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Abstract

In the last two decades, after the Asian financial crisis, Korea has witnessed a rapid increase in the share of temporary contractual work in its employment composition. In this paper, we investigate the impact of job insecurity and job loss on children's health using Korea Welfare Panel Study data. We find that paternal job loss and insecurity has a significantly negative effect on health, while maternal job loss and insecurity has no effect. This could be because the effects of income loss and financial hardship are greater for male workers than for females.

Keywords: child health, parental job loss and insecurity, panel data estimation, Korea welfare panel study

JEL Codes: I12, J13, J63, C33

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1. Introduction

In the 20 years after the Asian financial crisis of 1997, Korea has experienced a fundamental change in its employment composition. Particularly, the share of temporary employment has continually increased such that in 2019, temporary employment accounts for about 21% of dependent employees in Korea, one of the highest shares in the OECD region.[1] Hence, policymakers and academics are deeply concerned about job insecurity[2] status, in addition to job loss. As pointed out in László et al. (2010), this phenomenon is not just local but worldwide. As a result of globalization, labor markets have been deregulated across the world and adoption of temporary contracts has become a norm rather than an exception. Under this circumstance, considerable attention has been paid to the effects of job loss and insecurity on the workers involved, particularly on health. In fact, most studies have investigated the effects of only job loss on workers' health except for Voßemer et al. (2018b) (e.g., Voßemer et al., 2018a; Farré et al., 2018; Michaud et al., 2016; Schaller and Stevens, 2015; Huijts et al., 2015; Black et al., 2015; Browning and Heinesen, 2012). All these studies consistently showed that job loss has a significantly negative effect on the workers' mental, physical, self-rated health, and

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[1] See https://data.oecd.org/emp/temporary-employment.htm. Broadly speaking, temporary employment includes wage and salary workers whose job has a pre-determined termination date. The temporary employment proportion is measured as a percentage of the total dependent employees (i.e. wage and salary workers). According to Statistics Korea, this proportion was about 33% in 2018. The difference is due to the differences in measurement standards.

[2] In most studies, job insecurity refers to a subjective perception by workers. For instance, see László et al. (2010), Burgard et al. (2009), and Green (2015). However, we define job insecurity as used in Voßemer et al. (2018b) where an insecure job is defined as temporary employment with fixed-term contracts. We also include daily jobs with no contract in insecure jobs.

mortality. Further, Voßemer et al. (2018a) showed that early career job loss and youth unemployment have long-term negative health consequences later in life. Importantly, Voßemer et al. (2018b) examined the role of labor market policies in mediating the negative health effect of both unemployment and insecure jobs. It is the only study in American and European research that investigates the effect of insecure jobs on workers' health. Kim et al. (2016) conducted a systematic review of the relationship between temporary employment and health in South Korea. They demonstrated that workers with temporary employment had poorer health than standard workers. Recently, Yoon et al. (2017) studied whether job loss increases the risk of depressive symptoms according to job status, occupation, and tenure and found that there was a significant rise in depressive score after job loss. Though many studies document the negative effects of job loss and insecurity on health, much less is known about the consequences of job loss and insecurity on the children of the workers, in particular, children's health. Child health has been widely regarded as a crucial type of human capital that is not only important on its own but also has effects on future outcomes, such as educational and labor market performance later in life (Goodman and Currie, 2010; Currie, 2009). Hence, many studies have examined the relationship between child health and household socioeconomic characteristics, with special reference to the role of household income and parental educational attainment. Parental job loss and insecurity are also important determinants of child health possibly through household income changes, parental time reallocations, and parental mental health. To our knowledge, there have been only five studies on the relationship between parental job loss and

insecurity and child health.[3] Lindo (2011) examined the health effect of parental job displacement on the children of the displaced workers in the US and found that paternal job losses have significant negative effects on infant health. Schaller and Zerpa (2017) also found that paternal job loss was harmful to children's physical and mental health whereas maternal job loss did not have adverse effects on child health in the US. Bubonya et al. (2017) investigated the impact of involuntary job loss on the mental health of spouses and adolescent children in Australia. They found that women's mental health is negatively affected by husbands' job loss, while only female adolescents' health is negatively affected by parental job loss. Mörk et al. (2014) found that Swedish children with unemployed parents are more likely to be hospitalized than other children. Finally, Liu and Zhao (2014) studied the effect of parental job loss resulting from massive restructuring in Chinese state-owned enterprises on children's health. They used the underemployment concept to include part-time workers in unemployed workers and found that paternal underemployment has a significant negative effect on children's health, whereas maternal job loss has no effect.

