

Department of Economics, University of Warwick
Monash Business School, Monash University

as part of
Monash Warwick Alliance

**The Effect of Psychological Distress on Wage and Labour
Market Participation in Australia: A Longitudinal Analysis
Using 8 Annual Waves of the HILDA Cohort**

Natalija Isailovic

Warwick-Monash Economics Student Papers

September 2024

No: 2024/78

ISSN 2754-3129 (Online)

The Warwick Monash Economics Student Papers (WM-ESP) gather the best Undergraduate and Masters dissertations by Economics students from the University of Warwick and Monash University. This bi-annual paper series showcases research undertaken by our students on a varied range of topics. Papers range in length from 5,000 to 8,000 words depending on whether the student is an undergraduate or postgraduate, and the university they attend. The papers included in the series are carefully selected based on their quality and originality. WM-ESP aims to disseminate research in Economics as well as acknowledge the students for their exemplary work, contributing to the research environment in both departments.

Recommended citation: Isailovic, N. (2024). The effect of psychological distress on wage and labour market participation in Australia: A longitudinal analysis using 8 annual waves of the HILDA cohort. *Warwick Monash Economics Student Papers 2024/78*.

WM-ESP Editorial Board¹

Sascha O. Becker (University of Warwick)

Mark Crosby (Monash University)

James Fenske (University of Warwick)

Atisha Ghosh (University of Warwick)

Cecilia T. Lanata-Briones (University of Warwick)

Gordon Leslie (Monash University)

Thomas Martin (University of Warwick)

Vinod Mishra (Monash University)

Natalia Zinovyeva (University of Warwick)

¹ Warwick Economics would like to thank Gianna Boero and Samuel Obeng for their contributions towards the selection process.

The Effect of Psychological Distress on Wage and Labour Market Participation in Australia: A Longitudinal Analysis Using 8 Annual Waves of the HILDA Cohort

Natalija Isailovic*

Abstract

This paper investigates the impact of psychological distress on hourly wages and labour market participation within the Australian population, focusing on gender differences. The findings indicate that psychological distress significantly affects labour market outcomes, with varying effects based on gender and mental health status. Specifically, psychological distress significantly decreased hourly wages for healthy males and unhealthy females. An increase in labour market participation amongst mentally unhealthy males and both healthy and unhealthy females was also found. The research utilised data from biennial waves between 2007 and 2021, sourced from the Household, Income and Labour Dynamics in Australia (HILDA) survey.

JEL Codes: I12, I31, J17, J22

Keywords: Psychological distress, labour market participation, hourly wage, gender, Australia, HILDA

*email: natalijaisailovic@gmail.com

1 Introduction

Psychological distress is a topic of increasing societal concern with the significant socio-economic burden that it imposes becoming increasingly recognised. Beyond its inherent impact on individual well-being and diminished quality of life, psychological distress correlates with adverse life and economic outcomes (ul Husnain et al., 2014). Specifically, on an individual level, these poor economic outcomes have been shown to emerge as reduced labour market participation and hourly wages through factors such as increased absenteeism and presenteeism (attending work while ill) (Muller et al., 2021).

Recently, researchers, policymakers, and clinicians have broadened their focus to include milder forms of mental ill health, extending beyond severe mental illness when addressing mental health problems. Considering psychological distress levels, rather than merely focusing on clinically diagnosed illnesses, provides a more comprehensive approach to mental health and is a more holistic method of evaluating quality of life as it encompasses a broader spectrum of factors that influence an individual's mental health (Fowler et al., 2022). For example, a startling study by Fowler et al. (2022) found that 60% of male suicide victims in the United States of America had no prior history of documented mental health problems. Adolescents, young adults, and middle-aged men without known mental health conditions were more likely to experience relationship problems, arguments, and crises as precipitating circumstances to suicide compared to those with known mental health conditions (Fowler et al., 2022). These findings emphasise the importance of mitigating acute stressors and highlight the relevance of considering the socio-economic effects of psychological distress across a broader population, extending beyond those with diagnosed mental illness.

In Australia, levels of psychological distress significantly increased between the years 2001 and 2018, with women experiencing the highest levels. Additionally, there was an inverse relationship between distress rates and income (Enticott et al., 2022). These trends likely reflect a rise in community rates of mental disorders (Enticott et al., 2022). The ABS General Social Survey further recorded that the proportion of Australian adults experiencing severe psychological distress increased at the beginning of the COVID-19 pandemic. This measure has not returned to pre-pandemic levels as of 2023, with 12.9% of Australian adults reporting that they experienced severe psychological distress in August of 2023 (Australian Institute of Health and Welfare, 2023).

Australian policymakers have taken a proactive stance in instigating reform in relation to these statistics. The 10-year National Mental Health Workforce Strategy was proposed in October 2023 to address Australia's shortage of mental health professionals. The strategy is part of a \$586.9 million investment in mental health and suicide prevention in the 2023-24 Budget (Department of Health and Aged Care, Oct 2023). The government is also tackling youth mental health, with successive federal governments contributing to establishing and expanding Headspace centres (a primary care service for individuals ages 12-25 years) in over 150 communities across the country's states and territories (McGorry, 2022). This investment has the potential of being highly cost-effective as the effect of psychological distress on labour market outcomes is profound and multifaceted.

