Mental Health Consequences of Unemployment: Mental Health, Somatic Symptoms, Depressive Affect and Positive Affect

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by

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Abstract

In this dissertation, we endeavoured to investigate the relationship between mental health and labour market changes in South Africa. We started by understanding the relationship between the aggregate CESD-10 and labour market status and then explored whether this aggregate relationship holds true for each of the three mental health factors that make up the CESD-10 score.

Using data from the National Income Dynamics Study, waves 1-5, we documented increasing mental health symptoms with employed to other states of unemployment. This follows for somatic symptoms, depressed affect and positive affect, but the source driving the effects differs between factors and with the CESD-10 as well.

We found that those who are NEA suffer to a greater extent in positive affect than in the other two factors relative to the employed. For those who are unemployed (discouraged), we see they also experience the strongest detrimental effect to their positive affect relative to the employed. However, they experience lower depressed affect scores relative to the employed. Those who are unemployed (strict), meanwhile, experience greater depressed affect scores out of the three factors when compared to the employed.

As such, we expect to see an average increase in depressive symptoms classifications among those moving from employed to NEA statuses. We can also expect an average increase in depressed affect disorder classifications among those moving from employed to NEA labour force status. Likewise, we can expect higher positive affect across the five waves among those moving from a employed to NEA status.

We find that, after controlling for observed individual characteristics and utilizing the panel structure of the data by allowing for individual specific fixed effects, negative labour market shifts have a significant negative impact on mental health. The sub-group analysis shows that this has a particularly adverse effect on black people and males.

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Table of Contents

Chapter 1: Overview of the Study

1.1 Introduction and Background

Unemployment does not simply impact income and expenses. The unemployed have poorer health relative to the employed, and unemployment itself may cause a deterioration of health (Carlier, 2013). In this context, "health" not only refers to physical health, but also to mental health and well-being (Wanberg, 2012; Backhans & Hemmingsson, 2011). The OECD (2017) reported on life satisfaction of their member countries measured in their 2017 How's Life based on the European Survey on Income and Living Conditions (EU SILC). It is measured from 0 (representing "not satisfied") to 10 (representing "completely satisfied"). It was reported that there has been a reduction in life satisfaction in South Africa from 5.1 to 4.8 from the years 2005 to 2016. This score is below the OECD average of 6.5, putting South Africa last amongst the 38 participating countries (OECD, n.d). This ranking is echoed by the UN's World Happiness Survey, wherein South Africa ranks 106 of 156 (Helliwell, Layard, & Sachs, 2019). However, these measurements of well-being do not take into account the mental health and the implications it has on economic outcomes.

In this paper, we begin exploring the relationship between mental health and labour market status in South Africa. Fortunately, South Africa hosts a nationally representative household panel survey called the National Income Dynamics Study (NIDS) which has been running for ten years as of 2018. NIDS has been implemented since 2008, with wave 1, by the Southern Africa Labour and Development Research Unit (SALDRU) with a nationally representative sample of more than 28000 individuals and 7300 households. Since 2008 NIDS the survey has been conducted every two years thereafter with waves 2 to 5.

1.2 Research Questions

In this sub-section, the primary and secondary research questions of this research project are laid out.

1.2.1 Primary Research Question

The primary research question that guides this study is: do unemployed individuals experience a deterioration of mental health, stemming from a loss of employment?

1.2.2 Secondary Research Question

a) Does the loss of an employed labour force status affect mental health, as measured by CESD-10 score, differently to its factors, as measured by somatic symptoms, depressed affect and positive affect?

b) Does a move out of employment affect somatic symptoms, depressed affect and positive affect differently?

1.3 Objectives of Research

The purpose of this sub-section is to set out the primary and secondary research objectives of this research paper.

1.3.1 Primary Research Objective

The primary research objective that guides this study is to test whether unemployed individuals experience a deterioration of mental health, stemming from loss of employment.

1.3.2 Secondary Research Objective

a) To determine if loss of employment affects mental health, as measured by CESD-10 score, differently to its factors, as measured by somatic symptoms, depressed affect and positive affect.

b) To determine if loss of employment affects somatic symptoms, depressed affect and positive affect differently.

1.4 Layout of Research Paper

This research report will be separated into chapters, each of which will discuss the following topics:

Chapter 1 is an overview of the dissertation which introduces the research questions and objectives, as well as providing the context of the research report.

Chapter 2 provides a review of the mental health literature. It covers what mental health is and details some of the mental health issues one may experience, the risk factors negatively affecting mental health, and the issues that have been raised over mental health and unemployment.

Chapter 3 covers mental health and labour force status in South Africa. It addresses the National Income Dynamics Study data; both the attrition of data and the variables used in the research are described. Mental health and its correlates in South Africa are analysed descriptively, and the markers of depression are then profiled. Finally, wave-to-wave and aggregate mental health scores are profiled according to labour market transitions.

Chapter 4 houses the data analysis and findings. Here we model the relationship between mental health and labour market status with an appropriate set of controls. This is also done for each factor (somatic symptoms, depressed affect and positive affect). We start by anchoring the conditional correlation by running cross-sectional ordered probits on all four of the indicators. Followed by a change in labour market status on the change in mental health by estimating fixed effects logits and fixed effect OLS models using the first five waves of the NIDS panel data set.

Chapter 5 is where the discussion that consolidates differences between mental health and factor response to labour market status changes occurs.

Chapter 2: Review of Literature

2.1 Introduction

For many years, unemployment was hypothesised to be associated with depression and other mental disorders (Linn, Sandifer & Stein, 1985; Frese & Mohr 1987; Hämäläinen, Poikolainen, Isometsä, Kaprio, Heikkinen, Lindeman & Aro, 2005 McKee-Ryan Song, Wanberg & Kinicki, 2005; Stankunas, Kalediene, Starkuviene & Kapustinskiene, 2006; Paul & Moser, 2009). However, to sharpen my discussion of mental health and unemployment, I review a subset of the mental health literature that has been selected based on its relevance to the following questions:

1. What is mental health?
2. What are some mental health issues one may experience, specific to depressive affect?
3. Which conditions factor into mental health?
4. What issues have been raised over depression and unemployment?

2.2 Mental Health

Depression itself is a mental disorder wherein the diagnosed individual experiences dejection, a loss of interest in activities that they once enjoyed, lethargy, lowered self-efficacy, and hopelessness, among other symptoms, with 4.4% of the global population estimated to being afflicted (World Health Organization, 2017). Depression, specifically Major Depressive Disorder (MDD), is positively correlated with neuroticism and negatively with college attainment, years spent in education, cognitive performance and subjective well-being (Brain Consortium, 2018).

2.2.1 Types of Depression

According to the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision (DSM-IV-TR), a major depressive episode must last at least 2 weeks to be diagnosed as MDD and can occur without prior manic or mixed episodes. Usually, a person diagnosed with MDD also experiences at least four symptoms which are not limited to changes in appetite and weight, changes in sleep and activity, lethargy, feelings of guilt, cognitive issues, indecisiveness, and reoccurring thoughts of death and suicide (Sadock & Sadock, 2007). Major Depressive

Disorder (MDD), according to the World Health Organisation (WHO) (2018), is currently the leading cause of disability in developed countries, as well as the third leading cause of disability worldwide as of 2017 (Institute for Health Metrics and Evaluation, 2018).

The National Institute of Mental Health (NIMH) Epidemiological Catchment Area Program revealed that subjects diagnosed with MDD experienced higher levels of strain stemming from issues in the household and finances, higher social irritability, constrained functioning in one's occupation, poorer health practices, and more days absent from work than subjects without MDD (Eaton et al., 1981; Judd, 1996; Johnson, Weissman & Klerman, 1992). Results from the National Comorbidity Survey revealed that subjects diagnosed with either MDD or bipolar depression were less likely to complete high school or university and had higher rates of teenage pregnancy and divorce than non-depressed subjects (Kessler, McGonagle, Zhao, Nelson, Hughes, Eshleman, Wittchen & Kendler, 1994; Kessler, Foster, Saunders & Stang, 1995; Kessler, Berglund, Foster, Saunders, Stang & Walters, 1997; Kessler, Walters & Forthofer, 1998). Additionally, patients diagnosed with MDD were more likely to be unsatisfied in marriage and to report poorer quality of interpersonal relationships than those without MDD (Whisman, 1996; Zlotnick, Kohn, Keitner & Della Grotta, 2000). This further elucidates the risks of depression one may experience, as the previous listed works compared those diagnosed with MDD to those who were not after examination by a professional.

Melancholic depression is thought of as a severe affective condition (Woo & Keatinge, 2008). Those diagnosed with this form of depression suffer loss of enjoyment of the majority of activities they once found pleasure in, and experience indifference during generally pleasurable activities (American Psychiatric Association, 2000). In accordance with the DSM-IV-TR, the subject should present three symptoms from a list not limited to: worsening depressive state in the morning, waking up unusually early in the morning, rapid loss of weight or anorexia, belittling oneself, inflated feelings of guilt, feeling that life has no point to it and that all of one's efforts have resulted in failure, and severe reoccurring thoughts of suicide and death.

2.2.2 Measurement Tools

Self-reported mental health questionnaires are used to screen or diagnose these mental health disorders. There are a number of such measures which we review briefly as context for a more extensive review of the specific measures that are used in this research.

The Beck Depression Inventory (BDI-II), developed in 1961, is a 21-item inventory used to screen for depression, and also comes in a 13-item short version (Beck, Ward, Mendelson, Mock & Erbaugh, 1961). The BDI is efficient in screening depression in medical inpatients and outpatients (Rapp, Parisi, Walsh & Wallace, 1988; Norris, Galagher, Wilson & Winograd, 1987). However, it is less sensitive in screening major depression in elderly men relative to elderly women (Allen-Burge, Storandt, Kinscheft & Rubin, 1994).

The Patient Health Questionnaire (PHQ-9) is an inventory to measure the severity of depression (Kroenke, Spitzer & Williams, 2001). It is a self-reported version of the PRIME-MD diagnostic instrument, which is used for common mental disorders which the PHQ-9 is the depression module of. PHQ scores of 5, 10, 15 and 20 represent mild, moderate, moderately severe and severe depression respectively. While the PHQ-9 has validity in its accuracy in diagnosing depression, it is not as efficient in differentiating severity of depression, as the severity cut-offs were derived to be simple for clinicians to remember and apply (Cameron, Cardy, Crawford, du Toit, Hay, Lawton, Mitchell, Sharma, Shivaprased, Winning & Reid, 2011).

The Hospital Anxiety and Depression Scale Depression Subscale, developed by Zigmond and Snaith (1983), is normally used by medical professionals to determine depression severity. When used for self-assessment, the HADS-D is only valid for depression screening purposes and not severity diagnosis. The HADS-D was designed to only be of use in hospital settings; however, studies using it conclude that it is valid in other settings, such as community and primary care medical practice (Zigmond & Snaith, 1983).

Cameron, Crawford, Lawton and Reid (2008) conducted a psychometric comparison between PHQ-9 and HADS-D measures for depression severity in primary care. Both inventories demonstrated high internal consistency at baseline and at treatment end. However, they differed significantly in categorising depression severity, with the HADS-D categorising less patients with moderately severe depression than the PHQ-9 (Cameron et al., 2011).

The World Health Organisation (WHO) developed an instrument called the Major Depression Inventory (MDI) (Bech, Rasmussen, Olsen, Noerholm & Abildgaar, 2001). The MDI separates itself from other self-report inventories, as it allows for a measurement of DSM-IV and ICD-10 diagnosis of clinical depression according to on top of estimating depression severity (Bech et al., 2001). Recent research reveals that items 9 and 10 of the MDI do not fit the Rasch model, and all of the items show disordered response categories (Nielsen, Ørnbøl, Vestergaard, Bech, & Christensen, 2017; Christensen, Oernboel, Nielsen & Bech, 2019).

The Centre for Epidemiologic Studies Depression (CES-D) scale is a self-reported inventory, used to screen for symptoms of depression, developed to be used in research involving the epidemiology of depressive symptoms in a general population (Radloff, 1977). The CES-D consists of 20 items, the majority of them focusing the on affect aspect of depression. It requires a minimum amount of its item be answered, as it is considered missing if more than four items are missing. What this means is that if more than four are not recorded, it would be as if none were recorded. The eight and ten item CES-D inventories have been shown to have test-retest reliability and convergent validity depression screening instruments variants of the twenty-item inventory (Karim, Weisz, Bibi & Rehman, 2015; González, Nuñez, Merz, Brintz, Weitzman, Navas, Camacho, Buelna, Penedo, Wassertheil-Smoller & Perreira, K., 2017).

These 20 items measure different mental disorders, which together contribute to a mental health score defined by the CES-D. There are four of these mental disorders which serve as components of the composite CES-D score as to measure mental health as a whole. These are somatic symptoms, depressed affect, positive affect and interpersonal problems.

