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Economic Insecurity and Health

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Abstract

We here show that individual-level economic insecurity, based on the time profile of economic resources, is detrimental to both physical and mental health in long-run Australian panel data. This relationship is found in panel data, comparing an individual's change in economic security over time to the changes in her health. A heterogeneity analysis reveals that economic insecurity is particularly detrimental to the health of the most-deprived, those over the age of 30, and men rather than women.

Keywords— Economic Insecurity, Mental health, Physical health, HILDA.

JEL Classifications — I14, D63, I32.

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1 Introduction

Economic insecurity has become a major research topic in a number of social science disciplines, in particular following the financial crisis of 2008 that was characterised by increased volatility in financial markets, greater inequality, and higher unemployment rates. This economic downturn had dramatic economic consequences not only on individuals' current economic well-being, but also increased their worries about what the future might bring. Defined as the anxiety felt by individuals when they face the threat of future unfavourable economic prospects [Bossert and D'Ambrosio, 2013], this economic insecurity can affect household decisions such as children's educational choices [Stiglitz et al., 2009], family break-up [Larson et al., 1994], consumption patterns [Linz and Semykina, 2010], and fertility [Ciganda, 2015, Clark and Lepinteur, 2022]. Economic insecurity has also been argued to cause ill health, and in particular has been shown to impair mental health by altering cognitive functioning [Mani et al., 2013], damaging self-esteem [Heine et al., 2006] and triggering psychological disorders [Menéndez-Espina et al., 2019]. As stress and anxiety are also often manifested in somatic symptoms [DeLongis et al., 1988], economic insecurity can also have detrimental effects on physical health, as highlighted in the meta-analysis by Chou et al. [2016], due to the feelings of powerlessness it generates [Wallerstein, 1992].

Given this importance of insecurity for individual outcomes, the question of its measurement becomes central. This latter is a very active field of research, and a variety of measures have been proposed, including both subjective evaluations and objective elements. Among the former are the self-assessed probabilities of objective life events such as material deprivation, having a low income in the future, or becoming unemployed [Dominitz and Manski, 1997, Mau et al., 2012, Nau and Soener, 2019], and subjective evaluations of financial satisfaction or job insecurity measured via Likert scales [Rohde et al., 2015]. Regarding objective measures of insecurity, Hacker et al. [2014] propose an index that is based on downward income volatility, as measured by large (25% or more) drops in household income from one year to another; Bossert et al. [2023] expand this concept and propose an

index of economic insecurity, which they characterise axiomatically, that includes both individual income losses and gains over time. Extensive surveys of the theoretical approaches and empirical findings regarding economic insecurity can be found in D'Ambrosio [2018] by Rohde and Tang [2018] and Osberg [2018].

We will here apply the measure in Bossert et al. [2023] to establish the association between economic insecurity and physical and mental health in long-run panel data. Our analysis is carried out using data from HILDA, a nationally-representative survey of Australians that has been carried out every year since 2001. This contains annual information on household income, the movements in which are used to create a household's insecurity measure, and a number of measures of individual health. These latter include the SF-36, which is a psychometric scale widely used in Epidemiology to assess individual physical and mental health. We will show below that within-person changes in economic insecurity are strong predictors of both health measures, with an effect size that is as large as that from household income. A heterogeneity analysis reveals that this detrimental effect of economic insecurity on health is concentrated among the most economically-deprived, those aged over 30, and men rather than women.

Our research contributes to the literature on the effect of insecurity on health. This relationship with respect to job insecurity has been well-documented in the literature. Using international data from three cross-sectional surveys, László et al. [2010] highlighted that insecurity at work is associated with worse self-reported health. Kopasker et al. [2018] estimate the negative consequences of a measure of subjective economic insecurity on mental health via a set of questions on job security and the respondent's expected future financial situation. This relationship is argued to be causal, as subjective economic insecurity is instrumented by its incidence within the individual's reference groups. Lepinteur [2021] proposes a quasi-experimental design using changes in the French Delalande Tax on layoffs to establish a causal link between greater job insecurity and worse health. However, there is less work on the relationship between health and measures of economic insecurity that are

not specific to the labour market. Rohde et al. [2017] were the first to focus on an objective measure of economic insecurity, as reflected by income losses. They use HILDA data from 2001-2011 to show that this insecurity led to worse mental health for young adults. In a second contribution, Rohde et al. [2016] carry out a fixed-effect analysis of the effect of another set of economic-insecurity measures on mental health (as measured by the SF-36), finding that one standard deviation higher economic insecurity reduces the individual's mental health score by about 1.4 units (corresponding to about 8% of a standard deviation).

The approach we take here differs from the above. First, as the summary scores of physical and mental health are not directly provided in the HILDA data, Rohde et al. [2016] calculate them from the various component elements using the scoring rules in Ware Jr [2000] that are derived from the US population. We instead calculate summary scores in HILDA using weights from a factor analysis of the HILDA data itself. As such, our scores are directly applicable to the Australian data that we analyse. Second, we use the axiomatically-based measure of economic insecurity from Bossert et al. [2023], which relies only on income changes and not on levels. This allows us to analyse the heterogeneous effect of economic insecurity on health by income levels, without there being any confounding effect of the level of income itself on the insecurity measure. We show that economic insecurity is more detrimental for men, the economically-deprived, and those aged over 30.

The remainder of the paper is organised as follows. Section 2 introduces the dataset we use and the main variables. Section 3 describes our empirical strategy and presents the descriptive statistics. The main results, as well as the heterogeneity analysis and robustness checks, then appear in Section 4. Last, Section 5 concludes

2 Data and Variables

Our empirical analyses use 2001–2018 data from the Household, Income and Labour Dynamics in Australia (HILDA), a nationally-representative longitudinal survey of the Australian

population. HILDA is an annual household panel that collects information on respondents' socio-economic and demographic characteristics, life events, well-being, health and family life, among other topics. HILDA follows the lives of over 17,000 individuals each year. Given the length of the HILDA data, we will analyse unbalanced panel data.