Psychological distress can lead to reduced cognitive function, decreased productivity, and an overall decline in job performance (Oliveira et al., 2022). Workers experiencing psychological distress are more likely to take sick leave, and when they do attend work, their productivity may be significantly impaired (Oliveira et al., 2022). This combination of absenteeism and presenteeism can considerably impact an individual's earnings and career progression as employers may be less likely to promote those who are frequently absent or less productive, further exacerbating the economic consequences of psychological distress (Kim & Knesebeck, 2016). Specifically, the Productivity Commission found that the economic impact of mental illness and suicide on the Australian economy is substantial, amounting to approximately \$43–70 billion annually, alongside an additional \$151 billion attributed to diminished health and reduced life expectancy (Productivity Commission, 2020).

Continuing research on the state of mental health in Australia and its economic impacts is crucial, particularly regarding the individual effects of psychological distress on labour market participation and wages. This is supported by the research of Vecchio et al. (2014), who found that Australians who had lower levels of mental health and did not use medication to address these illnesses experienced a decrease in the likelihood of participating in the labour force. Among females experiencing poorer mental health, the use of any medication for mental well-being led to a decline in the probability of labour force participation. However, this association was not statistically significant for males (Vecchio et al., 2014). Similarly, a study by Germinario et al. (2022) found that going from having little to severe depressive symptoms reduced employment and earnings significantly.

Similar research undertaken by Lagomarsino and Spiganti (2019) found that psychological distress significantly affects men's and women's labour market participation and may decrease employment between 6 and 20 percentage points). However, psychological distress only negatively affected women's wages (Lagomarsino & Spiganti, 2019). This study was conducted using data from the British Household Panel Survey and nine biennial waves between 1991 and 2007.

This paper attempts to similarly evaluate the effect of psychological distress on labour market participation and hourly wage between males and females in an Australian population between 2007 – 2021 using data from the Household, Income and Labour Dynamics in Australia (HILDA) survey. It includes 2019 and 2021 wave data, thereby capturing this relationship in cohorts that have experienced the COVID-19 pandemic, which has exacerbated the adverse effects of this relationship, as previously mentioned. In line with the findings of Lagomarsino and Spiganti (2019), it was hypothesised that higher levels of psychological distress will negatively affect labour market participation (operationalised by hours per week usually worked in all jobs) for both men and women but will only decrease wage for women. Similarly, this research follows their methodology and estimates the relationship between these variables using Pooled Ordinary Least Squares (OLS) and Fixed Effects (FE) methodologies, as well as estimating Two-Stage Least Squares (2SLS) and Fixed Effects Two-Stage Least Squares (FE-2SLS) regressions. These methods control for unobserved individual factors, such as childhood circumstances and cognitive ability, which may be associated with mental health status and labour market outcomes. Additionally, they control for the issue of measurement error that may emerge due to the self-reported nature of mental health measures. Moreover, the endogeneity of the mental health variable is addressed by

instrumenting psychological distress with the frequency of contact with friends and relatives, and the use of fixed effects for neuroticism addresses correlated individual effects. However, unlike Lagomarsino and Spiganti (2019), this research does not run the Semykina and Wooldridge procedure aimed to eliminate sampling bias, which provides an opportunity for further research endeavours.

Some of the findings of this paper were unexpected and suggested that male respondents with high levels of psychological distress and female respondents with both normal and high levels of psychological distress exhibited higher levels of labour market participation. Furthermore, these findings indicated that male respondents with normal levels of psychological distress and females with high levels of mental distress earned lower hourly wages, whilst females with normal levels of psychological distress earned higher wages. The discussion section considers factors such as sampling bias and endogeneity that could have contributed to the counterintuitive nature of some of these results.

2 Further Analytical Context

When assessing the impact of psychological distress, it is crucial to control for the fixed effects of personality traits, especially neuroticism, to avoid diminishing the variability among personality traits. Neuroticism is one of the Big Five personality traits, which are a set of broad dimensions used to describe stable human personality over adulthood (Widiger & Oltmanns, 2017). Neuroticism refers to the tendency to experience negative emotions such as anxiety, depression, moodiness, and vulnerability to stress. Individuals high in neuroticism are often more prone to feelings of worry, guilt, fear, and insecurity, and they may exhibit greater emotional volatility in response to challenges (Widiger & Oltmanns, 2017). As a result, individuals with high levels of neuroticism are, therefore, more susceptible to psychological distress which can lead to adverse health implications and have negative economic impacts because it hinders work performance by causing emotional preoccupation, exhaustion, and distraction (Widiger & Oltmanns, 2017). As a result, prior studies examining the relationship between psychological distress and labour participation using the HILDA dataset have employed fixed effect models, thereby aiming to reduce potential bias from unobserved, time-invariant confounding factors by treating personality traits as a fixed effect (Ervin et al., 2023; Milner et al., 2016). Considering neuroticism as a fixed effect allows for better control over individual-specific characteristics that might otherwise confound the relationship between distress and labour participation.

Perhaps, more significantly, the endogeneity that arises in the relationship between psychological distress and wage and labour market participation (Lagomarsino & Spiganti, 2019) is an even more crucial issue to address when developing research methodology to evaluate these relationships. Psychological distress might reduce productivity and wages, while simultaneously, lower wages or unemployment could increase psychological distress, creating a bidirectional causality that complicates the analysis. Social capital, particularly when measured through the frequency of seeing family and friends, can serve as a valuable instrumental variable when evaluating the causal effects of psychological distress. This is made more evident when considering that social interactions act as a buffer against distress. When faced with adversity, individuals who maintain strong social ties experience less emotional strain (Manera et al., 2022). As such, this strong relationship allows for social activity to be an appropriate

instrumental variable for psychological distress. Using the frequency of family and friend interactions as an instrumental variable enables for disentangling the bidirectional feedback loop between psychological distress and labor market outcomes.. Furthermore, the frequency of seeing family and friends is a compelling instrumental variable as it is exogenous and uncorrelated with unobserved factors related to labour market participation and hourly wage.