In this study, we investigate the effect of parental job loss and insecurity on child health, which is captured by self-reported health status. This is the first work that attempts to examine the effect of both parents' job loss and job insecurity on child health. We use Korea Welfare Panel Study (KOWEPS) 2006–2017 data on parental job status and children's health. The rest of the paper is organized as follows. In section 2, we briefly discuss the theoretical background that deals with how parental job loss and insecurity could affect child health, with a special reference to possible mediating channels.

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[3] We excluded studies on the effect of maternal employment on child health (Gennetian et al., 2010; Morrill, 2011) and the effect of parental job loss on other health aspects of a child (Fairbrother et al., 2010).

Section 3 presents the data description. We describe KOWEPS, explain the measurements of job loss and insecurity and child health, and present the descriptive statistics of variables used in the empirical analysis. In section 4, we briefly discuss our empirical model, an ordered panel probit model with random effects. Section 5 presents the main empirical results, reverse causality test, and heterogeneous effects of parental job loss and insecurity by child gender, child age, and parental educational attainment. We also discuss the mediating roles of household income change, parental mental status, and financial hardship. Finally, we discuss and conclude the paper in section 6.

2. Theoretical background

The theoretical link between parental job loss and insecurity and child health is well discussed in Currie et al. (2009), where they formulated a theoretical model on why parental socioeconomic status affects child health. In the model, child health is an important component of the parental utility function. Parents maximize their inter-temporal utility function that consists of child health stock, consumption of other goods, and leisure, subject to child production function, budget constraints, and parental time constraints. The health stock is determined by the previous period's health stock, material, and time inputs into health production, exogenous productivity shifters, and permanent individual productivity shifters. These health inputs are valued by consumers not for their own sake, but because they affect child health, which, in turn, has a direct effect on parental utility.

Within this framework, there may be a few possible channels by which parental job loss and insecurity affect child health. First, the reductions in household income due to parental job loss and insecurity directly affect the budget constraint and, as a result, reduce the inputs into the child health production function, such as nutritional intake and

other market goods used in producing health. This generates the well-known income-health gradient. Second, job loss and insecurity alter parental time constraints and time allocations. A parent experiencing job loss and insecurity would spend more time on supervision and care of children, which works as a valuable input in child health production. Household income reduction and time reallocation could work in the opposite direction too, which result in the ambiguous effect of job loss and insecurity as explained in Liu and Zhao (2014). Third, the parental stress caused by job loss and insecurity could lead to changes in child health. Parental stress could affect child health either directly by affecting children's stress or indirectly by changing the quality of care. We could conclude from this discussion that, theoretically, parental job loss and insecurity has no decisive effect on child health and so, it needs to be judged by empirical investigation.[4]

As pointed out in the literature (e.g., Liu and Zhao, 2014; Schaller and Zerpa, 2019), the effect of job loss and insecurity and the way the channels work are likely to depend on the gender of the parent experiencing job loss and insecurity. Therefore, we examine if the effect of paternal job loss and insecurity is different from maternal job loss and insecurity.

3. Data

3.1. Korea Welfare Panel Study

The data used in the empirical analysis are from KOWEPS, administered by the Korea

[4] Unfortunately, we do not have information on parental time reallocation in the data. Hence, we examine the role of two other channels and, if the other channels have a significant effect, we conclude that time reallocation could play a minor role.

Institute for Health and Social Affairs and Seoul National University, to elaborate a more flexible social welfare policy. The survey is nationally representative and conducted every year.

The first wave of the survey conducted in 2006 consisted of 7,072 households.[5] There are three types of questionnaires in the survey: one for households and all household members, one for household members aged 15 and over, and one for special topics (supplements). The household samples include two groups: 3,500 households with less than 60% of the median income and 3,500 households with more than 60% of the median income. Given this structure, the survey collects various information on families and individuals on their social service needs, use patterns, economic and demographic characteristics, income sources, and emotional and behavioral health status, among others. The latest wave available is the twelfth wave in 2017. The attrition rate of original households in the twelfth wave compared to the first one is 37.81%.[6] The most important feature of the data is that it contains information on children's health status and it could be linked to various information on their parents', in particular, job loss and insecurity status.[7]

We use the unbalanced panel dataset for 2006–2017 and, ultimately, have 14,788

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[5] The first survey was conducted in 2006. However, all the data is based on 2005 information.