Dimsdale, J.E. (2019) defines somatic symptom disorder (SSD) as that "characterized by multiple persistent physical complaints that are associated with excessive and maladaptive thoughts, feeling and behaviours related to those symptoms". Symptoms can manifest in any part of the body, and the most commonly reported symptom is pain (Harvard Health Publishing, 2018). SSD can cause such distress as to impair the ability of an individual to function normally, thus negatively affecting their work or home life. While somatic symptoms impair one's health status, they are medically unexplainable (Creed, F. H., Davies, I., Jackson, J., Littlewood, A., Chew-Graham, C., Tomenson, B., Macfarlane, G., Barsky, A., Katon, W., & McBeth, J., 2012). SSD has been shown to be unrelated to anxiety and depression in genetic studies (Gillespie, N.A., Zhu, G., Heath, A.C., Hickie, I.B., Martin, N.G., 2000). However, a study by Gerrits, Vogelzangs, Van Oppen, Marwijk,

van der Horst and Penninx (2012) shows that somatic symptoms can be used to predict poor response to the treatment of depression and anxiety. The findings of Gillespie et al. hints at the factor "somatic symptoms" behaving differently from the rest of the CES-D factors.

According to the American Psychological Association (2019a), affect is "any experience of feeling or emotion, ranging from suffering to elation, from the simplest to the most complex sensations of feeling, and from the most normal to the most pathological emotional reactions". Together with cognition and conation, affect is a traditional component of the mind. (Finan & Garland, 2015).

Negative and positive affect are examples of affective states. Research on the relationship between positive and negative affect shows that they are unrelated at trait-level, but are negatively related at state-level (Schmukle, Egloff & Burns, 2002). Positive affect, according to the American Psychological Association (2019b), is "the internal feeling state or affect that occurs when a goal has been attained, a source of threat has been avoided, or the individual is satisfied with the present state of affairs". Positive affect presents itself in the form of pleasant moods and emotions that provide contentment and calmness. Additionally, the moods and emotions provided by positive affect are stable while varying over time and intensity, such has elation and happiness.

Negative affect, meanwhile, is "the internal feeling state or affect that occurs when one has failed to achieve a goal or to avoid a threat or when one is not satisfied with the current state of affairs" (American Psychological Association, 2019c). Depressed affect is a state of negative affect which spans from feelings of unhappiness and discontent to deeply negative emotions of pessimism, despondency and sorrow which negatively affects daily life (American Psychological Association, 2019d). Deterioration in physique and cognition may occur, together with decreased social interaction. Some other symptoms of high depressed affect include changed sleeping patterns, eating habits, lethargy, and difficulties with concentration and decision making (Finan & Garland, 2015).

For the purposes of this paper, a high score in positive affect is referred to as negative due to it being reverse-coded during the data cleaning stage. This was done to maintain congruence with the literature (e.g. maximum scores sum to 30) as well as to make analysis straightforward.

The merits of using these various measures of mental health (somatic, symptoms, depressed affect and positive affect) are that in assessing one's mental health in a single measure, it is important to

cover the entire spectrum of mental disorders. For instance, if one designs an instrument to assess mental health, but it only has items pertaining to anxiety disorders, then the instrument is not an accurate one. Therefore, an item that covers the spectrum of mental disorders, from somatic to depressive, is more suitable.

The National Income Dynamics Study uses the ten item CES-D (CESD-10) inventory which was selected by examining the correlation of individual items to the total score, where low correlating and items that were seen as redundant were removed (Andresen, Malmgren, Carter & Patrick, 1994). This led to the CESD-10 being comprised of the following items (a) I was bothered by things that usually don't bother me. (b) I had trouble keeping my mind on what I was doing. (c) I felt depressed. (d) I felt that everything I did was an effort. (e) I felt hopeful about the future. (f) I felt fearful (g) My sleep was restless. (h) I was happy (j) I felt lonely. (k) I couldn't "get going". To which possible answers are "Rarely or none of the time", "Some or little of the time", "Occasionally or a moderate amount of time" or "All of the time", which carry score of 1, 2, 3 and 4 respectively. The possible range of scores is 0 – 30, with greater scores indicating greater depressive symptoms, and scores greater than 10 being the cut-off and item 'e' needs is required to be recorded (Andersen et al., 1994).

These items reflect six areas of depression conceptualized by Radloff (1977), which are: depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance. Factor analysis using three separate samples of the six conceptual areas were consolidated into three factors: depressed affect, somatic disturbances and interpersonal problems (Radloff, 1977). In addition to these three factors a fourth, positive affect, surfaced as an artifact of the remaining items (Radloff & Teri, 1986).

The factors themselves in the full CES-D inventory correspond to the items as follows: somatic symptoms - items 1, 2, 5, 7, 11, 13, 20; depressed affect - items 3, 6, 9, 10, 14, 15, 17, 18; positive affect - items 4, 8, 12, 16; and interpersonal problems - items 15 and 19 (Radloff, 1977). For the CESD-10 they correspond as follows: somatic symptoms - items 1, 2, 4, 7, 10; depressed affect - items 3, 6, 9; positive affect - items 5, 8. The factor "interpersonal problems" is not present in the CESD-10.

Regarding its use in a South African context, Baron, Davies & Lund (2017) sought to establish the validity and reliability of the CESD-10 in Zulu, Xhosa and Afrikaans. They concluded that the

CESD-10 had acceptable internal consistency across samples and sufficient concurrent validity relative to the PHQ-9 and WHODAS, making it a valid and reliable screening tool for depression among IsiZulu, IsiXhosa and Afrikaans populations.

2.2.3 Risk Factors For Depression

According to the Mayo Clinic (2018) the factors that appear to increase one's risk of entering a depressed state include personality traits, specifically those such as neuroticism. Neuroticism reflects how even-tempered and emotionally stable someone is, and a highly neurotic individual is prone to anxiousness, nervousness and low self-efficacy (Salleh, Mendes, Grundy and Burch, 2010). Trauma from events in one's past, such as sexual and physical abuse, or a loved one's death, are additional risk factors. The same is true of having a history of depression, bipolar disorder and suicide in one's family, or a history of mental health disorders, substance abuse, serious illness and chronic conditions, or frequent use of some medications such as sleeping pills.

Together with individual risk factors, there also exist socioeconomic risk factors. For example, there exists a seven year longitudinal panel population study on depression and socioeconomic risk factors by Lorant, Croux, Weich, Deliège, Mackenbach & Ansseau (2007). It used a fixed-effects model wherein increased material hardships such as poverty and deprivation lead to increases in the risk of depressive symptoms and depression severity. Moreover, the effects of negative socioeconomic changes were greater on depression than the positive effects (Lorant et al., 2007).

Interestingly, Lorant et al. (2007) found that changes in employment status did not affect the severity or the risk of depression. This is contrary to the results from a previous study by Stankunas, Kalediene, Starkuviene and Kapustinskiene (2006), which noted an increase in depressive episodes among the long-term unemployed. The effect was also observed amongst the short-term unemployed, although to a lesser degree. In a study by McGee and Thomspon (2015), wherein unemployment was the variable of interest, it was noted that depression does have an effect on employment status. In corroboration with this, recent studies conclude that the longer a period of unemployment lasts, the more likely one is to suffer from MDD (Nurmela, Mattila, Heikkinen, Uitti, Ylinen & Virtanen, 2018). It should be noted that the negative impact of unemployment on the risk of depression is not only explained by material and social resources, as

this effect was also seen in a study amongst unemployed people who receive means-tested benefits in Germany (Zuelke, Luck, Schroeter, Witte, Hinz, Engel, Enzebach, Zacharie, Loeffler, Thiery, & Villringer, 2018).

McGee &Thompson (2015) discovered that the unemployed are more vulnerable to depression than the employed by a factor of three. According to their study, using data from the 2010 Behavioural Risk Factor Surveillance System (BRFSS), 12% of emerging adults were depressed and 23% were unemployed, with notably more unemployed being classified as depressed. A meta-analysis by Paul and Moser (2009) found the negative effects of unemployment on mental health, wherein the mental health (made up of depression, subjective well-being and others) of an unemployed person is half a standard deviation below that of an employed person. Duration of unemployment played a moderating role of the negative effects on mental health as well as the economic development of a country, meaning less developed countries experienced greater negative effects.

Unemployed individuals who are depressed seem to employ more unhealthy coping mechanisms relative to those who aren't depressed. In a study where the coping strategies used by unemployed and depressed individuals was investigated, Bordea (2017) identified three broad categories of strategies were used. The healthiest coping strategy is coping by focusing on the issue, which includes strategies such as such as planning, positive reinterpretation and seeking social support. Coping by focusing on emotion involves self-accusing and seeking emotional support, and avoidance strategies involve resorting to substances, denial, withdrawal and disengagement. Bordea found that the unemployed without depression employed coping strategies that focused on the issue, those with mild depression also employed focused coping together with emotional strategies. Those with moderate depression mostly used emotional and avoidance strategies. Lastly, those with severe depression used avoidance strategies, which in-turn negatively affects their ability to gain employment.

2.2.4 Depression & South Africa

Since the effects of depression are experienced throughout one's life (Arnett, 2000), the long-term effects of recurrent depressive episodes are established during the transition period from young adulthood to adulthood (Yaroslavsky, 2013). These long term effects may be more pronounced in

countries with a higher incidence of depression. Lim, Tam, Lu, Ho, Zhang & Ho (2018), in a meta-analysis of 90 studies on the prevalence of depression, discovered that depression is more prevalent in countries with a medium Human Development Index (HDI). They reason that it is because of people living in these types of countries being exposed to greater stress stemming from higher expectations, cost of living and costs of treating depression. As recently as 2018, South Africa has been classified as a medium HDI country (United Nations, 2018), with the youth (15-34) representing 36.2% of South Africa's total population (Statistics South Africa, 2016).

In the case of South Africa, depression is second among the most prevalent individual lifetime disorders at 9.8% and most prevalent of 12 month disorders at 4.8%, making depression one of the common mental disorders in the country (Herman, Williams, Stein, Seedat, Heeringa & Moomal, 2009), as well as being one of the leading causes of disability in Southern Africa (Murray Vos, Lozano, Naghavi, Flaxman, Michaud, & Aboyans, 2012). Studies show that 81% of lost productivity at work is explained by depression and presenteeism resulting from depression (Stewart et al., 2003).

Regarding loss of earnings, Lund, De Silva, Plagareson, Cooper, Chishold, Das, Knapp and Patel (2011) assessed the presence of mental disorders using the World Health Organization Composite International Diagnostic Interview schedule on a probability sample of adults in South Africa. What they found, through generalized linear regression models, was that the presence of severe depression or anxiety disorders were associated with significant reductions in earnings among both the unemployed and employed. South Africa experiences annual labour costs of $894.00 per worker from absenteeism and $6066.00 per worker from reduced productivity at cost due to depression which are equivalent to 0.62% and 4.23% of GDP respectively (Evans-Lacko & Knapp, 2016). Lund, Myer, Stein, Williams, & Flisher (2013) estimated the annual loss of earnings stemming from mental health disorders to be R3.6 Billion, indicating a large issue regarding mental health in South Africa's socioeconomic structures.

Not only does depression correlate with work productivity and unemployment, but Kim and von Dem Knesebeck (2016) find that job insecurity and unemployment were significantly related to symptoms of depression, in 20 cohort studies within 15 articles, with the odds ratio fairly higher for job insecurity than for unemployment. Griep (2016) adds that those with perceived insecure employment and the long-term unemployed experience more psychological complaints and lower life satisfaction than the short-term unemployment and the securely employment. This is

corroborated by Fergusson, McLeod, & Horwood (2014) who looked at the association between unemployment and psychosocial outcomes. They found significant relationships between the duration of unemployment, major depression and life satisfaction in both linear and non-observed fixed effects regressions.

With this we see that psychological complaints correlate with unemployment, and the complaints are exacerbated by the duration of the unemployment, which decreases productivity and motivation. This is then further affected by the loss in earning brought on by the unemployment, which increases levels of depression. Further on, the loss of earnings increases material hardships, which has also been found to increase levels of depression. This results in a multiplier effect where each subsequent event stemming from a loss of employment that decreases mental health makes it more difficult for the affected party to then regain employment, which becomes even more difficult the longer duration of unemployment is.

Chapter 3: Mental Health & Labour Market Status

3.1 The NIDS Data

The year 2008 marked the commencement of the National Income Dynamics Study (NIDS) as South Africa's first household panel survey as an initiative of the Department of Planning, Monitoring and Evaluation (DPME). The survey has since been repeated with two years between each wave for a total of five waves of publicly released data at this time. The purpose of the study is to provide accurate and timely national data for effective planning in regards to monitoring and evaluation (Brophy, Branson, Daniels, Leibbrandt, Mlatsheni & Woolard, 2018). The study consists of four questionnaires administered at the individual and household level: household questionnaire, adult questionnaire, proxy questionnaire and child questionnaire.

The questionnaires cover issues such as poverty, psychological well-being, household composition and structure, fertility and mortality, migration, labour market participation, economic activity, human capital formation, health, education, vulnerability and social capital. The survey is administered by the Southern Africa Labour and Development Research Unit (SALDRU), located at the University of Cape Town and is funded and supported by the Department of Planning, Monitoring and Evaluation (DPME).

Given the above review of international and South African evidence, this section serves to descriptively correlate the effects of unemployment on mental health and its factors (somatic symptoms, depressed affect and positive affect). We will be profiling depression and then describing the relationship between depression and labour market status. It makes use of the CESD-10 score that was described above.