With these considerations, this research builds on Lagomarsino and Spiganti's (2020) findings by considering the effect of psychological distress on wages within an Australian cohort. It includes wave data between 2007 and 2021, thereby representing more recent responses reflecting levels of psychological distress post the COVID-19 pandemic. Furthermore, the effect of both mild and severe psychological distress will be considered as opposed to merely considering mental health disorders, which is common in the economic literature. This distinction is essential due to Lagomarsino and Spiganti's (2020) observation that while research has been conducted to evaluate the negative correlation between diagnosed mental health disorders and labour market outcomes, research on the effects of milder forms of mental ill health is still in its nascent stage.

The rest of the paper is organised as follows. Section 2 (Further Analytical Context) provides further context into the fixed effects and endogeneity issues that may arise n when conducting research on the causal effects of psychological distress, Section 3 (Econometric Method) details the methodology used in this research, Section 4 (Data Source and Variables) details the nature of the data used and the structure of the key variables used, Section 5 (Results) describes the research findings, and Section 6 (Conclusion) interprets the findings.

3 Econometric Method

This research aims to investigate the causal effect of psychological distress on labour market participation and hourly wage. The econometric method employed followed the approach of Lagomarsino and Spiganti (2019). To do so, the wage equation (1.1) and labour market participation equation (1.2) were first estimated using pooled OLS and applied cluster robust standard errors to handle cluster heteroskedasticity. This estimator will remain unbiased, consistent, and efficient as long as the regressors are uncorrelated with the errors. Then, a within (Fixed Effects, FE) estimator with cluster robust standard errors was utilized, which assumes that the regressors are uncorrelated with the idiosyncratic error term without making assumptions about unobserved heterogeneity. The FE estimator will be unbiased and consistent as the number of individuals (N) and time periods (T) increases, even if the regressors are correlated with the individual-specific effects.

To estimate the effect of psychological distress on hourly wage, the following equation was used:

$$(1.1) \quad w_{it} = \beta_0 + x_{it}\beta_1 + y_{it}\beta_2 + \alpha_i + \eta_{it}$$

Where w_{it} is a measure of the hourly wage of individual $i = 1, \dots, N$ at $t = 1, \dots, T_i$, β_1 is a vector of parameters associated with the vector of independent variables x_{it} (this

includes psychological distress measured by the individual's score on the Kessler Psychological Distress (K10) Scale) that can be observed for all individuals in the sample and β_2 is a vector of parameters associated with y_{it} vectors of variables that can be observed only if the respondent is employed. The variables included within x_{it}^{\square} (other than the individual's K10 score) and y_{it} controls for socio-demographic variables that alter the causal relationship between the dependent and the primary explanatory variables. These control variables are listed in the *Other Regressors* section below. α_i denotes time-invariant fixed effects, which in the context of this research, refer to emotional stability. This has been reverse-scored and, therefore, represents neuroticism. α_i was only included in the fixed effects estimates (a basic OLS estimation was run, which did not include fixed effects). η_{it} is a mean zero unobserved error term.

To estimate the effect of psychological distress on labour market participation, the following equation was used:

$$(1.2) \quad S_{it} = \gamma_0 + z_{it}\gamma_1 + \alpha_i + e_{it}$$

Where S_{it} is a measure of labour market participation and denotes the hours per week typically worked in all jobs of individual $i = 1, \dots, N$ at time $t = 1, \dots, T_i$. γ_1 is a vector of parameters associated with the vector of independent variables z_{it} . z_{it} is a superset of x_{it} and includes variables that additionally control for labour market participation (these have been outlined in section *Other Regressors* section below). α_i remains the same as the first equation and is only present in the fixed effects estimation (it is absent from the OLS estimation).

Two-stage least squares estimation

Following this, the wage and labour market participation equation was estimated using two-stage least squares (2SLS) and within-2SLS (FE2SLS) regressions with cluster robust standard errors to address potential endogeneity. These instrumental variable (IV) methods require an instrument, which is a variable that is correlated with the endogenous regressor (psychological distress) but not with the dependent variable. Based on previous studies, the frequency of contact with friends and relatives was used as the instrument.

In the first stage, psychological distress (measured by K10 score) was instrumented by the frequency of contact with friends and relatives and the control variables included in the previous equations. The first stage of the 2SLS equation is denoted in the equation 2.1:

$$(2.1) \quad X_{it} = \pi_0 + \pi_1 Z_{it} + \pi_2 W_{it} + v_{it}$$

Where X_{it} represents psychological distress (K10 score), Z_{it} represents the instrumental variable (frequency of contact with friends and relatives) for individual i at time t , W_{it} represents the control variables relevant to hourly wage or labour market participation and v_{it} represents the error term.

In the second stage, the dependent variable (hourly wage or labour market participation) was regressed on the predicted values of the K10 score estimated in the first stage, along with the control variables. The second stage of the 2SLS equation is denoted in the equation 2.2:

$$(2.2) \quad Y_{it} = \delta_0 + \delta_1 \hat{X}_{it} + \delta_2 W_{it} + \epsilon_{it}$$

Where Y_{it} represents the dependent variable (hourly wage or labour market participation) for individual i at time t , \hat{X}_{it} is the predicted value of the psychological distress from equation 2.1, W_{it} represents the control variables relevant to hourly wage or labour market participation and ϵ_{it} represents the error term.