2.1 Economic Insecurity

The measure of economic insecurity that we will relate to individual health is that proposed by Bossert et al. [2023], which is based on individual-level intertemporal income changes. The motivation behind this index is that how well an individual has done in the past determines the confidence that they have today to overcome any future income loss. The least-insecure past income profile using this index is one that rose permanently; the most-insecure is one that fell permanently. Any constant stream of income produces an insecurity score of zero. Formally, the economic insecurity of individual i at time t is given by the following expression:

$$EI_{i,t} = l_0 \sum_{\substack{t\in\{1,\dots T\} \\ x_{i,-t}>x_{i,-(t-1)}}} \delta^{t-1}\Big(x_{i,-t} - x_{i,-(t-1)}\Big) + g_0 \sum_{\substack{t\in\{1,\dots T\} \\ x_{i,-t}<x_{i,-(t-1)}}} \delta^{t-1}\Big(x_{i,-t} - x_{i,-(t-1)}\Big) \quad (1)$$

where $x_{i,t}$ is individual i's equivalent household disposable income at time t (equivalised using the square-root equivalence scale), δ is the discount factor, and l_0 and g_0 are the parameters associated with income losses and gains respectively. $x_{i,-t}$ then refers to income t years ago, and $x_{i,-(t-1)}$ to that $t-1$ years ago. As such, $x_{i,-t} > x_{i,-(t-1)}$ in the first element of Equation 1 shows that income fell between t and $t-1$ years ago, and this income loss is weighted by l_0 in the calculation of the economic-insecurity index. On the contrary, in the second element of the equation $x_{i,-t} < x_{i,-(t-1)}$ indicates that there was an income gain between these two years, which is weighted by g_0 in the calculation of the index. The axiomatic characterisation requires that these latter parameters respect $\frac{g_0}{l_0} < 1 < \frac{l_0}{g_0}$ and

$\delta \in (0, \frac{g_0}{l_0})$. As in Bossert et al. [2023], we set $l_0 = 1$, $g_0 = 15/16$, and $\delta = 0.9$.

We can illustrate this index using some of the examples that appear in Bossert et al. [2023], in which T=3.

(a) Consider the stream $x^1 = (4, 12, 12, 16)$. This produces

$$I^3(x^1) = g_0 \left(\delta^2(4-12) + \delta^0(12-16)\right) = -\frac{15}{2}\delta^2 - \frac{15}{4} < 0.$$

There are no income drops in this stream, and as such the resulting insecurity value is negative for any choice of the discount factor. Any income stream with no losses and at least one gain yields a negative value of insecurity, corresponding to less insecurity than a constant income stream.

(b) The reverse stream $x^2 = (16, 12, 12, 4)$ yields

$$I^3(x^2) = \ell_0 \left(\delta^2(16-12) + \delta^0(12-4)\right) = 4\delta^2 + 8 > 0.$$

Here there are no income gains, and the insecurity value will be positive for any δ. Any income stream with no gains and at least one loss produces a positive insecurity value, reflecting more insecurity than a constant resource stream.

(c) Last consider a stream with both losses and gains: $x^3 = (16, 4, 4, 12)$. The insecurity index in this case is

$$I^3(x^3) = \ell_0\delta^2(16-4) + g_0\delta^0(4-12) = 12\delta^2 - 15/2.$$

The insecurity of this stream, as compared to a constant income stream, depends on the value of δ. For higher values of the discount rate (over $(1/2)\sqrt{5/2}$), the index value is positive (so that x^3 is more insecure than a constant resource stream). On the contrary, when $\delta < (1/2)\sqrt{5/2}$ x^3 is less insecure than a constant resource stream (as the higher discount rate puts relatively less weight on the more distant income loss).

2.2 Health

Our dependent variable in the analysis is individual health. The physical- and mental-health measures come from the health components of the Medical Outcomes Study Short-Form survey (SF-36) that appears in every HILDA wave. The SF-36 is a health questionnaire with 36 questions that can be used to analyse the health of a general or specific population. It has been used extensively in many national and international surveys, and its psychometric qualities of validity, fidelity, and reliability have been repeatedly assessed (see [Brazier et al., 1992]).

Respondents answer a set of items covering concepts that are the most affected by disease and treatment. These items are operational health indicators, "including behavioral function and dysfunction, distress and well-being, objective reports and subjective ratings and both favorable and unfavorable self-evaluations of general health status" [Ware Jr, 2000, p.3130]. After aggregation, these items yield indicators for eight health dimensions: physical functioning, role limitations due to physical difficulties, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional difficulties, and mental health. The combination of four of these eight continuous scores produces a summary measure of the respondent's physical health (the physical component summary, or PCS) and the combination of the other four a mental-health measure (the mental component summary, MCS).[1] Higher mental and physical component scores indicate better health.

As HILDA does not include the component summary scores, we calculate these ourselves via a factor analysis. Figure 1 depicts the path-diagram of the structural equation model. Given the longitudinal structure of the SF-36, we constrain the coefficients and intercept of the model to produce a time-invariant factor score over the different survey years. We carry out goodness of fit analyses of the structural equation model using incremental fit indices:

[1]The latent mental-health component is estimated using the dimensions of vitality, social functioning, role limitations due to emotional difficulties, and mental health; the latent physical health component is estimated from the dimensions of physical functioning, role limitations due to physical difficulties, bodily pain, and general health perceptions [Ware Jr, 2000].

these quantify the fit improvement by comparing the Chi-squared statistics of the model in question to a baseline model in which all of the observed variables are constrained to be uncorrelated with each other [Kenny, 2015]. We consider two indices of goodness of fit: the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI). Although these use somewhat different adjustments for the number of degrees of freedom, they both produce statistics lying between 0 and 1, where a value of 0.9 or over indicates a good model fit. The CFI of our model is slightly below this 0.9 threshold (0.89) but the TLI figure is 0.91, indicating that the model we use can be considered as a good fit.

3 Empirical Strategy

3.1 Econometric Model

We will estimate individual fixed-effects regressions. These control for any individual unobservable and time-invariant characteristics that might simultaneously affect an individual's economic insecurity and their health, via, for example, their labour-market choices or genetic factors. We consider the following model:

$$health_{i,t} = \Theta_1 EI_{i,t} + \Theta_2 log(x_{i,t}) + X'_{i,t}\beta + \alpha_i + \gamma_t + \varepsilon_{i,t} \tag{2}$$

where $health_{i,t}$ refers to the standardised physical- or mental-health score of individual i at wave t, $EI_{i,t}$ is a standardised measure of their economic insecurity, and $log(x_{i,t})$ is the standardised value of the logarithm of equivalised annual household income.[2] We introduce a number of control variables in $X_{i,t}$ in order to minimise any potential bias from time-varying omitted variables: these are age group (three dummies: aged under 30, 30 to 50 years old, and over 50), marital status, State of residence, number of children in the household, labour-force status, and home ownership. Last, γ_t are the wave fixed effects. As

[2]We trim the top 1% of the pooled distribution of equivalised annual household income to avoid extreme values.

HILDA is a panel survey, we are able to introduce individual fixed effects α_i that will account for any unobserved individual time-invariant characteristics. All adults in a household are interviewed, and we will therefore cluster standard errors at the household level.