Table 1: Transition Matrix of Change in Mental Health Score (CESD-10) from t0 to t1

	Category of CESD-10 Score in t1						
Category of CESD-10 Score in t0	**0 to 4**	**5 to 9**	**10 to 14**	**15 to 19**	**20 to 24**	**25 to 30**	**Total**
0 to 4	35.05	45.16	16.67	2.84	0.26	0.01	**100**
5 to 9	30.37	46.32	18.77	3.76	0.77	0.01	**100**
10 to 14	23.42	48.4	22.58	4.89	0.6	0.11	**100**
15 to 19	19.14	49.98	23.68	6.25	0.91	0.04	**100**
20 to 24	11.73	59.81	19.06	7.36	1.96	0.08	**100**
25 to 30	31.44	27.65	21.77	19.15	0	0	**100**
Total	**29.64**	**46.67**	**19.16**	**3.89**	**0.61**	**0.03**	**100**
N	**7,061**	**11,498**	**4,828**	**1,027**	**127**	**15**	**24,556**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

Table 1 is a transition matrix of the percentage individuals in a CESD-10 category in time t0 to time t1. The cells below the diagonal signified by the blue highlighted cells indicate that the proportion of people who made a transition to a lower score is greater than those who made a transition to a higher score. What this tells us is that on average, mental health scores (CESD-10) have been decreasing from wave to wave on average. Decreasing CESD-10 scores indicate that on average, mental health is improving.

Table 2
Transition Matrix: Change in Somatic Symptoms Score in t0 to t1

	Somatic Symptoms Score in t1				
Somatic Symptoms Score in t0	**0 to 3**	**4 to 7**	**8 to 11**	**12 to 15**	**Total**
0 to 3	68.89	27.92	2.92	0.27	**100**
4 to 7	61.46	33.29	5.08	0.17	**100**
8 to 11	59.26	34.64	5.71	0.39	**100**
12 to 15	47.72	39.53	10.22	2.53	**100**
Total	**66.15**	**29.87**	**3.72**	**0.26**	**100**
N	**16,065**	**7,472**	**940**	**59**	**24,536**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

In table 2 we see a similar transition matrix to that in table 1, but instead for somatic symptoms. Here the cells below the diagonal are far greater than those above the diagonal. This tells us the

proportion of people who made a transition to a lower score are greater than those who made a transition to higher scores. What this tells us is that on average, somatic symptom scores have also been decreasing from wave to wave on average. This indicates decreased somatic troubles on average over time.

Table 3
Transition Matrix: Change in Depressed Affect Score in t0 to t1

	Category of Depressive Affect in t1					
Category of Depressed Affect in t0	**0, 1 and 2**	**3 and 4**	**5 and 6**	**7 and 8**	**9 and 10**	**Total**
0, 1 and 2	75.54	18.25	5.28	0.83	0.1	**100**
3 and 4	70.78	20.05	7.5	1.63	0.02	**100**
5 and 6	66.48	25.05	6.94	1.21	0.31	**100**
7 and 8	60.19	27.01	10.11	2.29	0.41	**100**
9 and 10	69.08	23.58	5.05	2.3	0	**100**
Total	**73.79**	**19.17**	**5.89**	**1.04**	**0.1**	**100**
N	**17,924**	**4,890**	**1,415**	**287**	**40**	**24,556**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

Table 3 is also a transition matrix, as with the tables before it. However, this one is of depressed affect. In table 3, as with tables 1 and 2, we observe the same pattern. The cells below the diagonal indicate that the proportion of people making a transition to a lower score are greater than those transitioning to higher scores on average. This suggests decreases in depressed affect from wave to wave on average over time.

Table 4
Transition Matrix: Change in Positive Affect Score in t0 to t1

Positive Affect in t0	Positive Affect in t1							
	0	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
	24.1	13.34	15.08	18.83	13.36	5.84	9.44	**100**
1	19.23	12.15	16.65	20.08	14.8	6.72	10.36	**100**
2	19.23	11.96	17.95	20.8	13.58	7.12	9.38	**100**
3	19.41	12.58	17.56	20.2	12.19	8.03	10.04	**100**
4	17.77	12.49	15.05	18.78	15.72	8.89	11.3	**100**
5	17	14.64	14.9	21.61	13.82	6.97	11.05	**100**
6	23.56	12.74	15.99	19.31	13.71	7.24	7.45	**100**
Total	**20.31**	**12.74**	**16.32**	**19.83**	**13.73**	**7.26**	**9.82**	**100**
N	**4,969**	**3,122**	**4,045**	**4,749**	**3,384**	**1,757**	**2,530**	**24,556**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

Table 4's transition matrix, which deals with positive affect, is slightly different than the previous three tables. While the cells below the diagonal look to be nearly equal to those above them, they are in fact sum to a greater total (338.58 vs 256.88). This suggests that positive affect is on a decline from wave to wave on average, as with the other factors, as well as the CESD-10 as a whole, but at a reduced rate relatively.

Figure 1: Kernel Density of Change in CESD-10 Score (Wave to Wave)

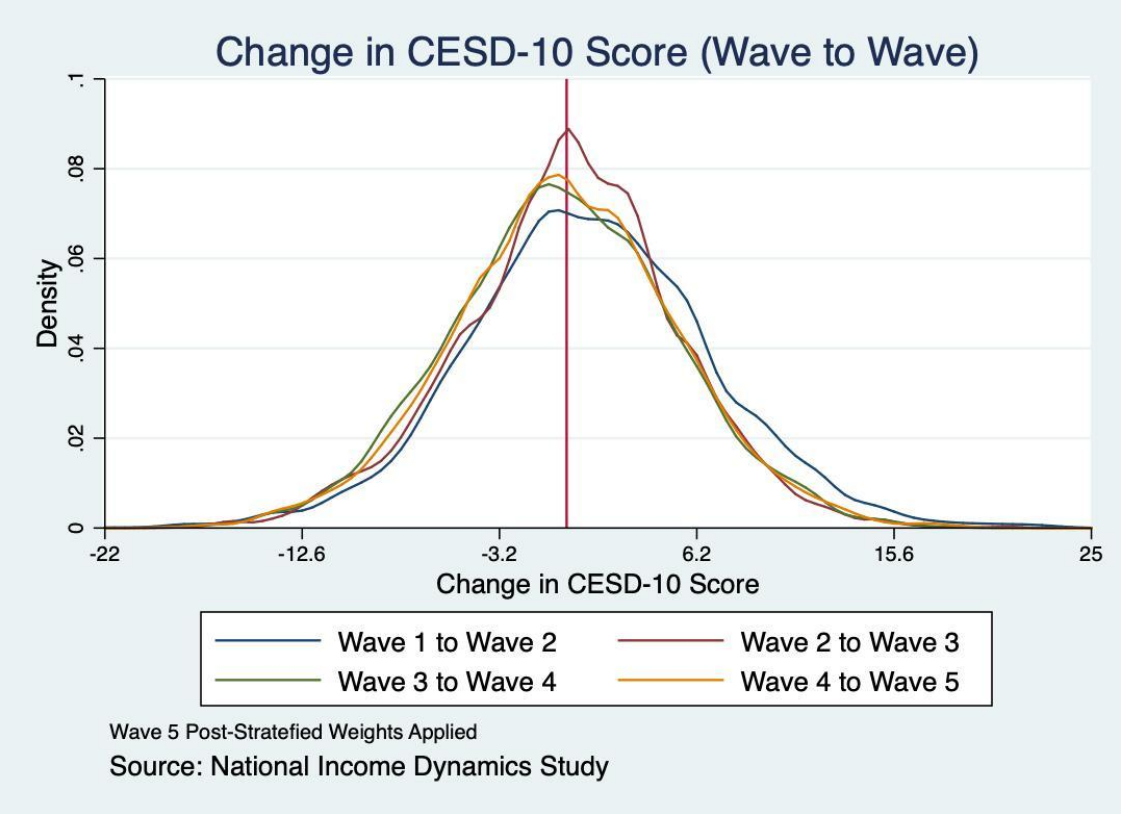


Figure 1 is a kernel density of the change in CESD-10 score from preceding wave to proceeding wave i.e. wave 1 to wave 2, wave 2 to wave 3 and so on. Any positive numbers represent increases in the CESD-10 score, while any negative numbers represent decreases and zero indicates no change. Across all wave-to-wave densities, the distribution is normal. However, wave 2 to wave 3 and wave 4 to wave 5 look to almost have slight bimodal distributions. The kernel density belonging to wave 2 to 3 has the highest peak, hinting at a higher number of participants who had little to no change in the CESD-10 score between waves. While the kernel density belonging to wave 1 to wave 2 has a lowest peak suggesting greater changes in CESD-10 scores occurring between those waves.

The wave 1 to wave 2 density has more of its share towards the right of 0 (indicated by the red line), meaning more individuals experienced increases in score. However, the highest peak lies towards the right of the zero, making this a little difficult to interpret. Wave 2 to wave 3 and wave 4 to wave 5 densities have their highest peaks towards the left of zero together with more of their areas towards the left as well. This suggests decreases in CESD-10 scores between those waves.

3.2 Attrition & Mental Health

When the survey commenced. it was with a sample of more than 28 000 participants in 7300 households across South Africa. The household members who were interviewed in 2008 and are continually sampled in each wave are referred to as Continuing Sample Members (CSMs). Individuals who become part of a household following this are referred to as Temporary Sample Members (TSMs) and are not tracked in the next waves. Children who are born to CSMs are added to the CSM sample and tracked. The sample experienced attrition of White, Indian/Asian and high-income respondents. In response a Top-Up sample of 2775 CSMs was added in Wave 5 to keep the sample nationally representative.

For analysis purposes, the sample was limited to working age adults (16–65) who were interviewed in all five waves of the adult NIDS survey. It was also necessary for the respondents to have answered the required questions of the adult NIDS survey for successful CESD-10 analysis. In the NIDS data of those who had successfully the answered the emotional section of the adult survey, 6251 did so only once in one of the five waves, 4038 did so twice, 7665 did so thrice, and 17 332 did so four times. The balanced panel at this point consists 30 835 observations.

We have CESD-10 scores for each panel member every time they are seen together with their current labour market status. We have similar information for each household member residing with the CSMs. Additionally, we have information about the characteristics of these individuals, and in this section we profile mental health scores by some key markers.

3.3 Description of Variables

Based on the literature review, and aside from labour market status these are the key correlates of depression that will be profiled descriptively and then controlled for in the multivariate analysis. Age and the age quadratic are included as controls, as age was found to have an effect on life satisfaction, and life satisfaction has an inverse relationship with mental health (Kannemeyer, 2016; Stoop, Leibbrandt, Zizzamia, 2019). The Years in Education variable is included to control for the effect increasing one's education has on mental health. The urban domicile is included to control for location specific interactions on mental health be it vegetation or poverty reasons.

Lastly, wave is controlled for due to increases and decreased in mental health resulting from time-based changes.

Table 5: Description of Variables

Variable Name	NIDS Variable Name	Description
CESD-10	w_cesd10	CESD-10 variable ranging from 0 – 30 which is the sum of Somatic Symptoms, Depressed Affect and Positive Affect variables.
Somatic Symptoms	w_somatic	Somatic symptoms variable, ranges from 0-15, derived from the CESD-10 inventory on questions that pertain specifically to somatic issues.
Depressed Affect	w_depress	Depressed affect variable, ranges from 0 to 9, derived from the CESD-10 inventory on questions that pertain specifically to depressive issues.
Positive Affect	w_positive	Positive affect variable, ranges from 0 to 6, derived from the CESD-10 inventory on questions that pertain specifically to troubles in experiencing positive feelings.
Employment	w_employ	A variable containing the number of individuals in four labour market statuses of which are employed, unemployed (strict), unemployed (discouraged) and not in economic activity.
Age	w_age	The age of the participant is measured in years.
Age^2	w_age2	A variable which is the w_age variable squared.
Years in Education	w_edyrs	The number of years a participant has spent in education calculated from the normal number of years it would take to complete a stage of education and how many of these stages one has completed. This does not take into account how long it took a participant to complete a particular stage, thus ignoring the events where it took one longer or shorter than normal to complete a stage.
Geography Type of Residence	w_domicile	A variable specifying the type of geographic area a participant resides in, e.g urban or rural.
Wave	w_wave	A variable capturing the number waves in the data.
More information on each of these variables are available in the wave 5 NIDS metadata document.		

3.4 Descriptive Statistics of Mental Health and its Correlates in South Africa

In this section we begin by using NIDS data to present a cross-sectional snapshot of mental health and its correlates. The same is done for the factors of mental health. We then move onto cumulative distribution functions of mental health and its factors by wave (wave 1 -5). Lastly we move onto histograms to graph the distribution of the four indicators.

Table 6: Summary Statistics by CESD-10 Score (Waves 1 to 5 Pooled) – Column Totals

CESD-10 Score (%)	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 30	Total (%)
Labour market Status							
Not Economically Active	38	46	50	52	53	60	45
Unemployed (Discouraged)	3	4	3	3	5	2	3
Unemployed (Strict)	12	12	12	10	14	9	12
Employed	47	39	35	36	28	28	40
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Population Group							
African	75	87	90	90	91	80	84
Coloured	21	11	8	8	6	16	13
Asian/Indian	1	1	0	1	0	2	1
White	3	1	1	1	3	2	2
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Gender							
Male	36	32	28	25	18	16	31
Female	64	68	72	75	82	84	69
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Sample size	**8433**	**14136**	**6372**	**1472**	**238**	**44**	**30695**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

Table 6 is a summary table of labour market status, population group and gender by grouped CESD-10 score. The last four CESD-10 score categories (10 – 14, 15 – 19, 20 – 24, 25 – 30) are scores which are classified as having depressive symptoms with the higher scoring categories representing greater depressive symptoms. When looking at labour market status we see that of any CESD-10 score categories, the not economically active (NEA) hold the greatest shares and for the last four categories the NEA hold half or more than half of the share. For population groups, Africans hold the overwhelming share majority in the CESD-10 score categories. Lastly, females hold the greater share of CESD-10 score categories. However, this may be due to the fact that the NEA are greater in the population of labour market statuses, Africans being the greater majority of amongst the population group, as well as females being the greater majority amongst the different genders.