The within-2SLS (FE2SLS) regressions were estimated considering neuroticism as time-invariant fixed effects.

4 Data Source and Variables

The data used in this analysis was taken from the Household, Income and Labour Dynamics in Australia (HILDA) Survey, which gathers essential data on economic and personal well-being, labour market trends, and family life across households. The HILDA Survey is funded by the Australian Government via the Department of Social Services. The Melbourne Institute oversees the survey's design and management, and the data was collected by Roy Morgan between Waves 9 and 21 (Melbourne Institute: Applied Economic & Social Research). A balanced panel was constructed from the data, which consisted of 3625 observations. The Kessler Psychological Distress Scale (K10), which evaluates psychological distress, was included in the survey once every two years. Therefore, the data was restricted to the following years: 2007, 2009, 2011, 2013, 2015, 2017, 2019, 2021.

Following the methodology of Lagomarsino and Spiganti (2019), participants who, in a given year, were self-employed, retired, still in education (both full-time and part-time), and on maternity or paternity leave were removed. Additionally, the sample was restricted to respondents between 18 to 62 years old. The upper bound of this range was determined by the age pension, which was set at 63 and 6 months for women in 2007 (Department of Social Services, 2024). Setting the age limit at 62 years, rather than excluding only those receiving pensions, helped maintain sample homogeneity. This approach accounts for the positive correlation between hourly wage and age, while also accounting for age-related risk factors that heighten the likelihood of psychological distress among Australians over 60 (Atkins et al., 2021).

Individuals who did not provide a valid answer to at least one question in the survey were also excluded. Respondents who failed to provide valid answers to key attitudinal or demographic questions were excluded from the sample, ensuring a balanced dataset. A breakdown of the sample size by gender and Kessler Psychological Distress Score can be observed in Table 1.

	Kessler Psychological Distress Score	n
Males	Likely to be well	1455
	Likely to have a mental disorder [†]	281
Females	Likely to be well	1437
	Likely to have a mental disorder [†]	452

[†] Mild to severe

Explanatory Variable - Kessler Psychological Distress Scale

The main explanatory variable was psychological distress, which was evaluated using the Kessler Psychological Distress Scale (K10). The K10 scale consists of 10 questions assessing emotional states, each with a five-point response scale. The K10 questionnaire was designed to provide an overall measure of psychosocial distress based on questions regarding respondent's levels of nervousness, agitation, psychological fatigue, and depression over the past four weeks (Australian Bureau of Statistics, 2017). It is important to note that this score does not reflect a clinical diagnosis of mental illness. However, prolonged psychological distress may increase the likelihood of developing more severe mental health conditions.

The interpretation of the K10 scores aligned with the standard that is adopted by the Australian Bureau of Statistics, where the K10 scores are interpreted as follows: 10 – 19 (Likely to be well), 20 – 24 (Likely to have a mild disorder), 25 – 29 (Likely to have a moderate mental disorder), 30 – 50 (Likely to have a severe mental disorder) ((Australian Bureau of Statistics, 2003). Therefore, a low K10 score indicates low psychological distress, and a high score indicates high psychological distress. The K10 scale was included in the Self Completion Questionnaire of the HILDA survey; however, it is only included in alternate waves of the survey.

A log transformation was applied to the K10 score to account for the non-linear structure of psychological distress, which followed the methodology of Lagomarsino and Spiganti (2019). Additionally, the discrete units of a psychological scale hold little inherent meaning, making it more logical to evaluate percentage differences rather than differences in numerical units (Uher, 2023).

Male participants had a mean K10 score of 15.14, with a standard deviation of 5.59, whilst females had a mean K10 score of 16.28, with a standard deviation of 6.34. This indicates that females experienced a higher degree of psychological distress with greater variance in their experience of this measure. A two-sample t-test comparing the mean K10 scores between men and women indicated a significant difference in the K10 scores between men and women ($p < 0.01$).

Labour Market Participation

Labour market participation was evaluated in terms of the hours per week typically worked in all jobs. In keeping with the method of Lagomarsino and Spiganti (2019), the inverse hyperbolic sine transformation (IHS) transformation was applied to this variable. The IHS transformation approximates a log transformation but is defined for zero values (Aihounton & Henningsen, 2020), allowing interpretation of the results of labour market participation in terms of percentage change.

Hourly wage

As suggested by the *HILDA User Manual – Release 22* (Melbourne Institute Applied Economic & Social Research, 2023), hourly wage was constructed by dividing *imputed current weekly gross wages* and *salary in all jobs* by *combined hours per week usually worked in all jobs*. The average hourly wage was higher for males (\$42.37) than for females (\$38.28). These values were higher than the medium hourly earnings reported by the Australian Bureau of Statistics, which was \$34.56 for males and \$28.98 for

females (across the years 2021, 2019, 2017, and 2015, adjusted for the consumer price index where the base year is 2021) (Australian Bureau of Statistics, 2023).

Instrument - Frequency of contact with friends and relatives

Following Lagomarsino and Spiganti (2019), an instrumental variable approach was used to attempt to address the potential endogeneity of psychological well-being. Whilst Lagomarsino and Spiganti (2019) measured the individual's perceived social capital as an instrument for psychological well-being, this research used the frequency of contact with friends and relatives, which is an approximate estimate of social capital available in the HILDA survey. Psychological literature suggests that social isolation is also linked to psychological distress (Pearce et al. 2023), with Feng and Astell-Burt (2016) finding that an increase in social interactions is protective against psychological distress for middle-to-older Australians. Additionally, Lagomarsino and Spiganti (2019) cite previous economic studies that have utilised social support variables as instrumental variables; these studies provide evidence of a notable correlation between social support and improved mental health status.

