns and Poisoning	0.003	240, 242, 243
Other Injuries	0.013	233, 234, 240
Mental Health		
Depression/Anxiety	0.015	ICD: 296, 298, 300, 308, 309, 311-313
Headache, Malaise, and Fatigue	0.016	84, 252

Notes: Clinical classification codes are used to categorize all conditions except for depression/anxiety, which is defined by ICD-9 CM codes. Sample means are estimated on the union of the father employed and mother employed samples, with observations weighted using MEPS sample weights.

Additional References - Appendix B

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APPENDIX C. CALCULATION OF ADJUSTED P-VALUES FOR MULTIPLE HYPOTHESIS TESTING

This appendix describes the procedure we follow for calculating p-values adjusted for multiple hypothesis testing. When there are several measured outcomes, significant coefficients may emerge by chance even if there are no treatment effects. If a single-hypothesis test statistic rejects a true null hypothesis at a significance level α, the probability of rejecting a single null hypothesis out of a number of null hypotheses increases with the number of hypotheses being tested. The most common approach to adjusting p-values for multiple hypothesis testing is to control the family-wise error rate (FWER). Suppose a family of S hypotheses is tested, of which J are true. The FWER is the probability that at least one of the J true hypotheses in the family is rejected. FWER control procedures adjust the test statistic (or p-value) of each test to reduce the probability of rejecting a true hypothesis. A method provides a *strong* control of the FWER when it assumes that all of the S hypotheses are true. The adjusted p-value can be interpreted as the probability that a result as extreme as the observed individual test statistic (or p-value) will appear when there is no causal basis for any effect (Westfall and Young, 1993).

Recent papers in the program evaluation literature have incorporated step-down algorithms to control for the FWER in the context of randomized control trials. Step-down methods order the observed p-values in a group of hypothesis tests from lowest to largest (or test statistics from largest to lowest, where the hypothesis with the lowest p-value or the largest test statistic is the one more likely to be rejected). The first p-value is adjusted for the FWER under the null hypothesis that all S coefficients are zero. If this hypothesis cannot be rejected, none of the other $S-1$ hypotheses will be. If this hypothesis is rejected, then we take this result as true and continue to the second lowest p-value, comparing it to the minimum p-value under the null hypothesis that the remaining $S-1$ treatment effects are zero, and the process continues.

Westfall and Young (1993) and Romano and Wolf (2005) have developed step-down algorithms for strong control of the FWER that are less conservative than the traditional Bonferroni and Holm methods.[18] Westfall and Young's step-down procedure is most adequate for data from a randomized experiment, as their method relies on permutations of the treatment assignment. Some examples

[18]For a description of the Bonferroni and Holm methods, see Westfall and Young (1993) or Heckman et al. (2010b).

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of recent applications are Anderson (2008), Finkelstein et al. (2012), Barrow et al. (2014). Kling, Liebman and Katz (2007) use a bootstrap adaptation of Westfall and Young's algorithm.

Romano and Wolf (2005) developed a similar step-down algorithm whose main difference with Westfall and Young (1993) is that they do not require the assumption of subset pivotality, which is not always satisfied. Romano and Wolf instead require a monotonicity condition for theoretical critical values. An advantage of this algorithm is that it can be applied using the bootstrap as well as permutation tests. This is particularly useful when the data do not come from a randomized experiment and one does not want to assume a distribution of the treatment variable under the null hypothesis, as is required in permutation tests. Some examples of recent papers that analyze data from randomized controlled trials use the FWER control algorithm proposed in Romano and Wolf (2005) using permutation tests are Conti, Heckman and Pinto (2016), Heckman et al. (2010a), and Attanasio et al. (2015). In this paper we use the bootstrap construction of the Romano and Wolf (2005) algorithm.

We start by presenting the description of the algorithm we use, which is based on Algorithm 1 and the bootstrap construction of critical values of Section 4.2 in Romano and Wolf (2005). We construct adjusted p-values based on this algorithm.

Denote an individual hypothesis by H_j, and its corresponding test statistic T_j (we use the t-statistic). Suppose we want to test a total of S hypotheses, with an intersection of K hypotheses being denoted by H_K, with $K \subset \{1, ..., S\}$.