Table 7: Summary Statistics CESD-10 (Wave 1 to 5 Pooled) – Row Totals

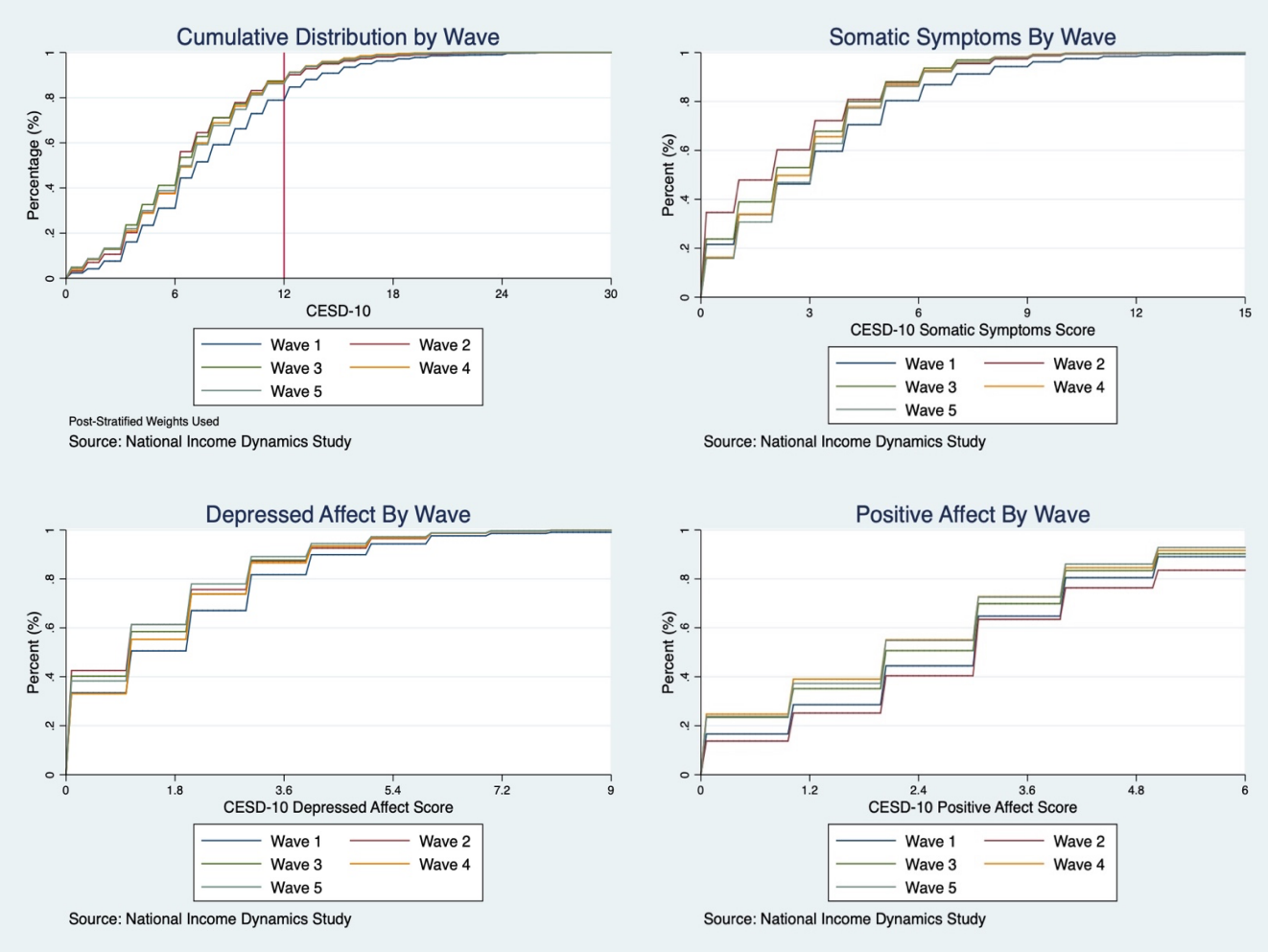
CESD-10 Score (%)	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 30	Total
Labour market Status							
Not Economically Active	24.9	46.83	21.81	5.15	1.19	0.13	100
Unemployed (Discouraged)	23.59	51.58	20.2	3.79	0.75	0.08	100
Unemployed (Strict)	28.37	44.73	20.43	5.17	1.18	0.12	100
Employed	33.07	45.07	17.29	3.98	0.53	0.05	100
Total	**29.15**	**45.87**	**19.46**	**4.56**	**0.87**	**0.09**	**100**
Population Group							
African	25.89	47.49	20.78	4.87	0.86	0.1	100
Coloured	40.67	37.69	17.42	3.68	0.36	0.17	100
White	44.37	39.9	11.75	2.34	1.64	0.01	100
Total	**29.14**	**45.83**	**19.51**	**4.56**	**0.86**	**0.1**	**100**
Gender							
Male	30.75	47.3	17.36	3.81	0.73	0.04	100
Female	28.11	44.9	20.88	5.03	0.94	0.14	100
Total	**29.14**	**45.83**	**19.51**	**4.56**	**0.86**	**0.1**	**100**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

Table 7 draws from the same data with table five, except it is by row total instead of column total. The NEA have the highest share at or greater than the CESD-10 cut-off of 10 at 28.27% of the NEA being classified as having depressive symptoms. Second are the unemployed (strict) with 26.9%, third are the unemployed (discouraged) and last with the lowest share are the employed with 21.86%.

For population groups, Africans have the highest share of their population being classified with depressive symptoms at 26.62%. This is followed by Coloured people at 21.64%, then Whites with the lowest share at the cut-off or greater than the rest of the population groups at 15.73%. With gender, we see that females have the highest share above the CESD-10 cut-off with 26.99% at or above it relative to males who have 21.95% of their share at or above the cut-off.

Figure 2: Cumulative Distribution Function by Wave per CESD-10 & Factors



Graphs of the cumulative distribution functions by wave per CESD-10 and its factors (somatic symptoms, depressed affect and positive affect) can be seen in Figure 2. What we observe, in regards to the CESD-10, is that the CESD-10 score is highest in wave 1 at every step of the distribution. For somatic symptoms the wave 1 score first order dominates waves 2 and 3 somatic symptoms scores. When looking at depressed affect, it does not appear to have any clear first order dominance between waves 1 to 5. Lastly, when looking at the positive affect CDF's, we notice that that waves 1 and 2 first order dominate waves 3, 4 and 5. We also see is that the positive affect score is highest in wave 2 at every step of the distribution.

This suggests that the CESD-10 and its factors do not necessarily behave the same and may move influenced by different factors. Another question that arises is whether the different factors of the CESD-10 behave stronger in certain population groups, genders or under certain environmental factors.

Table 8: CESD-10 Summary Statistics (Wave 1 – 5)						
CESD-10 Summary Statistic						
	Obs	Mean	St. Dev	Min	Max	%CESD-10 > 9
Wave 1	6139	8.163382	4.685813	0	30	35%
Wave 2	6139	7.095292	4.17344	0	27	24%
Wave 3	6139	7.010588	4.086717	0	24	25%
Wave 4	6139	6.795895	3.907601	0	24	23%
Wave 5	6139	6.94592	4.136362	0	26	25%
Overall	**30695**	**7.202215**	**4.234285**	**0**	**30**	**26%**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

Table 9: Somatic Symptoms Summary Statistics (Wave 1 – 5)						
Somatic Symptoms Summary Statistic						
	Obs	Mean	St. Dev	Min	Max	% Somatic Symptoms > 5
Wave 1	6139	3.410816	3.01684	0	15	33%
Wave 2	6131	2.541673	2.621722	0	15	22%
Wave 3	6137	2.804302	2.316681	0	15	23%
Wave 4	6139	2.786122	2.228119	0	13	21%
Wave 5	6139	3.019384	2.344155	0	13	24%
Overall	**30685**	**2.912563**	**2.538572**		**15**	**26%**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

Table 10: Depressed Affect Summary Statistics (Wave 1 – 5)

Depressed Affect Summary Statistic						
	Obs	Mean	St. Dev	Min	Max	%Depressed Affect > 3
Wave 1	6139	1.925232	1.915309	0	9	19%
Wave 2	6139	1.54113	1.801142	0	9	14%
Wave 3	6139	1.700766	1.735964	0	9	14%
Wave 4	6139	1.648803	1.666609	0	9	13%
Wave 5	6139	1.562632	1.651479	0	9	12%
Overall	**30695**	**1.675713**	**1.762019**	**0**	**9**	**15%**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

Table 11: Positive Affect Summary Statistics (Wave 1 – 5)

Positive Affect Summary Statistic						
	Obs	**Mean**	**St. Dev**	**Min**	**Max**	**% Positive Affect > 1**
Wave 1	6.139	2.827333	1.806318	0	6	75%
Wave 2	6.139	3.022642	1.938861	0	6	76%
Wave 3	6.139	2.508226	1.880701	0	6	67%
Wave 4	6.139	2.360971	1.932137	0	6	61%
Wave 5	6.139	2.363903	1.816753	0	6	64%
Overall	**30695**	**2.616615**	**1.894238**	**0**	**6**	**69%**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

Tables 8 to 11 are summary statistics of the CESD-10 and its 3 factors. They report the number of observations, mean, standard deviation, min, max and the percentage of participants who scored greater than the cut-off points. Starting with the CESD-10, we see the overall mean score is 7.2 with 8.16 in wave 1, around 7 in wave 2 and wave 3 and 6.78 and 6.94 in wave 4 and wave 5 respectively. Looking at somatic symptoms we see that the overall mean is 2.9. In wave 2, somatic symptoms averaged at 2.5, which is the best scoring wave due to it being the lowest scoring wave with 2.5. Waves 3 and 4 are comparable to each other with scores of 2.8 and 2.7 respectively, while somatic symptoms are highest in waves 2 and 3, averaging 4.9. The highest scoring waves were waves 1 and waves 5 with scores of 3.4 and 3 respectively. For depressed affect, the overall mean is 1.67. Depressed affect mean scores are very consistent across waves, with scores ranging from 1.9 in wave 1 to 1.5 in wave 2 and wave 5. Lastly, in regards to positive affect, the overall mean score is 2.6.