[6] The 62% retention rate in the twelfth wave is equal to or relatively higher than other panel surveys in Korea. Nonetheless, to address the problem of a decrease in the original sample size because the survey was rejected, natural losses, or there is a problem in the distribution of the sample and its representativeness, a survey of 1,800 households as a newly added sample was conducted in 2011.

[7] Another dataset, the Korean National Health and Nutrition Examination Survey, contains children's various health information and parental information. However, the data is not a longitudinal survey data.

father–children pairs and 5,191 mother–children pairs.[8]

3.2. Measures of Job Insecurity and Child Health

We construct the variable *jobinsec* using the employment histories from our longitudinal survey data. This measure is a binary variable taking the value of 1 when an individual's self-reported job status changes from full-time employment to temporary employment or from full-time employment to daily employment or from working to unemployed in consecutive waves.[9] The reference groups do not experience change in employment status between consecutive waves, that is, they remain in full-time employment.[10] As we saw in the literature review, most studies used the change in status from working to unemployed, that is, job loss as a measure of parental job insecurity. However, the change from full-time employment to temporary or daily employment is more likely to capture the phenomenon that is rapidly characterizing the Korean labor market.[11] One crucial thing to note is that our measurement of parental job loss and insecurity might not exclude voluntary unemployment or temporary

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[8] In this study, a child is defined as someone who is aged under 18, according to Korean child welfare law.

[9] In Korea, usually, full-time employment offers a contractual working period that lasts longer than one year, whereas temporary employment has a contractual period lasting longer than a month and less than a year. Daily workers either have contracts shorter than a month or no fixed locations of working, usually being employed on a daily basis.

[10] Additionally, we constructed an alternative measure of job insecurity. In Korea, self-employed people accounted for 21% of the total employed in 2018. So, we construct a job insecurity measure, which takes the value of 1 if an individual belongs to the original measure or if the individual moved from self-employed to unemployed. We have not presented the results for this measure because they exhibit the same qualitative features as the original measure. But they are available from the author on request.

[11] This is also the reason Liu and Zhao (2014) used underemployment in their analysis. For a detailed discussion of underemployment, see Hussmanns (2007).

employment in this self-reported job status data. In the previous studies, researchers have strictly tried to use involuntary job loss, that is, employment termination due to lay-off, retrenchment, redundancy, dismissal, or an employer going out of business, as in Bubonya et al. (2017). Inclusion of voluntary job loss and insecurity could be problematic because children's bad health status could cause parents to change their employment status for more time to take care of their children and, if this happens, we have reverse causality. We will return to this in the empirical analysis section.

As a measure of children's health, we use the self-rated health status of the child. This measure is divided into five categories: excellent, good, fair, poor, and very poor.[12] This measure captures the general health status of the child and is reported by the person who is best supposed to know the child's health status. As mentioned in Case et al. (2002), it is quite a challenging task to construct the most proper measure of child health status. In case of adults, self-rated health status is a good predictor of future mortality even after controlling for health-related behavioral variables. However, there have been very few studies on the predictive power of children's self-rated health status. According to Gennetian et al. (2010), although parental reports of children's overall health status do not allow us to capture the subtleties of children's health, prior research suggests that the measure is unbiased by the parents' own physical or mental health (Case et al., 2002; Dadds et al., 1995) and correlated with specific health conditions. In our case, self-rated health status (reported mostly by parents) is the most representative measure of child health status.[13] Further,

[12] The value each category takes is as follows: "excellent"=1, "good"=2, "fair"=3, "poor"=4, and "very poor"=5.

[13] Other health-related variables are the number of chronic diseases a child has and children's health care uses, such as the number of doctor visits, the number of inpatient service uses, and the length of stay per inpatient service use.

this measure is correlated with chronic diseases in children (correlation coefficient is 0.115) even though we cannot verify its relationship with mental health status.

3.3. Variables and Descriptive Statistics

Table 1 presents the descriptive statistics for the key independent variable—children's self-reported health—and parental self-reported health. We can see that most children have a self-rated health of either excellent or good. It should be noted that the distribution of children's self-rated health is very similar to the distribution of parents' self-rated health. Indeed, the coefficient of correlation between the two is high, 0.538. We discuss the implications of this in the conclusion section. Table 2 summarizes the descriptive statistics of all the variables used in the empirical analysis. The information includes the characteristics of children, parents, households, and some mediating variables.