The first set of fixed-effects regressions in Equation 2 relate current physical and mental health to the current values of economic insecurity and equivalised annual household income. We will also estimate versions of this equation where the latter two explanatory variables are lagged:

$$health_{i,t} = \Theta_1 EI_{i,t-1} + \Theta_2 log(x_{i,t-1}) + X'_{i,t}\beta + \alpha_i + \gamma_t + \varepsilon_{i,t} \tag{3}$$

The logic behind these lagged explanatory variables is to minimise problems of reverse causality running from health to income, where worse physical or mental health may increase economic insecurity through an effect on employment, for example. Lagged variables also help to avoid confounding from any individual-level omitted time-varying variables.

The main hypothesis tested in both our models is that economic insecurity leads to worse mental and physical health ($i.e\ \Theta_1 < 0$) conditional on household income, which latter we expect to attract a positive coefficient ($i.e\ \Theta_2 > 0$).

3.2 Descriptive Statistics

The empirical analysis will cover all non-retired individuals aged between 20 and 65 for whom all of our dependent and control variables are measured. The analysis sample starts in 2002. We cannot use the health data from the 2001 wave, as the measure of economic insecurity in Equation 1 above requires the observation of at least one lagged income figure. The analysis sample consists of around 144 000 observations on a little over 20 000 individuals.[3]

[3]There are 282,082 adult observations in the original entire HILDA dataset and 144,741 in the estimation sample. This drop is mostly due to restricting the analysis by age and labour-force status, which reducse the number of observations to 194,805. Almost all of the remaining gap reflects missing values for the dependent health variables.

Table 1 lists the summary statistics for the main HILDA variables in our regression analysis. Average age is around 41, and there are slightly more observations on women than men. Over two-thirds of observations are on the married or those in *de facto* relationships, and 19% of the observations are on the single. 80% of observations correspond to the employed, 16% are out of the labor force and only 3% unemployed.

Regarding our main independent variables, average equivalised annual household income in the sample is $50,924, which is in line with national averages [OECD, 2018]. The average economic insecurity figure of -7 931 does not have a natural unit, which is why we standardise it in the regression analysis. The figures in Table 1 are pooled averages, and do not describe any changes over time. We therefore also plot the time series for these two key variables in Figure 2. In the first panel, average equivalised annual household income rises secularly from $34,025 in 2002 to $63,916 in 2018. The second panel shows how average economic insecurity changes over time. This declined steadily from 2002 to 2009, and then rose, following the Great Recession, for the remainder of the sample period.

Figure 3 depicts the time profile of the main dependent variables, mental and physical health. These track each other over time: while both are relatively flat up until 2010, they exhibit sharp declines after that date. It is tempting to relate this break to the Great Recession. One of the hypotheses we will test in this paper is that this drop in physical and mental health is partly attributable to the rise in economic insecurity. The following section will test this hypothesis econometrically.

4 Results

4.1 Main Results

Table 2 presents the results from the fixed-effects regressions in Equation 2 for first physical and then mental health, as measured by the SF-36 components depicted in Figure 1. As economic insecurity and household income are fairly-highly correlated ($\rho = -0.63$), columns

(1) and (3) of this table show the results from baseline regressions which control for household income but not economic insecurity; columns (2) and (4) show the results when both are introduced at the same time.

In columns (1) and (3), household income is significantly positively correlated with both mental and physical health. A one standard deviation (SD) rise in the logarithm of equivalised annual household income is associated with a 0.014 (0.015) SD rise in mental (physical) health. These fixed-effect results are consistent with those found in the literature examining the causal influence of income on physical and mental health [see, for example, Apouey and Clark, 2015, Gardner and Oswald, 2007, Lindahl, 2005]. Adding economic insecurity in columns (2) and (4) reduces the size of the estimated income coefficient, which nonetheless remains significant. This drop is to be expected, as income and economic insecurity are negatively correlated. The estimated coefficient on economic insecurity itself is negative and significant for both health measures, with a standardised coefficient of about 0.01.[4] This finding that economic insecurity leads to worse health is consistent with that in Rohde et al. [2017], where economic insecurity is not measured as an index of income changes, but rather via a set of proxies such as income loss, job insecurity and inadequate emergency funds.

The results above referred to (within-individual) contemporaneous changes in income, insecurity and health. Table 3 presents the results from Equation 3, where both income and insecurity are lagged by one year. This ends up having only little effect on the estimated coefficients on economic insecurity, which is perhaps to be expected given that (from Equation 1) insecurity is already calculated over a long time period (so that dropping one year should not overly affect its calculated value). There is also little change in the estimated coefficients on household income in the physical-health equations, which are very similar

[4]We have estimated the relationship between insecurity and mental health, on the one hand, and physical health on the other. It may well be that the two health measures mediate each other, with for example insecurity negatively affecting physical health and the latter then affecting mental health (as noted on page 38 of Productivity Commission 2020, 2020). Given that insecurity is itself defined over many previous time periods, it is difficult to establish definitively mediating relationships in our analysis.

in Tables 2 and 3. On the contrary, the estimated income coefficients in the mental-health regressions in columns (3) and (4) of Table 3 are smaller than those in Table 2. This is consistent with reverse causality, whereby worse health causally reduces current income (but only worse mental health, and not worse physical health).[5] It is also consistent with there being aggregate labour-demand shocks that reduce both current income and current mental health; these would not be picked up in measure of economic insecurity as this latter is based on past movements in income (as opposed to being prospective or forward-looking, as in Clark and Lepinteur [2022] and Clark et al. [2023]).[6]

We last note that the results in Tables 2 and 3 are unweighted. Solon et al. [2015] recommend reporting both unweighted and weighted estimates in general. When we apply enumerated person longitudinal weights to the regressions, we obtain estimated coefficients on economic insecurity of 0.015 and -0.012 for the contemporaneous correlations in Table 2 and -0.008 and -0.006 for the lagged specification in 3. These figures are not significantly different from those in the main tables.

4.2 Heterogeneity

The coefficients in Table 2 refer to the average effects of economic insecurity over all individuals in the sample. To see whether some groups are more affected by insecurity than others, we explore potential heterogeneity by socio-economic characteristics (income, age, gender and household type) and by year. We do so by introducing interaction terms between economic insecurity and the characteristic in question into Equation 2.

[5]We did not have any *a priori* expectations about which type of health would be most important in determining income. It may be that, with the decline in jobs that require strenuous physical effort, physical health has become a less-important determinant of earnings on the labour market.

[6]Figure 9 in Appendix B plots the economic-insecurity results for each of the eight separate SF-36 dimensions (four each for mental and physical health). In the top half of Figure 9, economic insecurity is associated with significantly worse physical health for all four of these (at the 10% level at least). In the bottom half of Figure 9, the estimated coefficients for the emotional and mental health components are not significant, but there are negative significant coefficients for social functioning and vitality. In the spirit of multiple-hypothesis testing, we include these results in the Appendix only and reduce the dimensionality in the main text by combining the four components of each health measure into one single score.