Figure 3: **Histograms of CESD-10 & Factors**

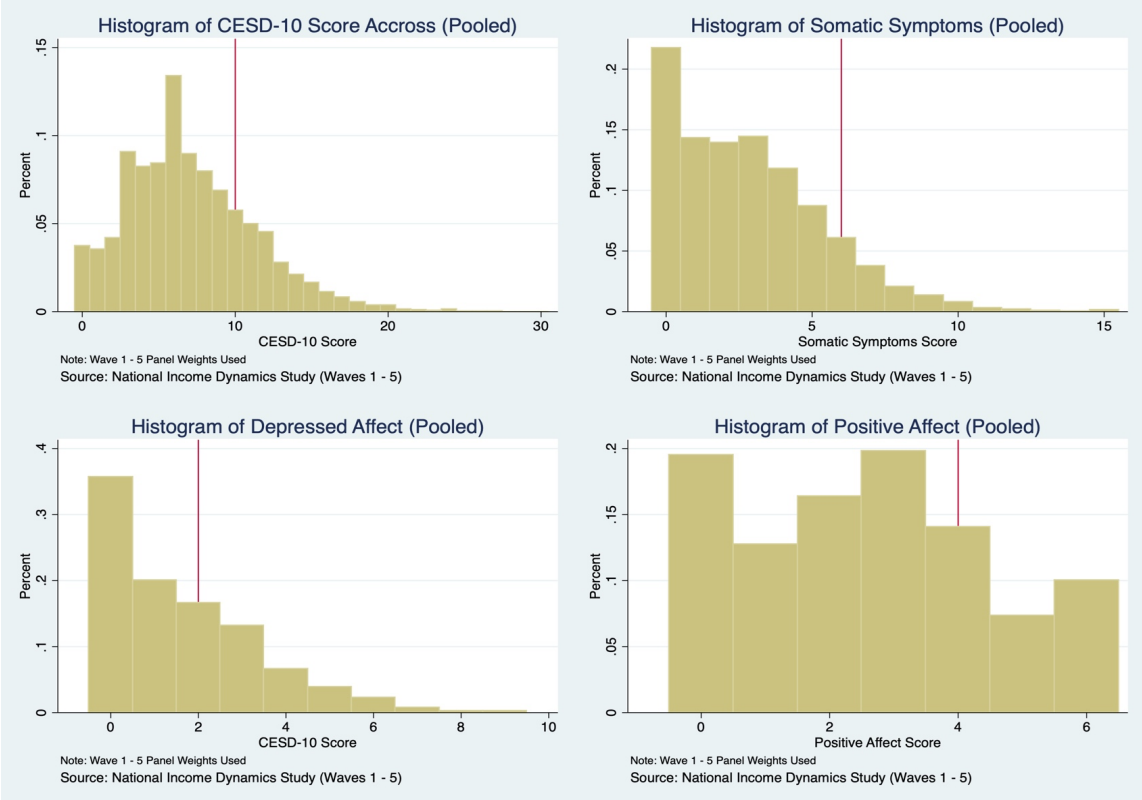
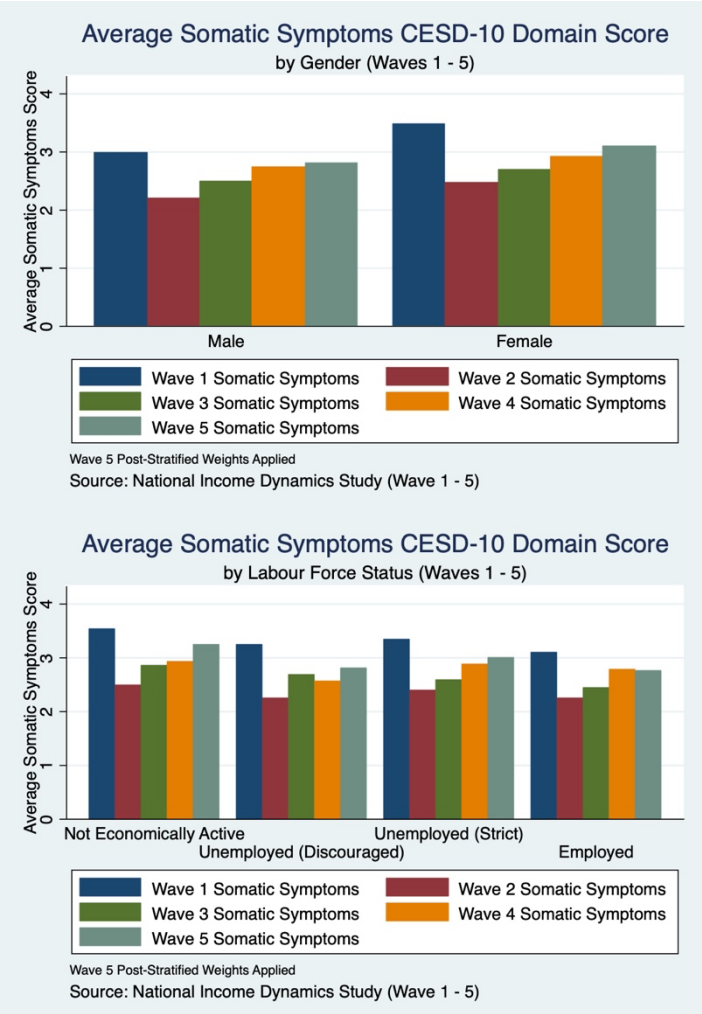


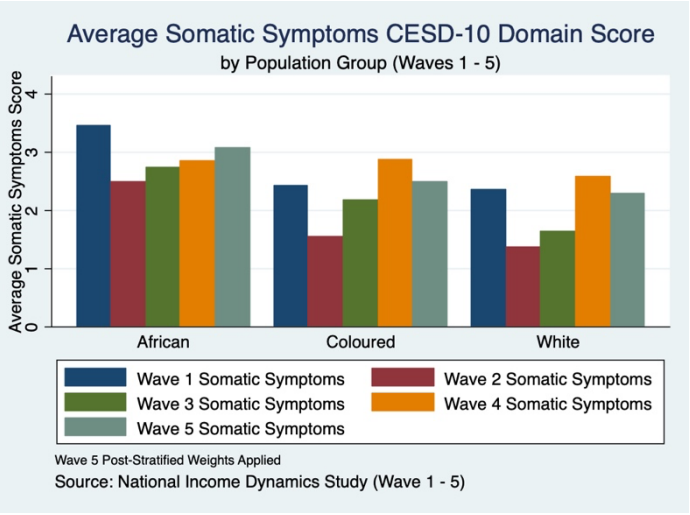
Figure 3 shows us four histograms representing the distribution of scores of the full CESD-10 its factors, these being somatic symptoms, depressed affect and positive affect, using a balanced panel of adults from the NIDS data (waves 1 to 5). The CESD-10, somatic symptoms and depressed affect histograms look to have a right-skewed distribution, which tells us that the majority of individuals, on average, lie on the lower range of score while that of positive affect has more of a random distribution. For the CESD-10 and somatic symptoms, the majority lie below the cut-off of 10 and 6 respectively, whereas less individuals lie below the depressed affect cut-off of 2.

3.5 Markers of Depression (Somatic Symptoms, Depressed Affect and Positive Affect)

In this section we begin by profiling the CESD-10 factors by gender, population group and labour market status visually using bar graphs and cumulative distribution functions.

Figure 6: Bar Graphs of Somatic Symptoms Affect Score by Gender, Population Group & Labour market Status

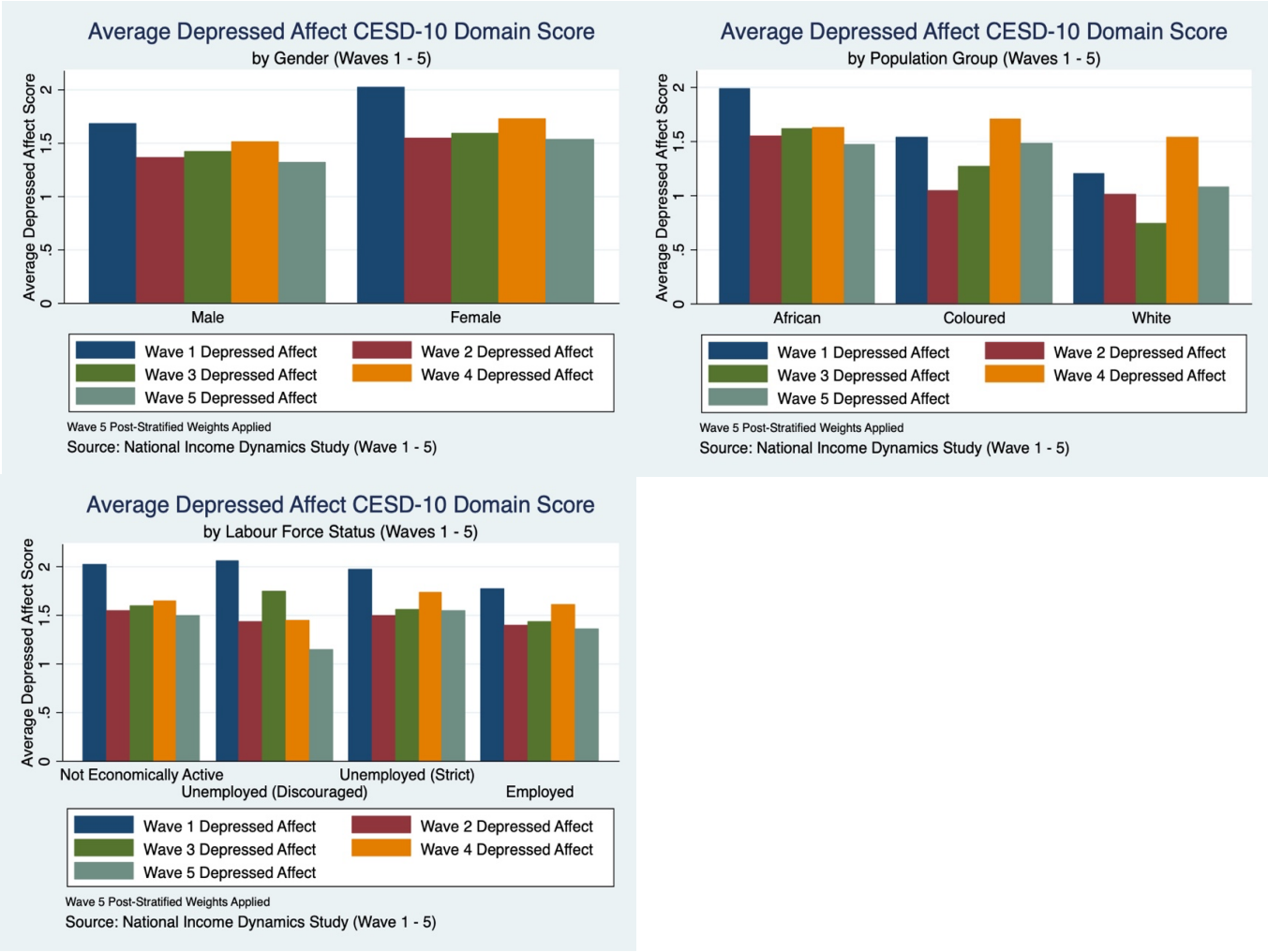




The NEAs have the highest average somatic symptoms score of all other labour market statuses for all five waves. The employed have the lowest score in waves 1 and 2, while the unemployed (strict) have the lowest in wave 3. Meanwhile, the unemployed (discouraged) have the lowest score in waves 4 and 5. Wave 4 and wave 5's highest average positive affect belongs to the unemployed (discouraged). The employed seem to have the lowest average positive affect scores on average. In terms of population group, Black Africans seem to have the highest average somatic symptoms scores across all waves. Whites, meanwhile, seem to have the lowest somatic symptoms scores

overall. Females appear to generally have a higher average somatic symptoms score across all five waves. The highest average score for both males and females occurs in waves 1 and 5.

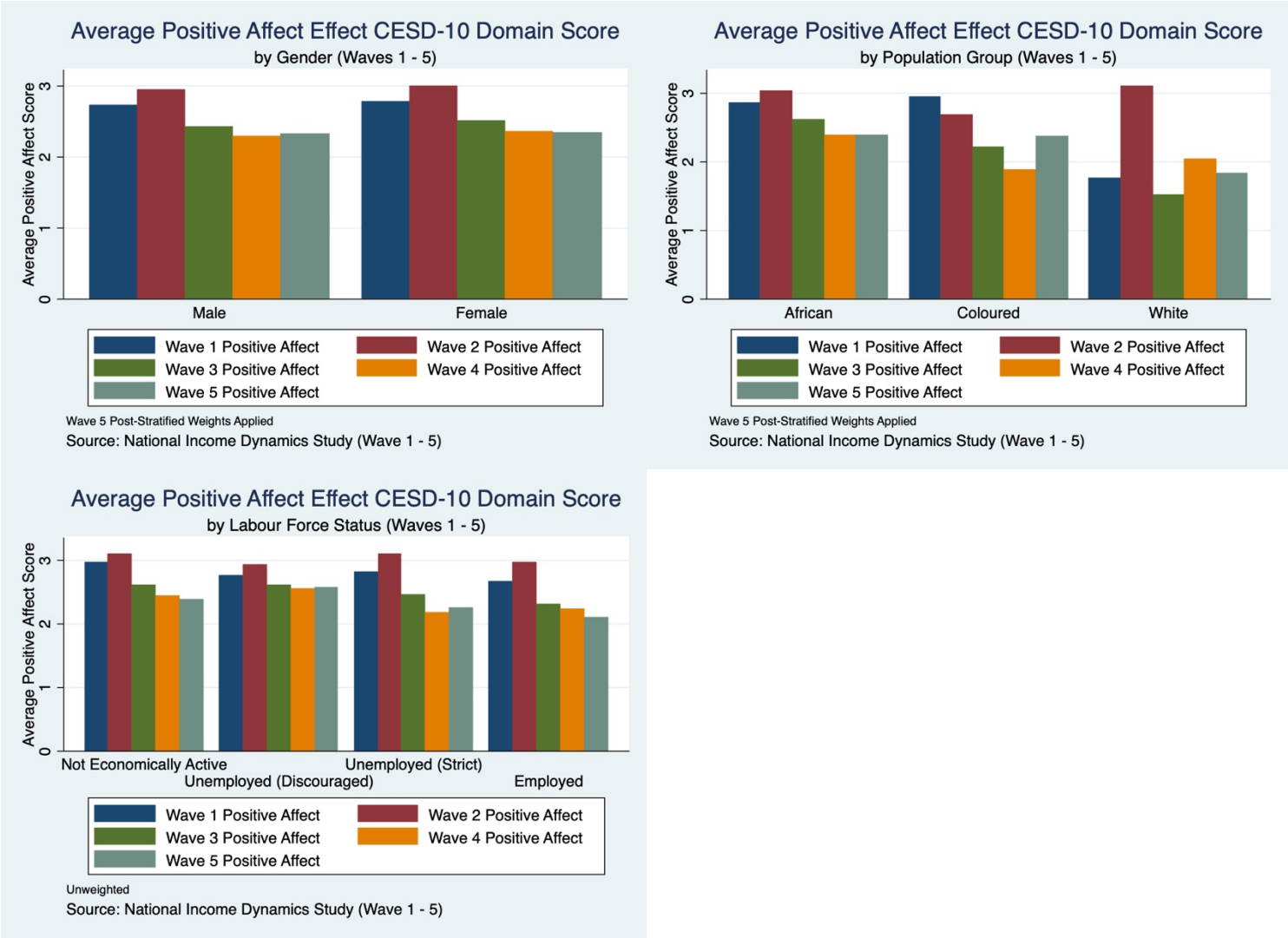
Figure 4: Bar Graphs of Average Depressed Affect Score by Gender, Population Group & Labour Market Status



The average depressed affect score by labour market status for the unemployed (discouraged) appears to be highest in wave 1 and wave 3. For wave 2, the highest average depressed affect was among the NEA. The highest average depressed affect belongs the unemployed (strict) for waves 4 and 5. The employed look to have the lowest average depressed affect scores across all waves save for waves 4 and 5, where the lowest belongs to the unemployed (discouraged). In terms of population group, Black Africans seem to have the highest average depressed affect scores in the first four of the five waves. The highest average depressed affect score belongs to the Coloureds in the last 2 waves. Whites have the lowest depressed affect scores in all five waves. Females appear to generally have a higher average score of depressed affect across all waves relative to

males. The highest average score can be found in wave 1, with wave 4 being the second highest average score.