In the sample for 2006–2017, about 5% of the fathers and 12% of the mothers experience a move to job loss and insecurity status as defined in the previous section between *t*-1 and *t* time periods.[14] With regard to the children's variables, there are statistical differences in child age and the national health insurance subscription between those parents who remain in secure employment status and those who move to job loss and insecurity status. In Korea, broadly speaking, all citizens are covered either by the National Health Insurance System or medical aid.[15] Since the classification into these is mostly related to parental job status, it is natural for us to observe this

[14] As of August 2017, the proportion of female workers in insecure job status was 55.2% while that of male workers was 44.8%. In Korea, female workers are known to be more vulnerable to job insecurity compared to male workers.

[15] For a detailed information on the Korean healthcare system, see Song (2009).

difference. There are also differences in parental educational attainment, real household income,[16] and housing status between the two groups. It is very plausible that educational attainment, income level, and housing status are related to the change to the job loss and insecurity status too.[17] It is also noteworthy that single parent households tend to be related more to the change to the job loss and insecurity status than to secure employment status.

One area of investigation in this study is the plausible channeling mechanisms that transfer the influence of parental job loss and insecurity to children's health as discussed in section 2. For that purpose, we selected real household income changes between the time periods *t*-1 and *t*, parental mental health status, and the financial hardship experienced to investigate the possible effects of these variables on children's health.[18] In Table 3, the real household income changes are significantly different between the two job insecurity groups. For those who experience a change to job insecurity, the change was negative, whereas it was positive for those who remain in non-job-insecurity status. Parental mental health was measured using the Centre for Epidemiologic Studies Depression Scale that consists of 11 questions. These questions take four ordinal answers,[19] and two of the questions measure the positive feelings of respondents for which the order is reversed. Overall, the higher the scores, the worse the mental condition. There are seven questions regarding the experience of financial

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[16] Income was converted into the real terms using consumer price index (2016=100).

[17] Rented housing 1 and rented housing 2 in Table 2 denote "*Jeonse*" and monthly rentals. In the *Jeonse* system, a renter makes a lump-sum deposit on a rental space, at anywhere from 50% to 80% of the market value, instead of paying a monthly rent. Rented housing 2 is usually considered inferior to *Jeonse* property.

[18] Unfortunately, there is no information available for investigating the role of time constrains and time allocations in the data set.

[19] As the answers get more negative, the scores become higher.

hardship.[20] Using this information, we construct a dummy variable that takes the value 1 if the respondent experiences any financial hardship, and zero otherwise. As shown in Table 2, there are significant differences between the two job security groups. We formally investigate in the empirical analysis whether these variables indeed mediate the shock from the changes in job security status to the children's health after controlling for other variables.

4. Empirical Method

We use the following random effect panel ordered probit model to estimate the effects of parental job loss and insecurity on child health. Given this specification, the latent child health ($csrh$) model framework can be written as

$$csrh_{it}^{*} = \beta_0 + \beta_1 jobinsec_{it} + \beta_2 X_{it} + \beta_3 Z_{it} + \alpha_i + \epsilon_{it} \quad (1)$$

This model consists of four components. First, $jobinsec$ is a binary indicator of whether the father (or mother) moves to the job loss and insecurity status from *t*-1 time to *t* as defined in the previous section. β_1 is the main parameter to be estimated. Second, α_i is an individual-specific and time-invariant random component assumed to follow a standard normal distribution with zero mean and variance σ_α^2.[21] This

[20] The experiences of "moving out because the respondent could not pay rents for more than 2 months," "not being able to pay utility bills," "not being able to tax bills," "being able to pay children's tuition fees for more than a month," "not having heating in the winter because of shortage of money," "not being able to go to hospital because of financial problems," and "becoming a credit defaulter."

[21] A fixed effect model is not considered because of the incidental parameter problem. Unlike in the linear case, the standard estimation of α_i, such as maximum likelihood estimation along with other parameters to be estimated leads to the inconsistent estimation of α and other parameters, βs, with T fixed and $N \to \infty$. See Lancaster (2000) for further details on this. However, bear in mind that the random

component represents unobserved individual heterogeneity. Third, X_{it} is a set of observed explanatory variables that capture child characteristics at time *t*. Fourth, Z_{it} is a vector of parental demographic and socioeconomic characteristics and household-specific exogenous variables. Further, ϵ_{it} is a serially independent error term assumed to follow a standard normal distribution with zero mean and unit variance.

We estimate the empirical model separately for paternal and maternal job loss and insecurity.