We first create four quartile groups from the continuous household-income variable. Figure 4 displays the total effects of economic insecurity by household income quartile.[7] It can clearly be seen that the negative effects of economic insecurity on both physical and mental health are concentrated in the first quartile of the income distribution. It is already widely-accepted that there is a health gradient in income [Marmot and Bobak, 2000]; these results show that economic insecurity, as measured from the income stream, exacerbates the disadvantage of the poorer.

We second consider heterogeneity by age, considering those below 30, 30 to 50, and 51 to 65. In Figure 5, the young are insulated against economic insecurity. This perhaps reflects that the younger have fewer family responsibilities and debt, and are so less reliant on steady incomes [Sverke et al., 2002, Witte, 1999]. Both of the older age groups suffer equally in terms of economic insecurity, with an estimated effect size that is very similar for physical and mental health.

Figure 6 reveal a substantial gender disparity, with men suffering far more from economic insecurity than do women. This gender gap is particularly noticeable for physical health, in line with Cheng et al. [2005] who argue that this disparity may reflect greater social expectations regarding men's contribution to household income.

We now turn to potential heterogeneity by household type: (1) two parents with children, (2) single parents with children, (3) single adults, and (4) couples without children. The estimated coefficients on the interaction terms (with single adult as the reference category) appear in Figure 7. Economic insecurity is negatively significantly correlated with mental health for all household types. The estimated coefficients are more negative for households with children, although the fairly-large standard errors mean that none of these coefficients are significantly different from each other. In the second panel of Figure 7, the estimated coefficients in the physical-health regression are very similar in size for all

[7] As for all of the heterogeneity analysis in this Sub-section, the estimated coefficients depicted are the sum of the main effect (here of income) plus the coefficients on the interaction terms, with one income group serving as the omitted category.

household types.

The last analysis refers to the year of the observations, where we might imagine that the Great Recession affected the relationship between insecurity and health. In Figure 8, we split the sample into observations up to 2007 and those after that date. There is a clear break between the two, with economic insecurity being significantly associated with worse health only in more-recent years.

4.3 Parameter Choice

The paper's main results of negative correlations between economic insecurity and physical and mental health come from parameter values of δ=0.9 (the discount factor), l_0 and g_0=15/16 (the relative weights on aggregate losses and gains). These are the same values that were used in Bossert et al. [2023].

To see how our results change with different parameter values, we carried out a grid search and estimated our physical- and mental-health regressions on measures of economic insecurity that were calculated using different values of g_0 and δ. We consider values of the discount factor δ from 0.1 to 0.9 in 0.1 increments, and values of the gain parameter from δ+0.1 to 0.9 (so that the gain parameter is always strictly greater than the discount factor, as required by the axiomatic characterisation), while keeping the value of the loss parameter at 1. The other control variables remain as in the main specification in the paper.

Our main result for mental health in Table 2 is a negative coefficient on -0.01. The grid search (results available on request) reveals that negative estimated coefficients on economic insecurity continue to be found for all of the δ and g_0 combinations up to a value of δ of 0.4, where some of the coefficients become positive. As discount factors become higher, the past matters less. With the index in Equation 1, the value of δ that was used in the main analysis implies that the weight (of δ to the power zero, *i.e.* one) assigned to the income change from last year to the present is 23% larger than that on the income change from three years to two years ago, and around 50% larger than that from five years ago to four

years ago. The corresponding figures with a value of δ of 0.4 are spectacularly larger, at 625% and 3900%, and many may think that these are unrealistic.

The analogous physical-health results from the grid search are similar in nature, with negative estimated coefficients appearing up to a value of δ of 0.5. Carrying out the same calculations as in the previous paragraph, a value of δ of 0.5 corresponds to relative weights of 400% and 1600%.

5 Conclusion

We have here used Australian HILDA data to examine the relationship between economic insecurity and physical and mental health. Panel analysis revealed that lower income and greater economic insecurity have similarly-sized detrimental effects on health. These relationships do not seem to be confounded by reverse causality or omitted variables, as they are found in panel analyses and mostly continue to hold when using a lagged measure of economic insecurity. Heterogeneity analysis reveals that economic insecurity does not affect everyone equally: men, those aged over 30 and those with income in the first quartile suffer the most.

These results first underline that it seems to be possible to measure economic insecurity not only by subjective questions, but also objectively via past income movements. Second, finding that insecurity plays a role in determining health conditional on income underlines that recessions may have substantial health consequences even after they are over, as they increase feelings of insecurity. Last, income may be even more strongly correlated with health inequality than was previously believed, given that the health consequences of economic insecurity are only found amongst the poorest.

There are estimated to be four million Australians with mental-health disorders [Productivity Commission, 2020]. Mental health is independently one of the most-important predictors of overall life satisfaction [see Clark et al., 2018, Chapter 6], and in addition

has substantial well-being and fiscal implications for many other life domains, such as the labour market [Table 1 of Productivity Commission, 2020]. We have here concluded that falls in income are associated with worse health via both the resulting lower income levels they produce and greater economic insecurity. The incidence of such income drops can be reduced via general economic growth, as well as by bespoke economic-support measures for those who facing difficulties [as found in Clark et al., 2022, for the generosity of these measures during the Covid pandemic].

Although we carry out a fixed-effect analysis, and include lagged values of income and insecurity, our results are not necessarily causal. It remains important to identify exogenous past movements in income that may inform current economic insecurity, or current events or policy changes that produce feelings of uncertainty about the future but do not affect current income. The analysis of economic insecurity in what is arguably an increasingly-uncertain world will likely remain an important area of research across the social sciences.

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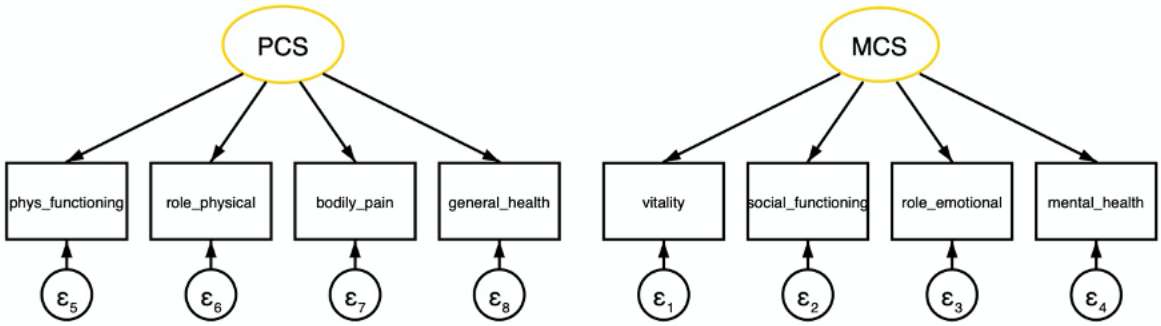
Appendices

A Tables and Figures

Figure 1: The Structural Equation Model for the Factor Analysis



Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: This figure depicts the path diagram for the factor analysis. Each structural equation is of the form $f_j = \lambda_{jk} z_{jk} + e_{jk}$, where f_j (in the ellipses) is a latent component, z_{jk} (in the boxes) a continuous dimension, and e_{jk} an independent error term with mean zero.