The variable estimating frequency of contact with friends and relatives came from the question, "How often do you get together socially with friends/relatives not living with you?" which was included in the Self Completion Questionnaire of the HILDA survey. The question was asked on a Likert scale with the following response options: Every day, Several times a week, About once a week, 2 or 3 times a month, About once a month, Once or twice every three months, Less often than once every three months. The variable was reverse-scored such that a high score for this question indicated a low frequency of social contact, in order to accommodate the K10 scale (where a high score indicates high psychological distress).

Other Regressors

As per Lagomarsino and Spiganti (2019), demographic variables were controlled for in this research. A dummy variable was created for respondents with a partner (defined as being married or in a de facto relationship). Additionally, the number of children in the household aged between 0 and 4 years and a dummy indicating the presence of dependent children with more than four years in the household were included. To control for educational attainment, a dummy variable was used to indicate whether the individual has a bachelor's degree or higher. Moreover, the hourly wage variable for the consumer price index was also adjusted, setting 2021 as the base year. A dummy for living in a metropolitan area was also included.

Additional wage equation controls

Third-degree polynomials of age and experience were used to control for the concavity of the earnings function. A dummy variable was also included to indicate that the individual works in the private sector (both for-profit and not-for-profit organisations) and a dummy variable for whether the individual has completed training or education related to their current job in the last 12 months. A dummy variable was included to indicate whether the individual is a union member.

Additional labour market participation equation controls

The IHS transformation of non-labour income, a dummy variable was utilised for individuals with a partner, partner's monthly gross pay, partner's education, and third-degree polynomials of both the individual's partner's age and labour market experience.

5 Results

In keeping with Lagomarsino and Spiganti (2019), this research presents findings for male and female participants separately and further break down the analysis by level of psychological distress. In all estimations, cluster-robust standard errors were applied.

In Table 2 and 3, below the first two columns, the outcomes derived from Pooled Ordinary Least Squares (OLS) and Fixed Effects (FE) methodologies are presented. Subsequently, in the third and fourth columns, the findings from the Two-Stage Least Squares (2SLS) and Fixed Effects Two-Stage Least Squares (FE-2SLS) regressions are presented, respectively, employing the individual's frequency of contact with friends and relatives as an instrumental variable for their psychological well-being.

Table 2 displays estimations of the percentage change in labour market participation (in terms of the hours per week usually worked in all jobs) that results from a 10% increase in psychological distress. Males who were likely to be well (report low levels of psychological distress) recorded a small effect size for psychological distress, which was not significant, indicating that an increase in psychological distress does not have a significant effect on the labour market participation of mentally healthy males. The results indicated that for males who were likely to have a mental disorder, a 10% increase in psychological distress led to a 23.68% increase in labour market participation, with these results being highly statistically significant at $p < 0.001$. The pooled OLS, 2SLS, and FE-2SLS estimates for the impact of psychological distress on males likely to have a mental disorder were small and not statistically significant, with only the pooled OLS measure indicating a negative correlation between psychological distress and labour market participation.

When considering the estimations for the females, the 2SLS estimating indicated that a 10% increase in labour market participation leads to a 17.38% increase in labour market participation when considering the 2SLS model and a 20.49% increase in labour market participation according to the FE-2SLS estimation. Both estimates were statistically significant at $p < 0.001$. The OLS and FE estimates were small and not statistically significant, suggesting that endogeneity may exist in these models.

Similarly, females likely to have a mental disorder indicated that a 10% increase in labour market participation leads to a 6.61% increase in labour market participation for the 2SLS model and a 7.80% increase in labour market participation according to the FE-2SLS estimation. Both estimates were statistically significant at $p < 0.1$, whilst the OLS and FE estimates were small and insignificant, further suggesting endogeneity within these models.

Therefore, these findings suggest that an increase in psychological distress leads to a significant increase in labour market participation for both psychologically healthy and unhealthy females (although the effect is more pronounced for the former group) as well

as males who are likely to have a mental disorder when taking into consideration neuroticism. Psychological distress does not affect labour market participation for males who are likely to be well.

It should be noted that three of the 16 estimates suggested that psychological distress decreased labour market participation. Therefore, the causal direction of these measures differed from the other estimate. However, these three estimates were small and were not statistically significant.

Table 2 Participation probabilities (percent), males and females

		OLS	FE	2SLS	FE-2SLS
Males	Likely to be well	0.089 [1.307]	0.647 [1.569]	1.498 [2.843]	-0.604 [3.182]
	Likely to have a mental disorder [†]	-3.327 [5.420]	23.681*** [0.000]	2.957 [4.734]	3.413 [4.834]
Females	Likely to be well	-0.210 [1.606]	0.303 [1.753]	17.377*** [4.205]	20.488*** [4.465]
	Likely to have a mental disorder [†]	-3.648 [3.782]	5.535 [11.303]	6.611 [^] [3.871]	7.798 [^] [3.983]

[†] Mild to severe

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 3 documents the anticipated impact of a 10% rise in psychological distress on the corresponding change in hourly wage expressed in dollars. When considering estimates for males who are likely to be well, all estimates are negative, suggesting that an increase in psychological distress will lead to lower hourly wage predictions. However, only estimates of the 2SLS and FE-2SLS models were large and statistically significant, with these estimates suggesting that a 10% increase in psychological distress leads to a \$16.54 and \$17.15 decrease in hourly wages, respectively. These results were statistically significant at $p < 0.001$.