5. Empirical Results

5.1. Main results

The results from the empirical analysis are presented in Table 3. The second and third columns show the effect of paternal and maternal job loss and insecurity on child health, respectively. In the case of paternal job insecurity, it clearly has a statistically significant and negative[22] effect on child health measured by the self-rated health. That is, the probability of reporting worse health increases with paternal job loss and insecurity. Child age has a positive effect on child health, which implies that child health gets better as the child grows. When the child has at least one chronic disease, it has a negative effect on child health. Father's age has a positive effect on child health. As the father's health status gets worse, it also affects child health negatively. The number of children in a household tends to have a negative effect on child health.

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effect model is based on a stronger assumption than the fixed effect model. That is, it is based on the assumption that the individual-specific effect is a random variable that is uncorrelated with the explanatory variables.

[22] As explained in footnote 12, the value each health status category takes increases as the health status deteriorates.

However, regarding the other explanatory variables, it would be natural to interpret the results as a correlation rather than a causality. Contrary to paternal job loss and insecurity, maternal loss and insecurity has no effect on child health. This is consistent with the results of previous studies, in particular, Schaller and Zerpa (2017) and Liu and Zhao (2014). As explained in Schaller and Zerpa (2017), previous theoretical and empirical studies suggested that the negative effects of paternal job loss are likely to be larger than those of maternal job loss[23]. The same logic could apply to job insecurity too. This can be attributed to the fact that paternal job loss often has a larger shock, both physically and mentally, and to the cultural emphasis of men being the breadwinners, clearly evident in Korea.[24] Child age and chronic disease have the same effect as paternal job loss and insecurity. Mother's health status is also positively correlated with child health. Less education, being a single mother, and the number of adults in the household—all significantly affect child health positively.

5.2. Reverse causality

Although we control for unobserved heterogeneity using random effect panel data model, one crucial endogeneity problem, reverse causality, is still worth investigating because we could not distinguish involuntary job loss and temporary employment from voluntary job loss and temporary employment as mentioned in section 3.2. There are

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[23] For instance, Kalil and Ziol-Guest (2008) and Rege et al. (2011) found out that the father's experience of involuntary employment is associated with children's academic progress while there is no significant association between the mother's employment experiences and children's academic progress.

[24] Moreover, it could be possible that maternal job loss and insecurity is associated with improved outcomes for children, as seen in Morrill (2011) and Gennetian et al. (2010). We show that this is the case later in this paper.

reasons to conjecture that causality could run in both directions, such that parental job loss and insecurity could affect child health negatively or adverse child health could cause parents to change to job loss and insecurity voluntarily or withdraw from the labor market to take care of their children.[25] That is, there could be unobserved factors simultaneously influencing children's health and parental job loss and insecurity status. We estimate the following panel probit equation to investigate the possible reverse causality.

$$jobinsec_{it+1} = \gamma_0 + \gamma_1 csrh_{it} + \gamma_2 X_{it} + \gamma_3 Z_{it} + \nu_i + u_{it} \quad (2)$$

Here, the main parameter to be estimated is γ_1. This captures the effect of child health on the changes in parental job loss and insecurity status between the current and the next period. If the estimated coefficient is statistically positive, this implies that there is reverse causality. As shown in Table 4, there are no significant effects of child health on the change to parental job loss and insecurity status between the *t* and *t*+1 time periods for either fathers or mothers. This suggests that any potential bias from reverse causality would not be a serious concern. Rather, the change is correlated to some parental and household characteristics as shown in Table 4.

5.3. Heterogeneous effects

When there is an effect of parental job loss and insecurity on child health, the effect could be heterogeneous across the subpopulations. To consider this possibility, we investigate the possible heterogeneous effects for some child subpopulations using the empirical model that is the same as the main model (1). We report the estimated coefficients for *jobinsec* and child-related variables only. First, we conduct the main

[25] Unfortunately, KOWEPS does not have information on whether the job loss and insecurity is voluntary.

empirical analysis for each gender separately. The results are presented in the second and third columns in Table 4. It is found that paternal job loss and insecurity status has a statistically significant negative effect on boys' health, but no effect on girls' health. In contrast, it turns out that maternal loss and insecurity has a significant positive effect on boys' health and no effect on girls' health. Thus, as shown in the literature, paternal and maternal job loss and insecurity affect children's health in both negative and positive ways; however, these effects are gender-specific, and girls' health is not affected. Second, we investigate whether the effect of parental job loss and insecurity varies according to children's age. For this purpose, we construct two child age groups: 0 to 9 years old and 10 to 17 years old. As shown in the third and fourth columns in Table 4, we find that parental job loss and insecurity has an effect on only the younger children. That is, the effect is age-specific. Further, similar to the analysis based on children's gender, the effect is opposite depending on the gender of parents whose status changes to job loss and insecurity. Finally, we examine the effect of parental job loss and insecurity across different parental educational attainment—less than college level and more than college level. The results are presented in the fifth and last columns of Table 4. We find that only paternal job loss and insecurity has a negative effect on children's health when the father has higher than a college level education.