Table 1: HILDA Sample Descriptive Statistics

	Mean	Std. Dev	Min	Max
Std. MCS	0.00	1.00	-4.40	1.46
Std. PCS	0.00	1.00	-4.39	1.33
Economic Insecurity	-7,931.69	17,081.00	-77,323.22	45,703.23
Income	50,924.45	25,859.62	0.00	141,511.86
Number of children in the HH	.87	1.31	0	12
Age	40.95	12.17	20	65
Home ownership	0.68			
Female	0.53			
Married	0.70			
Separated	0.03			
Widowed	0.01			
Divorced	0.06			
Single	0.19			
Employed (full-time or part-time)	0.80			
Unemployed (looking for full-time and part-time work)	0.03			
Out of the Labour Force	0.16			

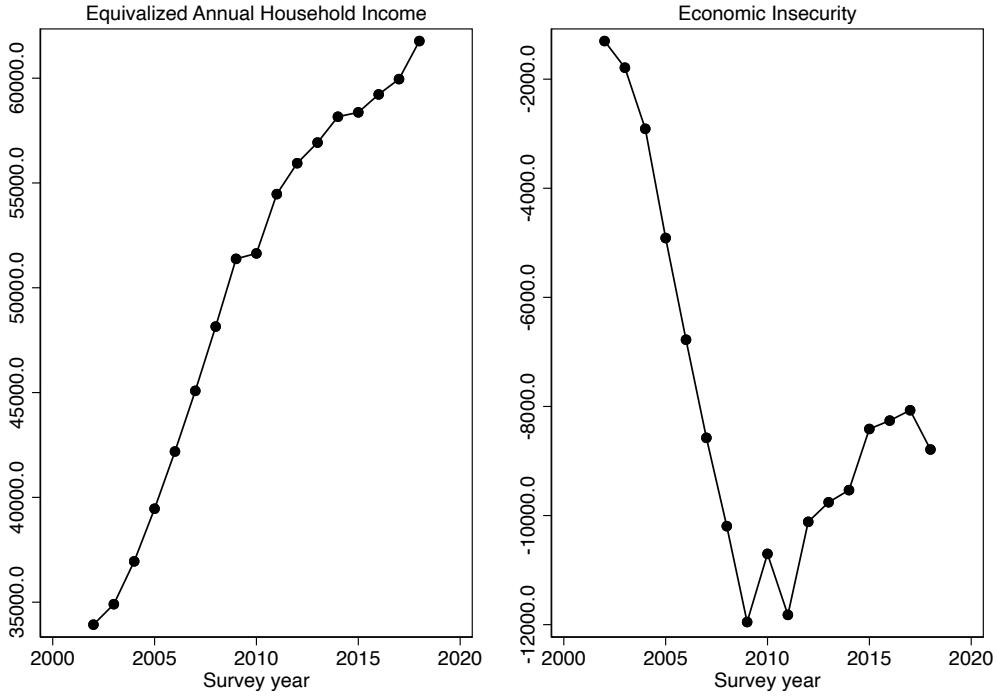
Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: The variables *Female*, *Married*, *Separated*, *Divorced*, *Single*, *Employed*, *Unemployed*, and *Out of the Labour Force* are dummies.

Table 2: Fixed-effects regression of physical and mental health on economic insecurity

	(1) PCS	(2) PCS	(3) MCS	(4) MCS
Std. Econ. Insec.		-0.012***		-0.010***
		(0.003)		(0.004)
Std. Eq. Annual HH Income (log)	0.014***	0.009***	0.015***	0.011***
	(0.003)	(0.003)	(0.003)	(0.003)
Individual Fixed-Effects	Yes	Yes	Yes	Yes
Time Fixed-Effects	Yes	Yes	Yes	Yes
Time-Varying Controls	Yes	Yes	Yes	Yes
Observations	144741	144741	144741	144741
Adjusted R^2	0.03	0.03	0.02	0.02

Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: Standard errors clustered at the household level appear in parentheses. The time-varying controls are age-group dummies, marital status, labour-force status and State of residence. All of the continuous dependent and independent variables are standardised. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 2: Time series of equivalised annual household income and economic insecurity



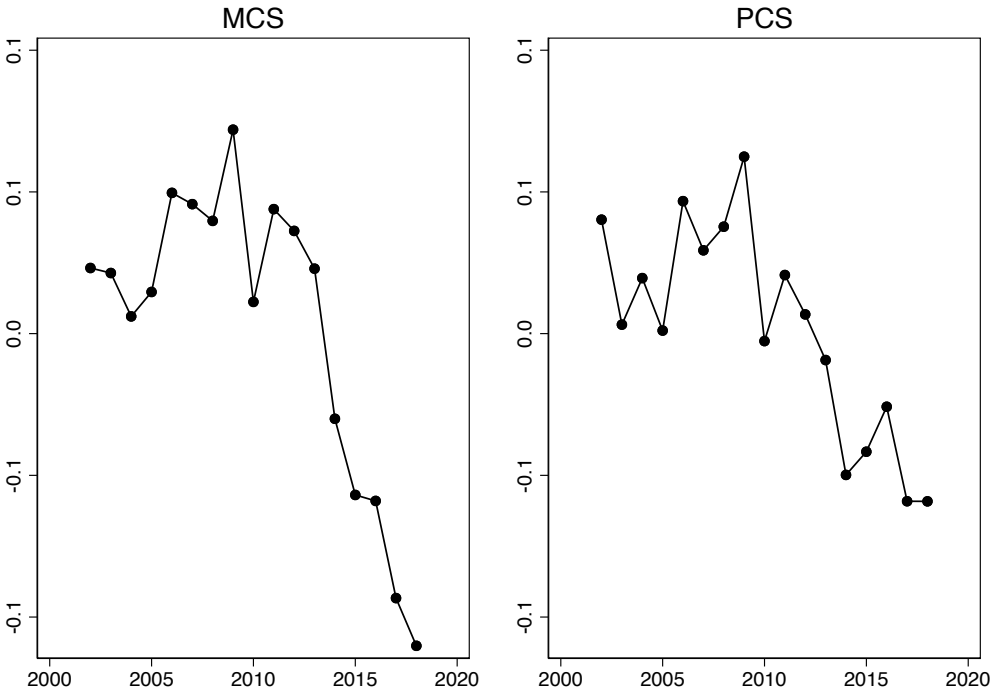
Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: This figure depicts the evolution of equivalised annual household income and economic insecurity over time.