Figure 5: Bar Graphs of Average Positive Affect Score by Gender, Population Group & Labour market Status



The average positive affect score by labour market status for the NEA appears to be highest in wave 1, while being tied with the unemployed (strict) in wave 2 and tied with the unemployed (discouraged) in wave 3. Wave 4 and wave 5's highest average positive affect belongs to the unemployed (discouraged). The employed seem to have the lowest average positive affect scores in waves 1, 3 and 5. The lowest in wave 2, meanwhile, belongs to the unemployed (discouraged) and the lowest in wave 4 to the unemployed (strict). In terms of population group, Black Africans seem to have the highest average positive affect scores in waves 3, 4 and 5. Wave 1's highest average positive affect score belongs to Coloureds while wave 2's belongs to Whites. Overall,

Whites seem to have the lowest positive affect scores. Females appear to generally have a higher average score of depressed affect across all waves relative to males. The highest average score occurs in waves 1 and 2 for both males and females.

In summation, these graphs show is that across all factors of the CESD-10, women exhibit far greater depressive symptoms on average than men do. The employed generally have lower average scores across all factors, whilst NEAs generally have higher score when it comes to somatic symptoms and positive affect. The highest average scores for depressed affect seem to belong to discouraged unemployed. Lastly, Black Africans look to generally have the highest average score of all factors relative to the other population groups (White and Coloured).

Figure 7: Cumulative Distribution Function by Labour market Status per CESD-10 & Factors

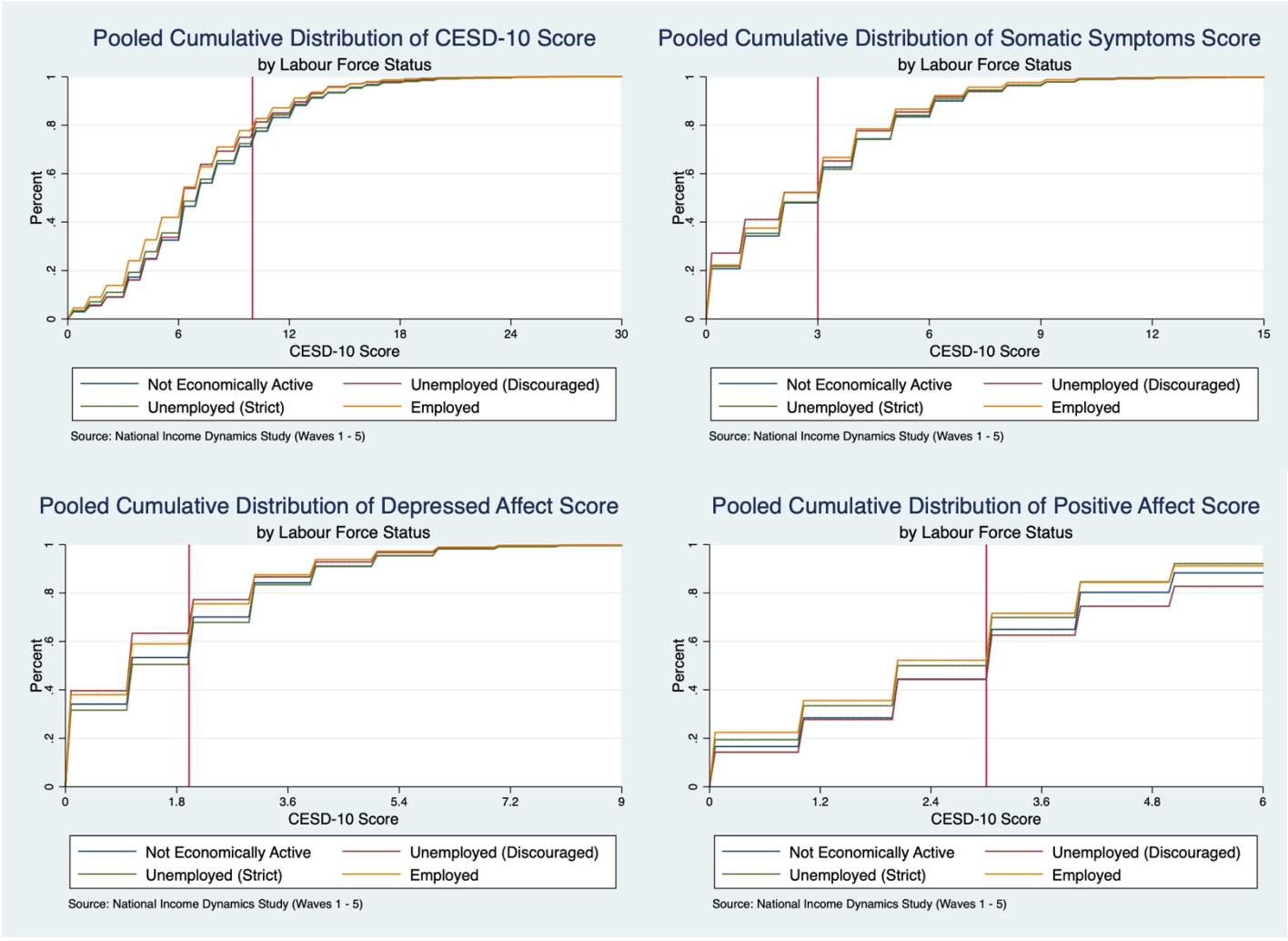


Figure 7 are four cumulative distribution functions of the CESD-10, somatic symptoms, positive affect and depressed affect by labour market status. Looking at the CESD-10 first, we see that the NEA and unemployed (strict) functions first order dominate those of the employed and unemployed (discouraged). The same pattern is observed when looking at the somatic symptoms and depressed affect cdf's. This changes when we come to the positive affect cdf's. Here we have the NEA and unemployed (discouraged) cdf's first order dominating the employed and unemployed (strict) cdf's.

3.6 CESD-10 by Labour Market Transitions

Now that we have shown you how the CESD-10 and its factors behave by wave, gender, population group, and labour market status, we go deeper. We profile the CESD-10 and its factors according to the changes in labour market status.

Figure 8: Average CESD-10 Score by Change in Labour market Status (Wave 1 to 2)

Panel A: Bar Graph of Change in Labour market Status

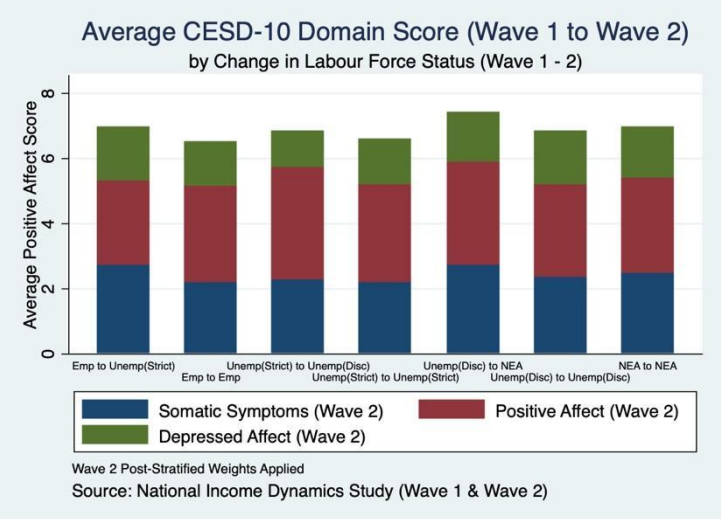


Figure 8 is a stacked bar graph displaying various changes and stayers of labour market status in average CESD-10 score from waves 1 to 2, while displaying the proportion of the CESD-10 score held by each of the CESD-10 factors. We see that the employment stayers have the lowest average followed by the unemployment (strict) stayers, the unemployment (discouraged) stayers and the NEA stayers being the fourth lowest average score. Interestingly the movers, moving from one

labour market status to another, have the higher average CESD-10 score relative to stayers. To illustrate, the highest average score belongs to the unemployment (discouraged) to NEA movers, followed by employment to unemployment (strict) movers, then the unemployed (strict) to unemployed (discouraged).

The lowest levels of average somatic symptoms score belong to the employment stayers as well as the unemployed (strict) stayers. The highest levels of average somatic symptoms scores, meanwhile, are of those who are employed to unemployed (strict) and unemployed (discouraged) to NEA movers. The greatest average positive affect score is that of the unemployed (strict) to unemployed (discouraged) movers. Lastly, in regards to the depressed affect, we see that the employed to unemployed (strict) movers, unemployed (discouraged) to NEA movers and NEA to NEA stayers have the highest average scores.

Table 12
Transition Matrix: Change in Mental Health Score (CESD-10) by Labour market Status (Wave 1 - Wave 2)

Labour market Status in Wave 1		Labour market Status in Wave 2				
		Not Economically Active	Unemployed (Discouraged)	Unemployed (Strict)	Employed	Total
Not Economically Active	Mean	1.07	2.16	2.18	1.31	**1.27**
	N	2603	159	283	392	**3437**
Unemployed (Discouraged)	Mean	1.09	2.89	1.49	1.06	**1.32**
	N	271	47	95	122	**535**
Unemployed (Strict)	Mean	1.3	0.87	2	1.75	**1.59**
	N	429	73	221	306	**1029**
Employed	Mean	0.17	0.45	0.76	0.71	**0.58**
	N	918	132	221	1755	**3026**
Total	Mean	**0.91**	**1.48**	**1.65**	**0.95**	**1.04**
	N	**4221**	**411**	**820**	**2575**	**8027**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

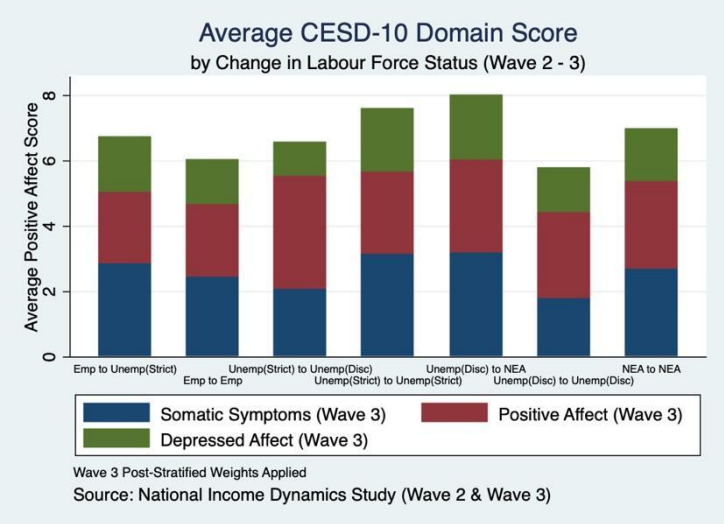
Table 12 is a transition matrix of the change of mental health score (CESD-10) from wave 1 to 2. Any positive change represents an increase in CESD-10 score, which is a move towards being less mentally unhealthy. The greatest increase in mental health score, from wave 1 to 2, belongs to those who remained unemployed (discouraged) at 2.89 points, and 47 is the number of individuals who were stayers in this time period.

Those who had the smallest increase in CESD-10 at 0.17 points, and thus had the smallest move towards being mentally unhealthy, are those who were employed in wave 1 and moved to being NEA in wave 2. The employed in wave 1 had the smallest movements towards being mentally unhealthy on average, regardless of move relative to all the other labour market statuses in wave 1 with a 0.58 points average. Those who experienced the greatest increase in CESD-10 points regards of their labour market status change in wave 2 are those were unemployed (strict) in wave 1 at 1.59 increase in CESD-10 score on average.

A move to being NEA in wave 2, meanwhile, regardless of labour market status in wave 1, gives the smallest increase at 0.91, with a move into employment coming in at a close second at 0.95 CESD-10 score increase on average. Meanwhile, the labour market status move in wave 2 with the greatest increase in CESD-10 score on average is the move to being unemployed (strict) at 1.65 points.

Figure 9: Average CESD-10 Score by Change in Labour market Status (Wave 2 to 3)

Panel A: Bar Graph of Change in Employment



In figure 9, we see a wave 2 to 3 stacked bar graph of average CESD-10 score according to changes in labour market status. The figure also displays the proportion of the average CESD-10 score held by each of the CESD-10 factors. We see that the unemployed (discouraged) stayers have the lowest average, followed by the employed stayers, the unemployed (strict) to unemployment (discouraged) movers, with the employed to unemployed (strict) movers being the fourth lowest average score. Unlike the transition from wave 1 to 2, the transition from wave 2 to 3 does not see

the stayers having lower scores than the movers across the board. However, the employed stayers are still amongst the group who have the lowest average CESD-10 score, where the lowest belongs to the unemployed (discouraged) stayers.