5.4. The role of mediating variables

In this subsection, we examine the possible mediating channels by which the effects of parental job loss and insecurity is transferred to children's health. We analyze this issue by further dividing samples according to parental partnership—being with a partner or being without a partner. The rationale is that the financial and mental troubles caused by job loss and insecurity would have different effects on workers depending on whether

there is a partner as a buffer. The results for the role of mediating variables are presented in Table 5. First, for the fathers, job loss and insecurity cause a drop in real household income significantly for both fathers with a partner and fathers without a partner. However, mental problems and financial hardships are caused by the job loss and insecurity of fathers with a partner only. Thus, we conclude that the mediating channels mainly work in households with two parents for paternal job loss and insecurity. Second, for the mothers, we observe that only those with a partner experience real income reductions owing to job loss and insecurity. However, we notice that mothers both with and without a partner do not experience financial hardship. In case of mothers with a partner, in particular, it is likely that their household is buffered by the husband's income even though their real household income relatively falls. Both mother groups suffer from mental problems. However, this factor does not seem to affect children's health directly, as can be seen from previous results. Overall, we can conclude that the material input discussed in section 2 works dominantly in the channeling mechanism in paternal job loss and insecurity, and the time reallocation effect dominates in maternal job loss and insecurity, at least for some child subpopulations.

6. Discussions and future directions

In this paper, we examine the effects of parental job loss and insecurity on children's health. Our results show that paternal job loss and insecurity affect children's health in a significantly negative way, whereas maternal job loss and insecurity have no effects. Next, we investigated using the reverse causality test whether the children's health caused a (possible) parental voluntary job loss and temporary employment. We found no evidence of such a phenomenon. Further, we investigated the heterogeneous effects

of parental job loss and insecurity on subpopulations of children. We found that either only boys or children under age 9 experience significant health effects due to parental job loss and insecurity. Interestingly, as suggested by some studies, paternal job loss and insecurity have a negative effect and maternal ones have a positive effect. Finally, we investigated the role of mediating channels. Our analysis took into account real income changes, mental problems, and financial hardship, excluding time reallocation effect due to data limitations. In this analysis, we observe that negative financial effects and mental effects are apparent for fathers, but only mental effects are apparent for mothers. Thus, we tentatively conclude that the time reallocation effect works dominantly for mothers, and this is reflected in the positive effect of maternal job loss and insecurity on either boys or children under age 9 in the heterogeneous effects analysis.

So far, labor market reforms in Korea have been discussed and dealt with in terms of efficiency enhancement. There have been concerns about the economic status and health deterioration of displaced workers. Our analysis shows that these effects have a wider consequences, in the sense that parental job loss and insecurity have adverse effects on their children's health too, which, in turn, may have a long-term effect on the children individually and the economy as a whole. Therefore, the future policies regarding labor market reformation should take this into consideration.

We conclude this paper by suggesting two future research directions. First, future studies could consider the various kinds of health indicators for children in constructing child health measurements. This is important because researchers usually use proxy self-reported health status for children. That is, child health measurement, like in our analysis, is a proxy variable reported by those who know the children the most in the family, usually the parents. Thus, this indicator is likely to be susceptible to

measurement error as it reflects the proxy reporter's health rather than the true health status of children.[26] This seems to be likely in our case as well. KOWEPS irregularly collects children's health as reported by children.[27] Figure 1 shows the histograms for self-reported health reported by children and proxy children's health reported by parents. We can notice that the distributions are fairly different from each other and we believe that the proxy variable has been contaminated by the reporting parents.[28] Hence, future research should incorporate objective measurements of children's health as long as rich data is available. Second, in this paper, we investigated the effect of parental job loss and insecurity on children's health only in the short run. It is highly likely that the early negative health effects could have a long-term effect on children's educational performance, adult health, and labor market performance, as evidenced in the literature. Therefore, investigating the long-term effects are a necessary task for the future.