Table 3: Fixed-effects regression of health components on lagged economic insecurity

	(1) PCS	(2) PCS	(3) MCS	(4) MCS
Lag Std. Econ. Insec.		-0.010***		-0.009**
		(0.004)		(0.004)
Lag Std. Eq. Annual HH Income (log)	0.014***	0.009**	0.009***	0.005
	(0.003)	(0.004)	(0.003)	(0.004)
Individual Fixed-Effects	Yes	Yes	Yes	Yes
Time Fixed-Effects	Yes	Yes	Yes	Yes
Time-Varying Controls	Yes	Yes	Yes	Yes
Observations	114337	114337	114337	114337
Adjusted R^2	0.03	0.03	0.02	0.02

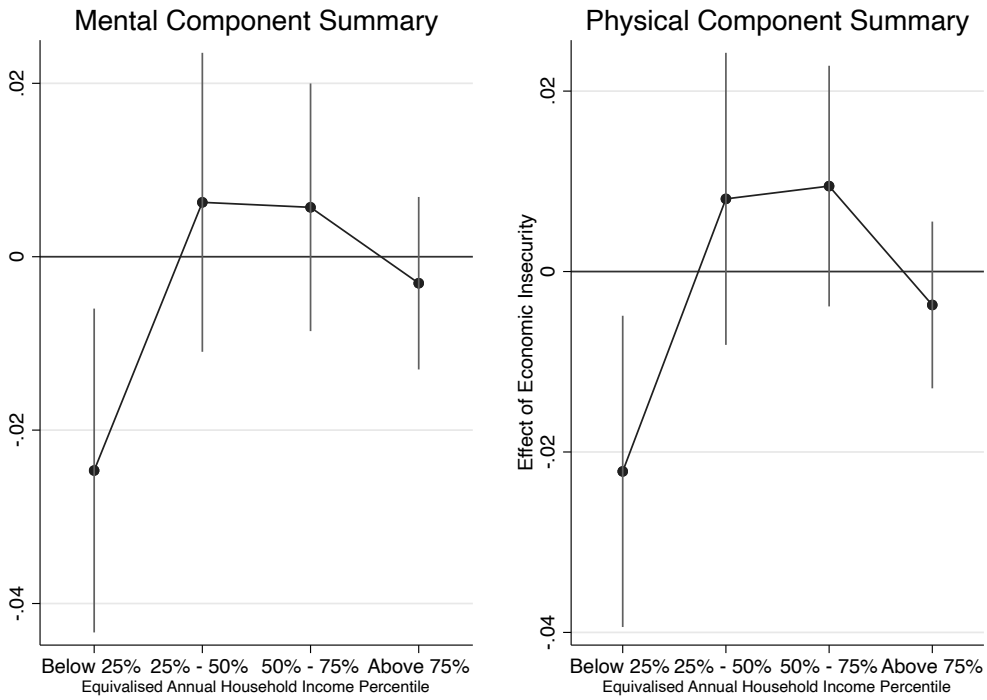
Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: Standard errors clustered at the household level appear in parentheses. Both economic insecurity and annual household income are lagged by one year. The time-varying controls are age-group dummies, marital status, labour-force status and State of residence. All of the continuous dependent and independent variables are standardised. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Figure 3: Time series of physical and mental health



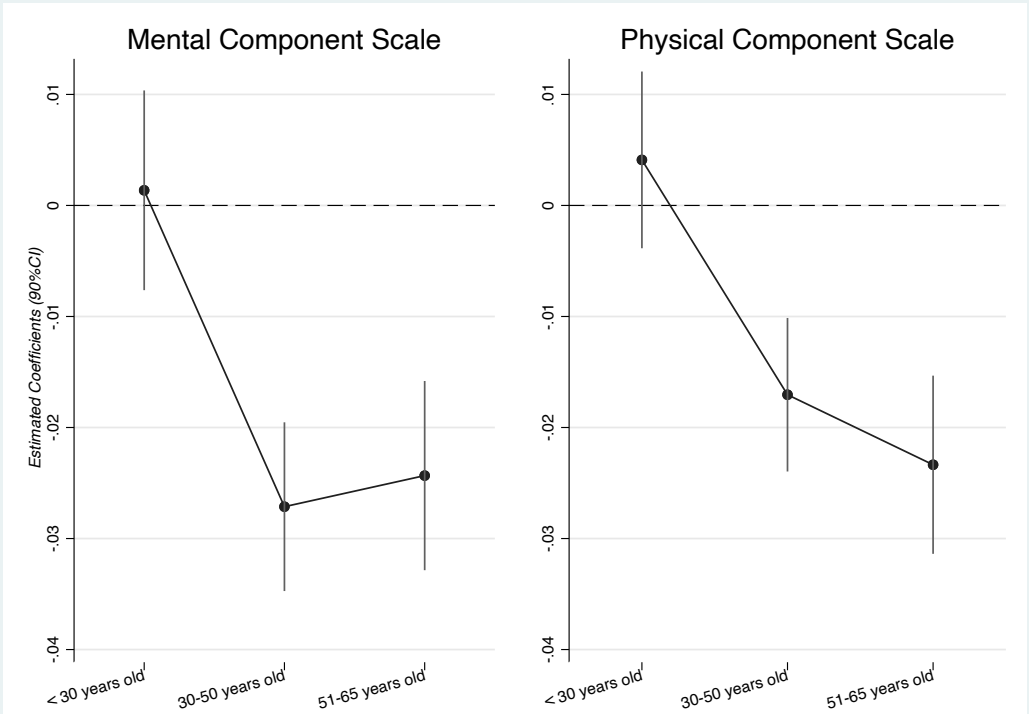
Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: This figure plots the values of the mental health component score (MCS) and the physical health component score (PCS) over time. Both indices are calculated using the factor scores from the structural equation model in Figure 1. We have imposed that the coefficients and intercepts of the model be time-invariant over all of the survey waves.