Males who were likely to have a mental disorder were estimated to experience a decrease in hourly because of a 10% increase in psychological distress by all models except the FE model. However, all estimates were small and were not statistically significant.

Females who were likely to be well were estimated by the 2SLS and FE-2SLS to respectively experience a \$6.43 and \$16.56 increase in hourly wage due to a 10% increase in psychological distress. These results were statistically significant at $p < 0.001$. The OLS and 2SLS estimates for this group indicated a contrasting directional association; however, both were modest in magnitude and lacked statistical significance

Females who were likely to have a mental disorder were estimated by the 2SLS and FE-2SLS to respectively experience a \$5.38 and \$5.25 decrease in hourly wage due to a 10% increase in psychological distress. As observed in females who were likely to be well, this group's OLS and 2SLS estimates indicated a contrasting directional association. However, both were modest in magnitude and lacked statistical significance.

Like the labour market participation estimates, the presence of statistical significance in the 2SLS methods, while absent in the OLS and FE equations, implies potential endogeneity within the latter equations.

Therefore, the results indicate that an increase in psychological distress leads to lower hourly wages for males who are likely to be well and females who are likely to be unwell, whilst having the opposite effect on females who are likely to be well. It is estimated to have no effect on the hourly wage of males likely to be unwell.

Table 3 Hourly wage predictions (AUD), males and females

		OLS	FE	2SLS	FE-2SLS
Males	Likely to be well	-0.267 [0.334]	-0.414 [0.375]	-16.537*** [1.932]	-17.147*** [2.300]
	Likely to have a mental disorder [†]	-0.2107 [0.625]	0.039 [0.555]	-2.683 [2.303]	-2.414 [2.318]
Females	Likely to be well	0.116 [0.273]	0.343 [0.312]	6.425*** [1.457]	16.562*** [1.884]
	Likely to have a mental disorder [†]	0.4218 [0.368]	0.398 [0.433]	-5.376*** [1.381]	-5.245*** [1.454]

[†] Mild to severe

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

6 Conclusion

This study aimed to explore the correlation between self-assessed psychological well-being and labour market outcomes. Unlike prior research, the approach of this paper expanded beyond solely examining diagnosed mental disorders. Instead, it considered the whole spectrum of negative mental states that could induce psychological distress and potentially lead to diminished emotional and cognitive capabilities. This study examined how psychological distress influences hourly wage and labour force participation, closely following the approach outlined by Lagomarsino & Spiganti (2020). A sample of Australian participants were analysed using household panel data from the HILDA survey spanning from 2007 to 2021. To do so, Pooled Ordinary Least Squares (OLS) and Fixed Effects (FE) approaches were estimated, accounting for neuroticism's within-group effects. Additionally, Two-Stage Least Squares (2SLS) and Fixed Effects Two-Stage Least Squares (FE-2SLS) regressions were estimated by instrumenting psychological distress with frequency of contact with friends and relatives to address endogeneity issues.

The findings related to the effect of psychological distress on the hours per week typically worked in all jobs suggest that for males who are likely to be well, an increase in psychological distress does not significantly affect labour market participation, as indicated by small, statistically insignificant estimates across all models. In contrast, males likely to have a mental disorder experience a significant increase of 23.68% in labour market participation with a 10% rise in psychological distress, highlighted by the FE model. For females likely to be well, the 2SLS and FE-2SLS models indicate significant increases in labour market participation (17.38% and 20.49%, respectively) with a 10% increase in psychological distress, while the OLS and FE estimates remain

insignificant, suggesting potential endogeneity. Similarly, females likely to have a mental disorder show modest but statistically significant increases in labour market participation (6.61% and 7.80%, respectively) according to the 2SLS and FE-2SLS models, with OLS and FE results indicating endogeneity. Additionally, it was found that males likely to be well and females likely to be unwell and recorded a decrease in hourly wage.

These findings are unexpected, as some of the estimates found indicate a causal relationship that contradicts the conclusions of previous research. Most notably, the research findings show that based on some estimations, females who are likely to be well and males who are likely to have a disorder will undertake higher participation in the labour market due to an increase in psychological distress. The finding that females who are likely to be well will experience an increase in hourly wage because of psychological distress is also at odds with past research findings. The significance observed for females exclusively in the 2SLS and FE-2SLS models indicates that these models address endogeneity not accounted for in the OLS and FE models. However, the counterintuitive direction of the relationship suggests the possibility of further unaddressed endogeneity, potentially reversing the relationship. Additionally, omitted variable bias may contribute to this reversal. An increase in labour market participation or hourly wage is, at times, correlated with more demanding occupations, leading to higher psychological distress levels (Laditka, 2023).

However, the findings that females who are likely to have a mental disorder and males who are likely to be well do align with previous literature suggesting that higher levels of psychological distress lead to lower hourly wages.

The factors influencing males and females, as well as those with or without a mental disorder, in the context of psychological distress and labour market outcomes, may differ significantly. For instance, societal expectations, gender roles, and access to mental health resources can vary greatly between genders, resulting in distinct sets of unobserved variables for each group. These differences could explain why some of findings in this paper align with previous research while others do not.

While the research methodology adopted in this paper largely adhered to the framework outlined by Lagomarsino & Spiganti (2019), it did not run an analysis using the Semykina and Wooldridge estimator, which is designed to mitigate sampling bias. Given that HILDA data is derived from survey responses, there is significant potential for sample selection bias, which may have influenced the present findings. This suspicion is corroborated by the observation that the average hourly wage among male and female respondents in the sample exceeds the median hourly wage, indicating a possible skew in the data.