The lowest levels of average somatic symptoms score belong to the unemployed (discouraged) stayers and the unemployed (strict) to unemployed (discouraged) movers. The highest levels of average somatic symptoms scores are of the unemployed (strict) stayers and unemployed (discouraged) to NEA movers. The greatest and lowest average positive affect score belongs to the unemployed (strict) to unemployed (discouraged) movers, as with the wave 1 to 2 transition, and the employed stayers respectively. Lastly, in regards to the depressed affect, we see the highest average scores belong to the unemployed (strict) stayers and the unemployed (discouraged) to NEA movers, while the lowest average depressed scores belong to unemployed (strict) to unemployed (discouraged) movers.

Table 13
Transition Matrix: Change in Mental Health Score (CESD-10) by Labour market Status (Wave 2 to Wave 3)

Labour market Status in Wave 2		Labour market Status in Wave 3				
		Not Economically Active	Unemployed (Discouraged)	Unemployed (Strict)	Employed	Total
Not Economically Active	Mean	-0.2	0.7	0.42	1.01	**0.15**
	N	3440	142	724	892	**5198**
Unemployed (Discouraged)	Mean	-0.99	1.66	-0.8	0.68	**-0.35**
	N	210	22	98	126	**456**
Unemployed (Strict)	Mean	-1.09	0.29	-1.27	0.03	**-0.62**
	N	278	39	235	317	**869**
Employed	Mean	-0.57	-1.39	0.61	0.41	**0.27**
	N	476	25	261	2010	**2772**
Total	Mean	**-0.36**	**0.43**	**0.07**	**0.51**	**0.09**
	N	**4404**	**228**	**1318**	**3345**	**9295**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

The transition matrix of the change of mental health score (CESD-10) in table 13 is from wave 2 to 3. Any positive change represents an increase in CESD-10 score, which is a move towards being less mentally healthy. The greatest increase in mental health score, from wave 2 to 3, belongs to

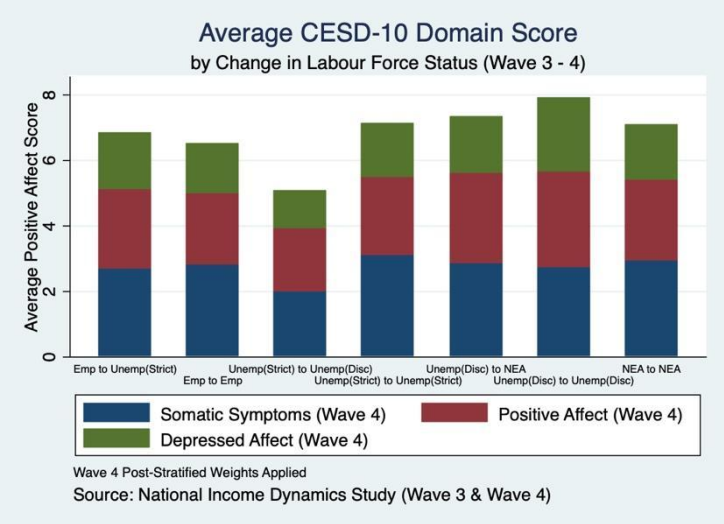
those who remained unemployed (discouraged) at 1.66 points and 22 is the number of individuals who were stayers in this time period.

Those who had the smallest change in CESD-10 at -1.39 points and thus had the smallest move towards being mentally unhealthy are those who were employed in wave 2 and moved to being unemployed (discouraged) in wave 3. The unemployed (strict) in wave 2 had the smallest movements towards being mentally unhealthy on average, regardless of move relative to all the other labour market statuses in wave 2 with a -0.62 change in score on average. Those who experienced the greatest increase in CESD-10 points regards of their labour market status change in wave 2 are those were employed in wave 2 at 0.27 increase in CESD-10 score on average.

Meanwhile, a move to being NEA in wave 3, regardless of labour market status in wave 2 gives the greatest reduction at -0.36 CESD-10 score increase on average, whereas the labour market status move in wave 3 from wave 2 with the greatest change in CESD-10 score and thus greatest move towards becoming more mentally unhealthy on average is the move to being employed at 0.51 points.

Figure 10: Average CESD-10 Score by Change in Labour market Status (Wave 3 to 4)

Panel A: Bar Graph of Change in Employment



In figure 10 we see a wave 3 to 4 stacked bar graph of average CESD-10 score according to changes in labour market status. The figure also displays the proportion of the average CESD-10 score held by each of the CESD-10 factors. We observe that the unemployed (strict) to unemployed

(discouraged) movers relative to the other labour market status movers and stayers. As with the transition from wave 2 to 3, we don't see the stayers having lower scores than the movers across the board. However, as with wave 2 to 3, the employed stayers are still amongst the group who have the lowest average CESD-10 score, where the lowest belongs to the unemployed (discouraged) stayers.

The lowest levels of average somatic symptoms score belong to the unemployed (strict) to unemployed (discouraged) movers. With the highest levels of average somatic symptoms scores are of the unemployed (strict) stayers. The greatest and lowest average positive affect score belongs to the unemployed (strict) stayers and the unemployed (strict) to unemployed (discouraged) movers respectively. Lastly, in regards to the depressed affect, we see the highest average scores belong to the unemployed (discouraged) stayers. Meanwhile, the lowest average depressed scores belong to unemployed (strict) to unemployed (discouraged) movers.

Table 14
Transition Matrix: Change in Mental Health Score (CESD-10) by Labour market Status (Wave 3 to Wave 4)

Labour market Status in Wave 3		Labour market Status in Wave 4				
		Not Economically Active	Unemployed (Discouraged)	Unemployed (Strict)	Employed	Total
Not Economically Active	Mean	0.12	1.22	-0.03	0.38	**0.19**
	N	2723	74	482	867	**4146**
Unemployed (Discouraged)	Mean	-0.78	-0.85	-3.03	1.25	**-0.54**
	N	98	4	48	61	**211**
Unemployed (Strict)	Mean	-0.08	0	-0.76	-0.49	**-0.43**
	N	385	23	311	518	**1237**
Employed	Mean	-0.62	0.8	0.28	-0.37	**-0.34**
	N	568	22	250	2344	**3184**
Total	Mean	**-0.05**	**0.88**	**-0.26**	**-0.21**	**-0.15**
	N	**3774**	**123**	**1091**	**3790**	**8778**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

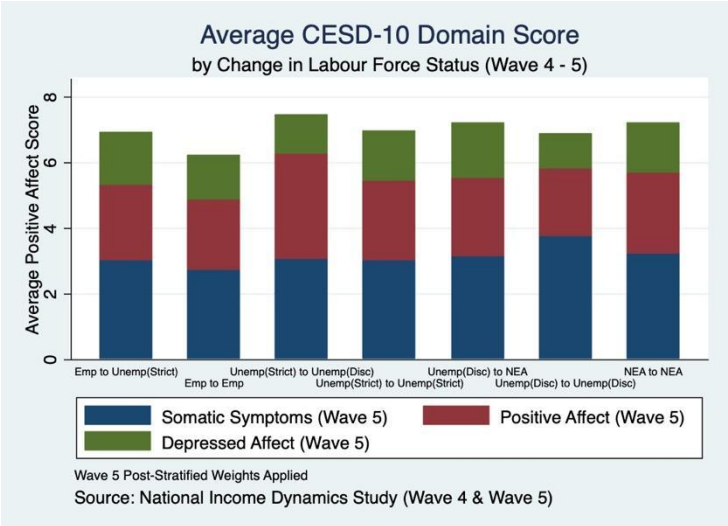
The transition matrix of the change of mental health score (CESD-10) in table 14 is from wave 3 to 4. The greatest positive change in mental health score, from wave 3 to 4, belongs to those who were NEA in wave 3 and moved to being unemployed (discouraged) in wave 4 at 1.22 points and there were 74 individuals who made this move.

Those who had the smallest change CESD-10 score and increased their mental health was -3.03 points among the unemployed discouraged in wave 3 and moved to being unemployed (strict) in wave 4. The unemployed (discouraged) in wave 3 had the largest movements towards being mentally healthy on average, regardless of move in wave 4, relative to all the other labour market statuses in wave 3 with a -0.54 change in score on average. Those who experienced the greatest increase in CESD-10 points, regards of their labour market status change in wave 3 regardless of the labour market status in wave 4 are those were NEA in wave 3 at 0.19 increase in CESD-10 score on average.

While a move to being unemployed (strict) in wave 4, regardless of labour market status in wave 3 gives the greatest reduction at -0.26 CESD-10 score increase on average. Whereas the labour market status move in wave 4 from wave 3 with the greatest change in CESD-10 score and thus greatest move towards becoming more mentally unhealthy on average is the move to being unemployed (discouraged) at 0.88 points.

Figure 11: Average CESD-10 Score by Change in Labour market Status (Wave 4 to 5)

Panel A: Bar Graph of Change in Employment



Lastly, with figure 11, we see a wave-4-to-5 stacked bar graph of average CESD-10 score according to changes in labour market status. It also displays the proportion of the average CESD-10 score held by each of the CESD-10 factors. We can observe the unemployed (strict) to unemployed (discouraged) movers relative to the other labour market status movers and stayers. As with the transition from wave 2 to 3, we don't see the stayers having lower scores than the

movers across the board. However, as with wave 2 to 3, the employed stayers are still amongst the group who have the lowest average CESD-10 score where the lowest belongs to the unemployed (discouraged) stayers.

The lowest levels of the average somatic symptoms score belong to the unemployed (strict) to unemployed (discouraged) movers. The highest levels of average somatic symptoms scores are of the unemployed (strict) stayers. The greatest and lowest average positive affect score belongs to the unemployed (strict) stayers and the unemployed (strict) to unemployed (discouraged) movers respectively. Lastly, in regards to the depressed affect, we see the highest average scores belong to the unemployed (discouraged) stayers. The lowest average depressed scores, meanwhile, belong to the unemployed (strict) to unemployed (discouraged) movers.

Table 15
Transition Matrix: Change in Mental Health Score (CESD-10) by Labour market Status (Wave 4 to Wave 5)

Labour market Status in Wave 4		Labour market Status in Wave 5				
		Not Economically Active	Unemployed (Discouraged)	Unemployed (Strict)	Employed	Total
Not Economically Active	Mean	-0.28	-0.15	0.3	0.13	**-0.12**
	N	2762	46	469	738	**4015**
Unemployed (Discouraged)	Mean	-0.24	-0.94	-2.51	-1.56	**-1.08**
	N	53	7	32	42	**134**
Unemployed (Strict)	Mean	-0.87	-1.6	-0.04	0.22	**-0.21**
	N	441	30	289	481	**1241**
Employed	Mean	-0.57	-0.21	-0.48	0.17	**0.01**
	N	807	21	354	3121	**4303**
Total	Mean	**-0.42**	**-0.56**	**-0.1**	**0.16**	**-0.07**
	N	**4063**	**104**	**1144**	**4382**	**9693**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

In table 15 we examine the transition matrix of the change of mental health score (CESD-10) from wave 4 to 5. The greatest movement towards being mentally unhealthy according to CESD-10 score, from wave 4 to 5, belongs to those who were NEA in wave 4 and moved to into being unemployed (strict) in wave 5 at 0.3 points, and there were 469 individuals who made this move.

Those who had the smallest change to their CESD-10 score and increase in their mental health was -2.51 points unemployed discouraged in wave 4, who moved to being unemployed (strict) in wave 5. The unemployed (discouraged) in wave 4 had the largest movements towards being mentally healthy on average, regardless of move in wave 5, relative to all the other labour market statuses in wave 4 with a -1.08 change in score on average. Those who experienced the greatest increase in CESD-10 points, regardless of their labour market status change in wave 4 or wave 5 are those were employed in wave 4 at 0.01 increase in CESD-10 score on average, which is not that great of a move and represents little change.

A move to being unemployed (discouraged) in wave 5, regardless of labour market status in wave 4 gives the greatest move towards being mentally healthy is at -0.56 CESD-10 score increase on average. The labour market status move in wave 5 from wave 4 with the greatest change in CESD-10 score and thus greatest move towards becoming more mentally unhealthy on average is the move to being employed in wave 5 at 0.16 points.

3.7 Aggregate of Mental Health and Factors

In this section we summarise all of the wave-to-wave transitions into a transition matrix of CESD-10 score by labour market status in t0 and t1. This was done by averaging the CESD-10 score of the first four waves by labour market status for each individual and doing the same for the last four waves. From there, the aggregate transition matrix of CESD-10 score by labour force status could be created. The diagonal elements, which represent no change in labour market status, are small save for a move from being unemployed (discouraged) in t0 to being unemployed (discouraged) in t1 together with being unemployed (strict) in t0 and remaining unemployed (strict) in t1.

Table 16
Transition Matrix: Change in Mental Health (CESD-10) by Labour market Status in t0 and t1

Labour market Status in t0	Labour market Status in t1				Total
	Not Economically Active	Unemployed (Discouraged)	Unemployed (Strict)	Employed	
Not Economically Active	0.2	1.14	0.38	0.05	0.21
Unemployed (Discouraged)	1.32	1.57	0.26	1.07	1.04
Unemployed (Strict)	0.32	1.66	1.16	0.93	0.83
Employed	0.36	0.07	0.62	0.43	0.43
Total	**0.28**	**1.13**	**0.64**	**0.43**	**0.41**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

We see in table 16 that remaining unemployed (discouraged) from t0 to t1 results in an almost 1.5-point increase (1.57) in mental health score, while remaining unemployed (strict) results in a 1.1-point increase in mental health score. The greatest increase in mental health score (1.66) is from t0 to t1 change from unemployed (strict) to unemployed (discouraged).