Figure 4: Economic Insecurity and Income Quartile



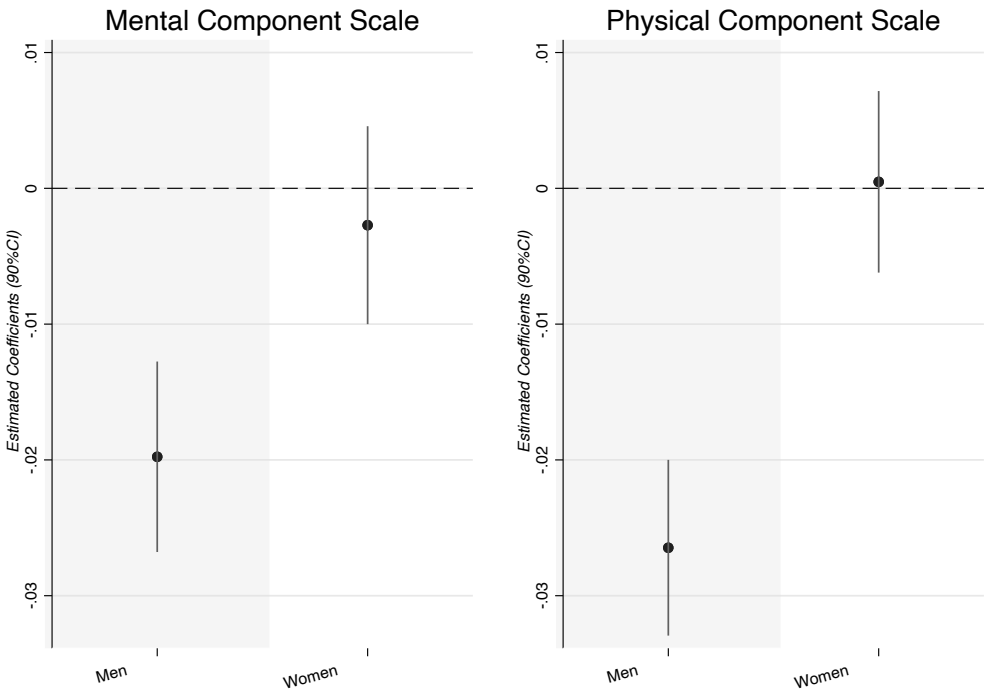
Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: This figure shows the total effects of economic insecurity on mental and physical health by quartile of equivalised annual household income, corresponding to the main effect of economic insecurity and its interaction with the associated income-quartile dummy. All of the regressions include wave and individual fixed effects, as well as time-varying controls controls for age, marital status, labour-force status and State of residence. All of the continuous dependent and independent variables are standardised.

Figure 5: Economic Insecurity and Age



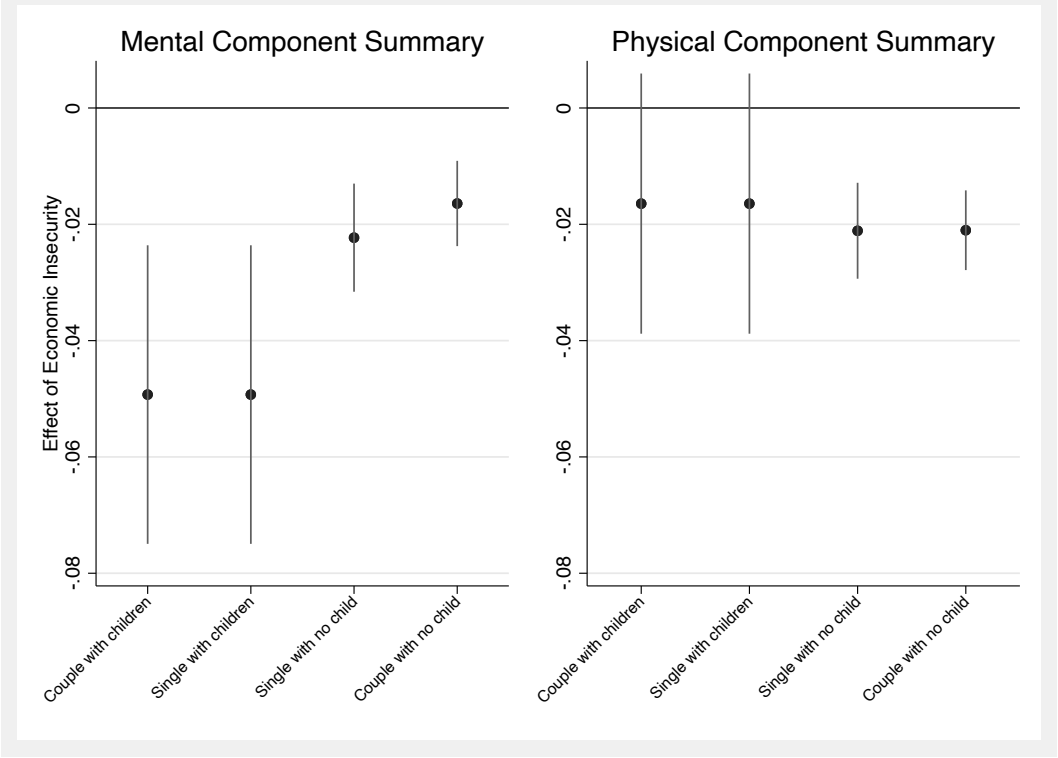
Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: This figure shows the total effects of economic insecurity on mental and physical health by age group, corresponding to the main effect of economic insecurity and its interaction with the associated age-group dummy. All of the regressions include wave and individual fixed effects, as well as time-varying controls controls for age groups, marital status, labour-force status and State of residence. All of the continuous dependent and independent variables are standardised.

Figure 6: Economic Insecurity and Gender



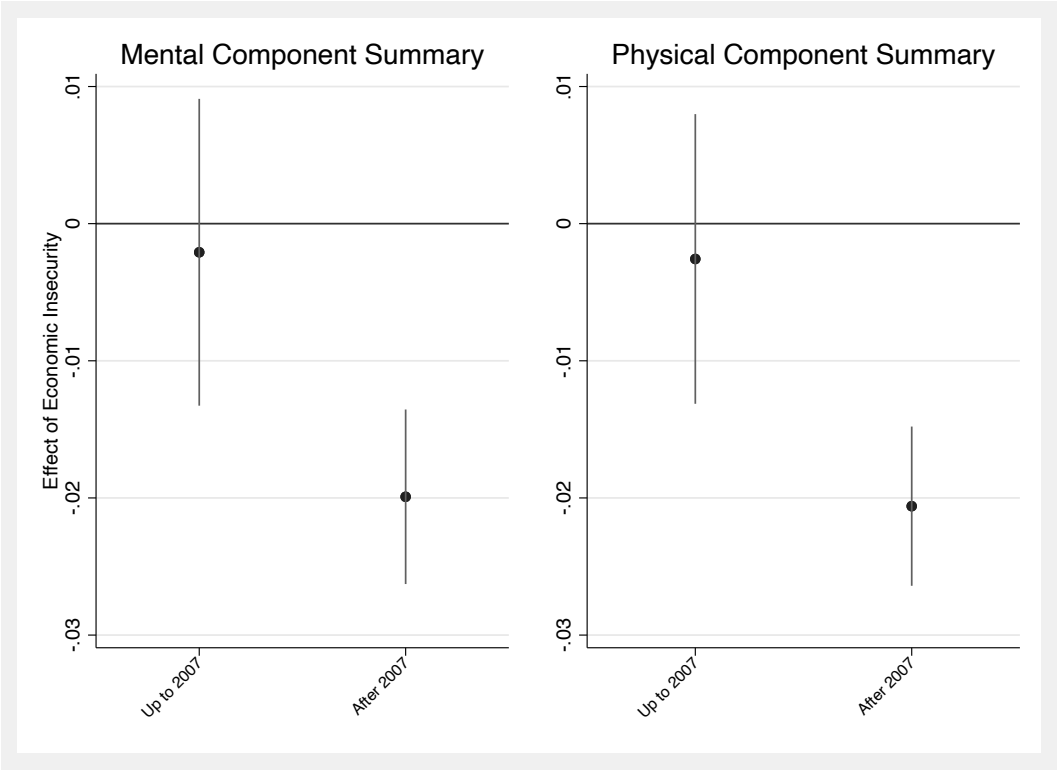
Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: This figure shows the total effects of economic insecurity on mental and physical health by gender, corresponding to the main effect of economic insecurity and its interaction with the associated gender dummy. All of the regressions include wave and individual fixed effects, as well as time-varying controls for age, marital status, labour-force status and State of residence. All of the continuous dependent and independent variables are standardised.