Addressing this issue warrants consideration not only in terms of respondents' mental health status but also potentially through the application of sample weighting based on hourly wage. Incorporating such adjustments could enhance the robustness of the analysis by better aligning the sample with the population distribution.

Future research endeavours would warrant evaluating these relationships by employing the Semykina and Wooldridge estimator to rectify sampling bias associated with psychological distress. Doing so holds the potential to yield more accurate and insightful results, thereby advancing our understanding of the relationship between

mental health and labour market outcomes. Furthermore, whilst confounding variable bias was controlled for based on the methodology implemented by Lagomarsino & Spiganti (2019), there may be confounding variables that are relevant to an Australian population or the later time period which differ from the British population that Lagomarsino & Spiganti (2019) evaluated. As such, future research may benefit from reevaluating the confounding variables that need to be controlled for in the model.

While these findings are somewhat varied, some intuitive results provide a foundation for further advocating for government support in addressing psychological distress. These initial insights underscore the potential benefits of targeted mental health interventions in improving labour market outcomes. Most importantly, these findings make a case that mental health aid should be provided for the entire Australian population as opposed to limiting care to individuals who are clinically diagnosed with mental illness, as the absence of a psychiatric diagnosis does not protect from the negative economic outcomes of psychological distress. Furthermore, the endogeneity issues that arise suggest that there may be a positive feedback loop between psychological distress and poor labour market outcomes amongst individuals. Hence, allocating resources towards early intervention policies for individuals who may not have received a psychological diagnosis could be justified. Implementing proactive measures might not only mitigate adverse outcomes for individuals and governmental entities but also hold the promise of generating self-sustaining programs. By fostering improved individual outcomes, these initiatives can elevate tax revenues for the government, ultimately resulting in a net positive return on investment.

In conclusion, this paper explores the correlation between self-reported psychological well-being and labour market outcomes. Building from prior studies, this investigation extends beyond diagnosed mental disorders to encompass the full range of negative mental states potentially inducing psychological distress, thereby impacting emotional and cognitive capabilities. Additionally, it attempts to tackle the various econometric challenges inherent in this relationship, including endogeneity and unobserved heterogeneity within a comprehensive analytical framework. Evidence is provided that for some populations, negative psychological distress leads to lower hourly wages. However, findings relating to the effect of psychological distress on labour market participation, whilst highly statistically significant, are counterintuitive to previous research and may result from endogeneity rather than a direct causal relationship.

References

- Atkins, J., Naismith, S.L., Luscombe, G.M., et al. (2013). Psychological distress and quality of life in older persons: relative contributions of fixed and modifiable risk factors. *BMC Psychiatry*, 13, 249. <https://doi.org/10.1186/1471-244X-13-249>
- Australian Bureau of Statistics. (2003). 4817.0.55.001 - Information Paper: Use of the Kessler Psychological Distress Scale in ABS Health Surveys, Australia, 2001. Available at: <https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4817.0.55.001Main+Features12001?OpenDocument> (Accessed: 28 May 2024).
- Australian Bureau of Statistics. (2017). Main features - Kessler psychological distress scale-10 (K10). Available at: [https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4363.0~2014-15~Main%20Features~Kessler%20Psychological%20Distress%20Scale-10%20\(K10\)~35](https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4363.0~2014-15~Main%20Features~Kessler%20Psychological%20Distress%20Scale-10%20(K10)~35) (Accessed: 28 May 2024).
- Australian Bureau of Statistics. (2023). Employee Earnings and Hours, Australia. ABS. Viewed 30 May 2024. Available at: <https://www.abs.gov.au/statistics/labour/earnings-and-working-conditions/employee-earnings-and-hours-australia/latest-release>.
- Australian Government - Department of Social Services. (2024). 3.4.1.10 qualification for age. Available at: <https://guides.dss.gov.au/social-security-guide/3/4/1/10> (Accessed: 29 May 2024)
- Australian Government Department of Health and Aged Care. (2022). Major Mental Health Study released. Available at: <https://www.health.gov.au/ministers/the-hon-mark-butlermp/media/building-the-workforce-to-make-mental-health-care-more-available-and-equitable> (Accessed: 11 January 2024).
- Australian Institute of Health and Welfare (AIHW). (2023, September 7). Report card on the wellbeing of Australians looks at what's changed since the COVID pandemic began. Available at: [https://www.aihw.gov.au/news-media/media-releases/2023/2023-september/report-card-on-the-wellbeing-of-australians-looks-at-what-s-changed-since-the-covid-pandemic-began#:~:text=In%20August%202023%2C%2012.9%25%20of,prior%20to%20COVID%20\(2017\)](https://www.aihw.gov.au/news-media/media-releases/2023/2023-september/report-card-on-the-wellbeing-of-australians-looks-at-what-s-changed-since-the-covid-pandemic-began#:~:text=In%20August%202023%2C%2012.9%25%20of,prior%20to%20COVID%20(2017)) (Accessed: 30 May 2024).
- Botha, F., et al. (2023). Generational differences in mental health trends in the twenty-first century. *Proceedings of the National Academy of Sciences*, 120(49). doi:10.1073/pnas.2303781120.
- de Oliveira, C., Saka, M., Bone, L., & Jacobs, R. (2023). The Role of Mental Health on Workplace Productivity: A Critical Review of the Literature. *Applied Health Economics and Health Policy*, 21(2), 167-193. doi:10.1007/s40258-022-00761-w.
- Enticott, J., Dawadi, S., Shawyer, F., Inder, B., Fossey, E., Teede, H., Rosenberg, S., Ozols, A., Meadows, G. (2022). Mental Health in Australia: Psychological Distress Reported in Six Consecutive Cross-Sectional National Surveys From 2001 to 2018. *Frontiers in Psychiatry*, 13, 815904. doi:10.3389/fpsy.2022.815904. Erratum in: *Frontiers in Psychiatry*, 13, 934065.