[26] Pastor and Reuben (2011), Davis et al. (2008), and Waters et al. (2000) investigated the effect of parental health status on children's health reported by parents. They found that there is evidence of a link between proxy-reported child health and proxy reporter's health.

[27] It was conducted in 2006, 2009, 2012, and 2015 for some selected subgroups of children.

[28] However, at this stage we cannot adjudge which one is a better measurement.

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Table 1 The distribution of self-rated health status of parents and children

	Children			Parents		
	Full	Insecure	Secure	Full	Insecure	Secure
Excellent	29.18	28.14	29.25	23.52	18.97	23.84
Good	65.22	65.38	65.21	63.53	66.62	63.32
Fair	4.42	5.09	4.38	10.31	10.41	10.30
Poor	0.93	0.93	0.93	2.43	3.62	2.35
Very poor	0.25	0.46	0.22	0.21	0.39	0.19

Note: n=19,979. Coefficient of correlation between parental and children's self-rated health for full sample is 0.5381

Table 2 Descriptive statistics of variables

Variable	Full		Secure	Loss and Insecure
	Mean (1)	Standard Deviation (2)	Mean (3)	Mean (4)
Parental Job Loss and Insecurity				
Paternal job loss and insecurity	0.047	0.211		
Maternal job loss and insecurity	0.117	0.321		
Children Variables				
Child age[a***]	9.157	4.624	9.097	10.02
Female	0.492	0.500	0.492	0.490
Entitled to Korean medical aid[***]	0.006	0.078	0.005	0.029
Having at least one chronic disease	0.134	0.340	0.134	0.123
Parental Variables				
Age[a]	40.45	5.228	40.46	40.31
Having education less than college level[***]	0.402	0.490	0.384	0.654
Household Characteristics				

Log real household income[a***]	7.950	0.429	7.974	7.606
Single parent household[***]	0.031	0.173	0.027	0.087
Rented housing 2	0.231	0.422	0.232	0.229
Rented housing 3[***]	0.182	0.386	0.173	0.309
	(Reference: Owned housing)			
Number of children[a***]	1.988	0.653	1.993	1.914
Number of adults[a]	2.182	0.521	2.180	2.207
Region 2 (Metropolitan city)	0.280	0.449	0.279	0.298
Region 3 (City)	0.436	0.496	0.436	0.446
Region 4 (Town)	0.111	0.315	0.112	0.098
	(Reference: Seoul)			
Mediating Variables				
Real income changes[***] between *t* and *t-1*	185.2[b]	1,190	199.2[b]	-16.29[b]
Mental health scores[a***]	15.34	2.510	15.28	16.32
Financial hardship[***]	0.024	0.154	0.019	0.096

[a] These variables are continuous variables. The remaining variables are discrete and the mean values for the discrete variables denote the proportions of the samples belonging to the relevant group.

[b] This variable is measured in 10,000 Korean won. The income variable was made real using consumer price index, and the base year is 2016. In 2016, one US dollar was equal to 1,161.11 won.

[***] and [**] denote significant difference between columns (3) and (4) at $p<0.01$ and $p<0.05$, respectively.

Table 3 The effects of paternal and maternal job loss and insecurity on child health

Random effects ordered probit	Father's loss and insecurity	Mother's loss and insecurity
Jobinsec	0.130**(0.055)	-0.086(0.064)
Child characteristics		
Age	-0.020***(0.004)	-0.020***(0.007)
Female	0.031(0.029)	-0.073(0.047)
Korean medical aid	-0.017(0.199)	0.004(0.191)
Chronic disease	0.368***(0.033)	0.338***(0.060)
Parental characteristics		
Age	-0.008**(0.004)	0.007(0.007)
Less than college	-0.042(0.032)	-0.254***(0.054)
Self-rated health status	1.205***(0.020)	1.344***(0.035)
Household characteristics		
Log household income	-0.038(0.036)	-0.037(0.055)
Single parent	0.069(0.099)	-0.381***(0.104)
Rented housing 2	-0.038(0.032)	-0.076(0.055)
Rented housing 3	-0.042(0.035)	-0.004(0.061)
Number of children	0.049**(0.021)	-0.028(0.036)
Number of adults	0.040(0.029)	-0.110***(0.042)
Region 2	0.106**(0.045)	0.135*(0.071)
Region 3	0.020(0.042)	-0.045(0.064)
Region 4	0.026(0.055)	0.047(0.090)
Cut1	1.031(0.325)	1.273(0.525)
Cut2	3.889(0.327)	4.321(0.530)
Cut3	4.860(0.329)	5.234(0.535)
Cut4	5.772(0.339)	6.174(0.556)

σ_α^2	0.222(0.018)	0.185(0.031)
Log likelihood	-9,783	-3,169

*** and ** denote statistical significance at p<0.01 and p<0.05, respectively. Figures in parentheses are the standard errors of the estimates.