Figure 7: Economic Insecurity and Household Type



Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: This figure shows the total effects of economic insecurity on mental and physical health by household type, corresponding to the main effect of economic insecurity and its interaction with the associated household-type dummies. All of the regressions include wave and individual fixed effects, as well as time-varying controls for age, marital status, labour-force status and State of residence. All of the continuous dependent and independent variables are standardised.

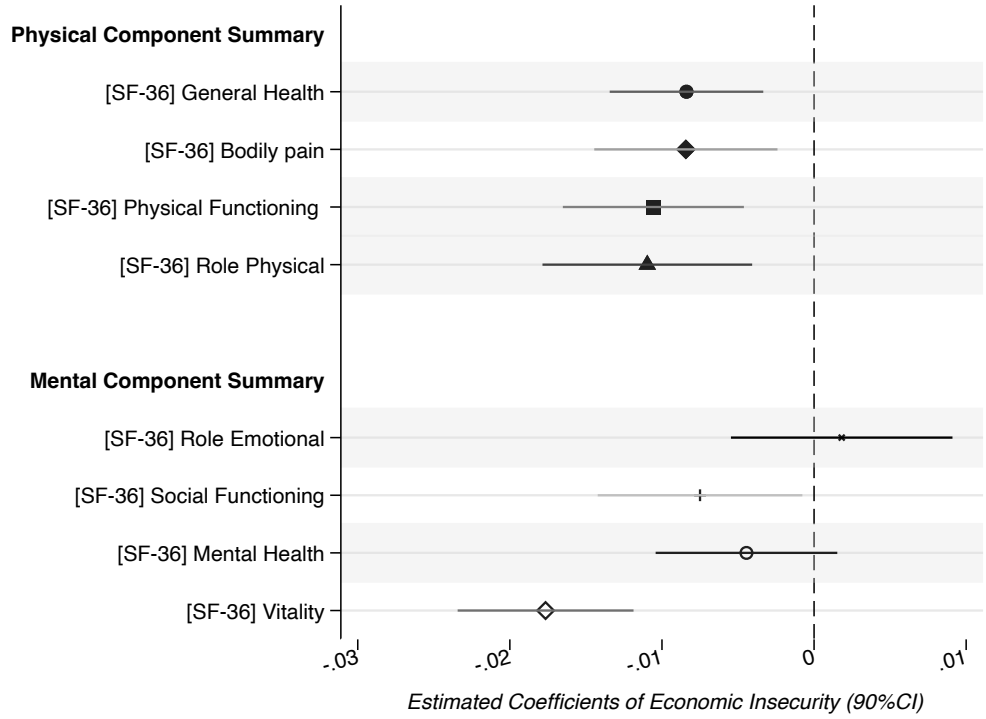
Figure 8: Economic Insecurity and the Great Recession



Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: This figure shows the total effects of economic insecurity on mental and physical health up to and after 2007, corresponding to the main effect of economic insecurity and its interaction with the associated year dummy. All of the regressions include wave and individual fixed effects, as well as time-varying controls for age, marital status, labour-force status and State of residence. All of the continuous dependent and independent variables are standardised.

B Economic insecurity and the SF-36 dimensions

Figure 9: Economic Insecurity and the Eight SF-36 Health Dimensions



Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: This figure depicts the estimated effect of economic insecurity on the eight SF-36 standardised dimensions for physical and mental health. All of the regressions include wave and individual fixed effects, as well as time-varying controls controls for age, marital status, labour-force status and State of residence. All of the continuous dependent and independent variables are standardised.

C Not for publication

Table 4: Fixed-effects regression of physical health on economic insecurity with different time windows

	(1) PCS	(2) PCS	(3) PCS	(4) PCS
Std. Econ. Insec. 2w	0.005**			
	(0.002)			
Std. Econ. Insec. 3w		-0.001		
		(0.002)		
Std. Econ. Insec. 4w			-0.004	
			(0.002)	
Std. Econ. Insec. 5w				-0.005*
				(0.003)
Individual Fixed-Effects	Yes	Yes	Yes	Yes
Time Fixed-Effects	Yes	Yes	Yes	Yes
Time-Varying Controls	Yes	Yes	Yes	Yes
Observations	144741.00	128753.00	114733.00	102033.00
Adjusted R^2	0.03	0.03	0.03	0.03

Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: This table displays the fixed-effects regressions of physical health using the HILDA dataset. Standard errors, clustered at the household level are in parentheses. The time-varying controls are age groups, marital status, labour-force status and State of residence. All of the continuous dependent and independent variables are standardised. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Fixed-effects regression of mental health on economic insecurity with different time windows

	(1) MCS	(2) MCS	(3) MCS	(4) MCS
Std. Econ. Insec. 2w	0.004*			
	(0.002)			
Std. Econ. Insec. 3w		-0.002		
		(0.002)		
Std. Econ. Insec. 4w			-0.004	
			(0.003)	
Std. Econ. Insec. 5w				-0.005
				(0.003)
Individual Fixed-Effects	Yes	Yes	Yes	Yes
Time Fixed-Effects	Yes	Yes	Yes	Yes
Time-Varying Controls	Yes	Yes	Yes	Yes
Observations	144741.00	128753.00	114733.00	102033.00
Adjusted R^2	0.02	0.02	0.02	0.02

Source: The estimation sample comes from HILDA waves 2002 to 2018.
Notes: This table displays the fixed-effects regressions of mental health using the HILDA dataset. Standard errors, clustered at the household level are in parentheses. The time-varying controls are age groups, marital status, labour-force status and State of residence. All of the continuous dependent and independent variables are standardised. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.