- Feng, X., & Astell-Burt, T. (2016). What types of social interactions reduce the risk of psychological distress? Fixed effects longitudinal analysis of a cohort of 30,271 middle-to-older aged Australians. *Journal of Affective Disorders*, 204, 99-102. doi:10.1016/j.jad.2016.06.041.
- Fowler, K.A., Kaplan, M.S., Stone, D.M., Zhou, H., Stevens, M.R., Simon, T.R. (2022). Suicide Among Males Across the Lifespan: An Analysis of Differences by Known Mental Health Status. *American Journal of Preventive Medicine*, 63(3), 419-422. doi:10.1016/j.amepre.2022.02.021.
- Germinario, G., Amin, V., Flores, C.A., & Flores-Lagunes, A. (2022). What can we learn about the effect of mental health on labour market outcomes under weak assumptions? Evidence from the NLSY79. *Labour Economics*, 79(C).
- Ghislain, B. D. A., & Henningsen, A. (2021). Units of measurement and the inverse hyperbolic sine transformation. *The Econometrics Journal*, 24(2), 334–351. <https://doi.org/10.1093/ectj/utaa032>.
- Kessler Psychological Distress Scale-10 (K10). (2017). Australian Bureau of Statistics. Available at: [https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4363.0~2014-15~Main%20Features~Kessler%20Psychological%20Distress%20Scale-10%20\(K10\)~35](https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4363.0~2014-15~Main%20Features~Kessler%20Psychological%20Distress%20Scale-10%20(K10)~35) (Accessed: 28 May 2024).
- Kim, T.J., & von dem Knesebeck, O. (2016). Perceived job insecurity, unemployment and depressive symptoms: a systematic review and meta-analysis of prospective observational studies. *International Archives of Occupational and Environmental Health*, 89(4), 561-573. doi:10.1007/s00420-015-1107-1.
- Lagomarsino, E., & Spiganti, A. (2020). No gain in pain: Psychological well-being, participation, and wages in the BHPS. *The European Journal of Health Economics*, 21(9), 1375–1389. doi:10.1007/s10198-020-01234-4.
- McGorry, P.D., et al. (2022). Designing and scaling up Integrated Youth Mental Health Care. *World Psychiatry*, 21(1), 61–76. doi:10.1002/wps.20938.
- Melbourne Institute: Applied Economic & Social Research. Hilda Survey. Available at: <https://melbourneinstitute.unimelb.edu.au/hilda> (Accessed: 28 May 2024).
- Müller, G., et al. (2021). Socio-economic consequences of mental distress: Quantifying the impact of self-reported mental distress on the days of incapacity to work and medical costs in a two-year period: A longitudinal study in Germany. *BMC Public Health*, 21(1). doi:10.1186/s12889-021-10637-8.
- Pearce, E., Birken, M., Pais, S., Tamworth, M., Ng, Y., Wang, J., Chipp, B., Crane, E., Schlieff, M., Yang, J., Stamos, A., Cheng, L.K., Condon, M., Lloyd-Evans, B., Kirkbride, J.B., Osborn, D., Pitman, A., Johnson, S. (2023). Associations between constructs related to social relationships and mental health conditions and symptoms: an umbrella review. *BMC Psychiatry*, 23(1), 652. doi:10.1186/s12888-023-05069-0.
- Productivity Commission. (2020). *Mental Health*, Report no. 95, Canberra.

- Summerfield, M., et al. (2023). Hilda User Manual Release 22. Available at: https://melbourneinstitute.unimelb.edu.au/__data/assets/pdf_file/0020/4815110/HILDA-User-Manual-Release-22.0.pdf (Accessed: 11 January 2024).
- Summerfield, M., Garrard, B., Nesa, Mossamet., Kamath, R., Macalalad, N., Watson, N., Wilkins, R., & Wooden, M. (2023). HILDA User Manual – Release 22. Melbourne Institute: Applied Economic and Social Research, University of Melbourne.
- Uher, J. (2023). What’s wrong with rating scales? Psychology’s replication and confidence crisis cannot be solved without transparency in data generation. *Social and Personality Psychology Compass*, 17(5). doi:10.1111/spc3.12740.
- ul Husnain, M.I., Hajizadeh, M., Ahmad, H., et al. (2024). The Hidden Toll of Psychological Distress in Australian Adults and Its Impact on Health-Related Quality of Life Measured as Health State Utilities. *Applied Health Economics and Health Policy*. <https://doi.org/10.1007/s40258-024-00879-z>.
- Vecchio, N., Mihala, G., Sheridan, J., Hilton, M., Whiteford, H., & Scuffham, P. (2014). A link between labor participation, mental health and class of medication for mental well-being. *Economic Analysis and Policy*, 44(4), 376-385. <https://doi.org/10.1016/j.eap.2014.11.006>
- Widiger, T.A., & Oltmanns, J.R. (2017). Neuroticism is a fundamental domain of personality with enormous public health implications. *World Psychiatry*, 16.