Table 4 Reverse causality test

Random effects probit	Father's loss and insecurity	Mother's loss and insecurity
Child health	-0.066(0.055)	-0.063(0.087)
Other child characteristics		
Age	-0.001(0.010)	0.068***(0.016)
Female	0.079(0.064)	-0.032(0.097)
Korean medical aid	0.412(0.366)	0.677*(0.392)
Chronic disease	0.067(0.080)	0.198(0.120)
Parental characteristics		
Age	0.007(0.008)	-0.036**(0.015)
Less than college	0.446***(0.072)	0.413***(0.110)
Self-rated health status	0.023(0.049)	0.038(0.074)
Household characteristics		
Log household income	-0.837***(0.081)	-0.806***(0.124)
Single parent	0.311*(0.180)	-0.180(0.205)
Rented housing 2	0.003(0.078)	-0.027(0.117)
Rented housing 3	0.319***(0.078)	0.217*(0.123)
Number of children	-0.246***(0.049)	-0.198**(0.081)
Number of adults	0.186***(0.060)	0.047(0.088)
Region 2	-0.154(0.099)	0.202(0.152)

Region 3	-0.036(0.091)	0.093(0.139)
Region 4	-0.608***(0.141)	0.175(0.188)
σ_u	0.669(0.091)	0.814(0.121)
P	0.310(0.058)	0.398(0.071)
Log likelihood	-1,598	-889

***, **, and * denote statistical significance at p<0.01, p<0.05, and p<0.1, respectively. Figures in parentheses are the standard errors of the estimates.

Table 4 Heterogeneous effects of parental job insecurity

Random effects ordered probit	Boy	Girl	Age 0-9	Age 10-17	Less than college	More than college
Father						
Jobinsec	0.182**(0.077)	0.075(0.079)	0.170**(0.073)	0.061(0.086)	0.095(0.068)	0.199**(0.092)
Age	-0.020***(0.006)	-0.021***(0.006)	–	–	-0.011*(0.006)	-0.032***(0.006)
Female	–	–	0.028(0.037)	0.012(0.043)	0.015(0.044)	0.042(0.038)
Korean medical aid	-0.606**(0.289)	0.582**(0.274)	0.563*(0.320)	-0.200(0.265)	0.282(0.212)	-1.781***(0.580)
Chronic disease	0.382***(0.046)	0.348***(0.049)	0.340***(0.044)	0.418***(0.053)	0.292***(0.053)	0.414***(0.043)
Mother						
Jobinsec	-0.218**(0.086)	0.068(0.097)	-0.357***(0.122)	0.004(0.077)	-0.096(0.080)	-0.092(0.112)
Age	-0.017*(0.009)	-0.025**(0.011)	–	–	-0.023**(0.011)	-0.021**(0.010)
Female	–	–	-0.032(0.074)	-0.085(0.059)	-0.130*(0.069)	-0.001(0.064)
Korean medical aid	-0.238(0.295)	0.149(0.258)	-0.150(0.469)	0.097(0.210)	0.089(0.214)	0.631(0.521)

Chronic disease	0.451***(0.079)	0.177*(0.093)	0.332***(0.093)	0.352***(0.081)	0.292***(0.092)	0.383***(0.081)

***, **, and * denote statistical significance at p<0.01, p<0.05, and p<0.1, respectively. Figures in parentheses are the standard errors of the estimates.

Table 5 Mediator between parental job insecurity status and children's health

	Random effect linear		Random effect linear		Random effect probit	
	Real income changes		Mental health scores		Financial hardship	
	With a partner	Without a partner	With a partner	Without a partner	With a partner	Without a partner
Jobinsec: father	-254.5***(45.87)	-333.0***(106.9)	0.351***(0.098)	-0.228(0.522)	0.360***(0.116)	0.304(0.337)
Jobinsec: mother	-173.2***(64.88)	-58.72(91.92)	0.377***(0.126)	1.331***(0.453)	0.244(0.279)	0.202(0.122)

***, **, and * denote statistical significance at p<0.01, p<0.05, and p<0.1, respectively. Figures in parentheses are the standard errors of the estimates.

Figure 1 The distribution of self-rated health status of children and proxy health by parents