The step-down method proceeds as follows:

0. After estimating the regression coefficients of interest and their corresponding t-statistics ($\hat{\beta}_1, ..., \hat{\beta}_S$ and $\hat{T}_1, ..., \hat{T}_S$), order the test statistics from largest (most significant) to smallest:

$$T_{r_1} \geq T_{r_2} \geq ... \geq T_{r_S}$$

Perform N bootstrap replications of the S regressions (we use $N = 1000$), estimating the coefficient of interest for each hypothesis ($\hat{\beta}^{b_n}_{r_1}, ..., \hat{\beta}^{b_n}_{r_S}$) and its corresponding standard error ($\hat{se}(\hat{\beta}^{b_n}_{r_1}), ..., \hat{se}(\hat{\beta}^{b_n}_{r_S})$). Calculate the simulated test statistics for each individual hypothesis

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based on the bootstrap:

$$T_{r_j}^{b_n} = \frac{|\hat{\beta}_{r_j}^{b_n} - \hat{\beta}_{r_j}|}{\hat{se}(\hat{\beta}_{r_j}^{b_n})}$$

1. Let $H_{K_1} = \cap_{j \in K_1} H_j$, where $K_1 = r_1, ..., r_S$, be the intersection of the S hypotheses. Calculate $T_{m_1}^{b_n} = \max_{j \in K_1} T_{r_j}^{b_n}$, and order the N maximum bootstrap statistics from smaller to largest to construct the bootstrap approximation of the distribution of $T_{r_1} = \max_{j \in K_1} T_j$. Calculate s_1, the number of times that $T_{m_1}^{b_n} \geq T_{r_1}$, and compute the adjusted p-value for the hypothesis with the largest test statistic (smaller p-value):

$$p_{r_1}^{adj} = \frac{s_1}{N}$$

2. Let $H_{K_2} = \cap_{j \in K_2} H_j$, where $K_2 = r_2, ..., r_S$, be the intersection of the $S-1$ hypotheses excluding H_{r_1}. Calculate $T_{m_2}^{b_n} = \max_{j \in K_2} T_{r_j}^{b_n}$, and order the N maximum bootstrap statistics from smaller to largest to construct the bootstrap approximation of the distribution of $T_{r_2} = \max_{j \in K_2} T_j$. Calculate s_2, the number of times that $T_{m_2}^{b_n} \geq T_{r_2}$, and compute the adjusted p-value for the hypothesis with the second largest test statistic (second smaller p-value):

$$p_{r_2}^{adj} = \max\{\frac{s_2}{N}, p_{r_1}\}$$

Note that this last step imposes the monotonicity of the individual hypothesis p-values to the adjusted p-values.

⋮

k. Let $H_{K_k} = \cap_{j \in K_k} H_j$, where $K_k = r_k, ..., r_S$, be the intersection of the $S-(k-1)$ hypotheses excluding $H_{r_1}, ..., H_{r_{k-1}}$. Calculate $T_{m_k}^{b_n} = \max_{j \in K_k} T_{r_j}^{b_n}$, and order the N maximum bootstrap statistics from smaller to largest to construct the bootstrap approximation of the distribution of $T_{r_k} = \max_{j \in K_k} T_j$. Calculate s_k, the number of times that $T_{m_k}^{b_n} \geq T_{r_k}$, and compute the adjusted p-value for the hypothesis with the k_{th} largest test statistic (k_{th} smaller p-value):

$$p_{r_k}^{adj} = \max\{\frac{s_k}{N}, p_{r_{k-1}}\}$$

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$\vdots$

S. Let $H_{K_S} = H_S$ be the last hypothesis. Compute $T^{b_n}_{m_S} = T^{b_n}_{r_S}$, and order the N bootstrap statistics from smaller to largest to construct the bootstrap approximation of the distribution of T_{r_S}. Calculate s_S, the number of times that $T^{b_n}_{m_S} \geq T_{r_S}$, and compute the adjusted p-value for the hypothesis with the smallest test statistic (largest p-value):

$$p^{adj}_{r_S} = \max\{\frac{s_S}{N}, p_{r_{S-1}}\}$$

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