Table 17
Transition Matrix: Change in Somatic Symptoms by Labour market Status from t0 and t1

Labour market Status in t0	Labour market Status in t1				Total
	Not Economically Active	Unemployed (Discouraged)	Unemployed (Strict)	Employed	
Not Economically Active	0.15	1.04	0.3	0.23	0.21
Unemployed (Discouraged)	0.91	0.49	-0.15	1.18	0.76
Unemployed (Strict)	0.05	1.12	0.68	0.36	0.37
Employed	-0.15	0.03	0.35	0.14	0.11
Total	**0.11**	**0.88**	**0.39**	**0.2**	**0.2**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

In table 17 we see the transition matrix for the change in somatic symptoms by labour for status. The largest possible change in somatic symptoms score is 15 or -15. Unemployed (strict) in t0 to t1 and unemployed (discouraged) in t0 to t1 are the two greatest increases of somatic symptoms of the diagonal elements at 0.68 and 0.49 respectively. Interestingly, the greatest increase of somatic symptom score, at a 1.18-point increase, is from an unemployed (discouraged) t0 move to employed in t1.

Table 18
Transition Matrix: Change in Depressed Affect by Labour market Status from t0 and t1

	Labour market Status in t1				
Labour market Status in t0	**Not Economically Active**	**Unemployed (Discouraged)**	**Unemployed (Strict)**	**Employed**	**Total**
Not Economically Active	0.01	0.41	0.15	0.06	0.05
Unemployed (Discouraged)	0.48	0.78	0.48	0.61	0.53
Unemployed (Strict)	-0.08	0.21	0.44	0.06	0.12
Employed	-0.06	-0.17	0.28	0.13	0.11
Total	**0**	**0.3**	**0.27**	**0.12**	**0.1**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

In regard to depressed affect, we refer to table 18, where the greatest possible change is 9 or -9. Here we see that the greatest increase in depressed affect score from t0 to t1 is among the diagonal elements unemployed (discouraged) to unemployed (discouraged) at 0.78. The lowest change depressed affect score from t0 to t1 is from Employed in t0 to unemployed (discouraged) in t1 at -0.17.

Table 19
Transition Matrix: Change in Positive Affect by Labour market Status from t0 and t1

	Labour market Status in t1				
Labour market Status in t0	**Not Economically Active**	**Unemployed (Discouraged)**	**Unemployed (Strict)**	**Employed**	**Total**
Not Economically Active	0.04	-0.31	-0.09	-0.27	-0.05
Unemployed (Discouraged)	-0.07	0.3	-0.13	-0.75	-0.27
Unemployed (Strict)	0.36	0.33	0.08	0.51	0.35
Employed	0.57	0.21	-0.01	0.16	0.21
Total	**0.17**	**-0.06**	**-0.03**	**0.11**	**0.11**

Notes: The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). The sample in this Table is comprised of all adults who were successfully interviewed during each wave and answered the CES-D. Own calculations using post-stratified weights.

Lastly, when looking at positive affect in table 19, the greatest possible change in score is either -6 or 6, representing the change from maximum possible score to minimum possible score. The greatest change in score observed belongs to the change from unemployed (discouraged) in t0 to employed in t1 at -0.75. The largest increase in somatic symptoms score at 0.57 is due to being employed in t0 to Not Economically Active in t1.

Chapter 4: Econometric Specification

Having profiled mental health changes and labour market changes descriptively, in this chapter we go into modelling the relationship between the CESD-10 by labour market status, including an appropriate set of controls. We do this for each factor too (somatic symptoms, depressed affect and positive affect). We start by anchoring the conditional correlation by running cross-sectional ordered probits on all four of the indicators. We then push further into the impact of a change in labour market status on the change in mental health by estimating fixed effects logits and fixed effect OLS models using the first five waves of the NIDS panel data set.

4.1 What Econometric Literature has to Offer

In formulating my estimations, I draw on the literature modelling the relationship between labour market status and life satisfaction. Winklelmann and Winkelmann (1998) examined the importance of non-pecuniary costs of unemployment using longitudinal data on life satisfaction of working age men in Germany. In light of the fixed effect ordered probit and fixed effects logit models giving inconsistent results, they dichotomised the life satisfaction variable into satisfied and dissatisfied and estimated a fixed effects conditional logit model.

However, the conditional logit model has a limitation restricting of samples to observations where there is a change in status which leads to losses in data and variation (Ferrer-i-Carbonell & Frijters, 2004; Kassenboehmer & Haisken-DeNew, 2009). An efficient estimator for the fixed effects ordered logit model was developed by Das and van Soest (1999). In response to this, Ferrer-i-Carbonell and Frijters (2004) suggested a model where an individual's threshold for being satisfied or unsatisfied is evaluated at the individual level, which is referred to as the FF estimator. This allowed for the reduction of variance of the estimator. However, Baetchmann, Staub and Winkelmann (2015) showed that the FF estimator, and approaches of the like, are inconsistent.

4.2 Model Selection

A CESD-10 score is measured on an ordinal scale making ordered logit and probit models appropriate econometrics techniques (Greene, 1993 cited in Winkelmann & Winkelmann, 1998). At the time of Greene's research there was no ready formulation of a model for the fixed-effects

case. What was done in response was they proposed the collapsing of the ordinal variable, in this case the CESD-10 variable, into a binary variable (no depressive symptoms/depressed symptoms).

While collapsing of the CESD-10 variable limits the use of information, it does allow for the use of the relatively a well-developed class of limited dependent variable panel models that were reviewed above. Moreover, it was shown in Crouchley (1995 cited in Winkelmann & Winkelmann, 1998) that the resulting binary logit estimator is consistent that does not depend on the break point of no depressive/depressive symptoms.

Clark (2003) uses a similar approach, but looking at mental health instead of life satisfaction using panel data. Instead, the 13-point GHQ score was dichotomized into a dummy variable for having the highest score, for conditional fixed effects logit estimation. For the purposes of this thesis, the CESD-10 variable will instead be dichotomized as 'No Depressive Symptoms' and 'Depressive Symptoms'. We effectively cut the measure into one third and two thirds, with a cut-off of 10 being used. Similarly, the factor variables somatic symptoms, depressed affect and positive affect will instead be dichotomized as 'No Somatic Symptom Disorder' and 'Somatic Symptom Disorder', 'No Depressed Affect Disorder' and 'Depressed Affect Disorder' and 'No Positive Affect Disorder" and 'Positive Affect Disorder' respectively. Which are cut into one third and two thirds with a cut-off of 6, 4 and 2 respectively being used. Using this we re-estimate, the initial ordered probit as a conventional binary logit for cross-sectional analysis on all five waves of NIDS.

Together with dichotomizing the independent variable of choice, Clark and Winkelmann & Winkelmann used fixed-effects models. Fixed-effects techniques involve repeated observations on the same individual (using panel data), which allow controls for unobserved individual heterogeneity in the normal way (Clark, 2003). For this paper, fixed-effects probit/logit models will be used as per Clark as well as Winkelmann and Winkelmann. As repeated observations of the same subject enables us to control for unobserved individual heterogeneity. A descriptive statistic that represents what is being modelled here is Table 16's transition matrix of CESD-10 score by labour market status. Dichotomized dependent variables, in ordered probit models, will be used. Given concerns over the influence of the specific, 10-point cut-off, this will be augmented with a fixed effects logit estimation on the full CESD-10 score

4.3 Dependent and Explanatory Variables

Due to a lack of literature on the factors of the CESD-10 and appropriate cut-off scores, this paper will use the medians of each. As shown in tables 8 to 10, the median scores for Somatic Symptoms, Depressed Affect and Positive Affect are 6, 4, and 2 respectively. A sensitivity analysis on the CESD-10 cut-off was performed and results can be found in appendix 10.

In all of the modelling work, the dependent variables used in this section are as follows:

Table 20: Description of Dependent Variables used in the Modelling Work

Variable Name	Description	NIDS Variable Name
CESD-10	Explained in Table 5 under Section 3.3	w_cesd10
Somatic Symptoms	Explained in Table 5 under Section 3.3	w_somatic
Depressed Affect	Explained in Table 5 under Section 3.3	w_depress
Positive Affect	Explained in Table 5 under Section 3.3	w_positive
CESD-10 Dummy with 8 Point Cut-Off	A dummy variable created from the CESD-10 variable where it was dichotomized by scores below 8 and scores above and including 8 for sensitivity test purposes.	w_dep_dummy8
CESD-10 Dummy with 10 Point Cut-Off	A dummy variable created from the CESD-10 variable where it was dichotomized by scores below 10 and scores above and including 10 for sensitivity test purposes.	w_dep_dummy10
CESD-10 Dummy with 12 Point Cut-Off	A dummy variable created from the CESD-10 variable where it was dichotomized by scores below 12 and scores above and including 12 for sensitivity test purposes.	w_dep_dummy12
Somatic Symptoms Dummy	A dummy variable created from the Somatic Symptoms variable where it was dichotomized by scores below 6, the median score, for high score/low score comparisons similar to the CESD-10 dummies.	w_somatic_dummy
Depressed Affect Dummy	A dummy variable created from the Depressed Affect variable where it was dichotomized by scores below 4, the median score, for high score/low score comparisons similar to the CESD-10 dummies.	w_depress_dummy
Positive Affect Dummy	A dummy variable created from the Positive Affect variable where it was dichotomized by scores below 2, the median score, for high score/low score comparisons similar to the CESD-10 dummies.	w_positive_dummy

The independent variables used in this paper are as follows:

Table 21: Summary Description of Independent Variables

Variable Name	Description	NIDS Variable Name
Employment	The age of the participant is measured in years.	w_employ
Age	A variable which is the w_age variable squared.	w_age
Age^2	The number of years a participant has spent in education calculated from the normal number of years it would take to complete a stage of education and how many of these stages one has completed. This does not take into account how long it took a participant to complete a particular stage thus ignoring the events where it took one longer or shorter than normal to complete a stage.	w_age2
Years in Education	A variable specifying the type of geographic area a participant resides in e.g urban or rural.	w_edyrs
Domicile	A variable capturing the number waves in the data.	w_domicile
Wave	The age of the participant is measured in years.	w_wave

4.4 Econometric Analysis – Mental Health (CESD-10)

In this section we go into modelling the relationship between the CESD-10 by labour market status. Relevant Hausman tests can be found in the appendices (appendix 11 – 14) which indicate that fixed effects modelling as more suitable.

4.4.1 Predicting Change in the CESD-10 Score, Cross-Sectional and Fixed Effects Estimations

Table 22 is an ordered probit of the full 30-point CESD-10, with waves 1 to 5 pooled into a cross-section. Cut points have been estimated but omitted from this table. The full table can be found in appendix 5. All of the predictors are statistically significant save for unemployed (discouraged) in model 3.

Table 22: Ordered Probit on Full CESD-10

VARIABLES	(1) Model 1: Simple Specification	(2) Model 2: Some Controls	(3) Model 3: Broad Specification
Labour market Status (Base: Employed)			
Not Economically Active	0.221***	0.172***	0.178***
	(0.0125)	(0.0139)	(0.0140)
Unemployed (Discouraged)	0.127***	0.0867***	0.0363
	(0.0325)	(0.0328)	(0.0330)
Unemployed (Strict)	0.0983***	0.124***	0.127***
	(0.0190)	(0.0194)	(0.0194)
Age		0.0172***	0.0213***
		(0.00186)	(0.00187)
Age		-0.000187***	-0.000215***
		(2.00e-05)	(2.00e-05)
Years in Education		-0.0300***	-0.0260***
		(0.00169)	(0.00171)
Domicile			
Not Urban (Traditional or Farm)		0.0787***	0.0787***
		(0.0121)	(0.0121)
Wave (Base: Wave 1)			
Wave 2			-0.258***
			(0.0184)
Wave 3			-0.271***
			(0.0184)
Wave 4			-0.312***
			(0.0186)
Wave 5			-0.287***
			(0.0189)
Observations	30,578	30,502	30,502

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10 with a cut-off of 10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

For the labour market status predictor, we observe that being not economically active increases the probability of scoring one point higher on the CESD-10, when compared to being employed, by 0.221 for model 1, by 0.172 for model 2 and 0.178 for model 3 ceteris paribus. Meanwhile, being discouraged unemployed relative to employed increases the probability of scoring a CESD-10 point higher by 0.127 in model 1 and 0.0867 in model 2. Being unemployed strict, relative to being employed, increases the probability of scoring a CESD-10 point higher by 0.0983 in model 1, 0.124 in model 2 and 0.127 in model 3.

With age, model 2 and 3 show that, with each year increase in age, CESD-10 score increases the probability of scoring one CESD-10 point higher by 0.0172 and 0.0213 respectively ceteris paribus. This continues until $-\frac{0.0172}{2(-0.000187)} = 45.989$ for model 1 and $-\frac{0.0213}{2(-0.000215)} = 49.535$ for model 2. This means that model 2 predicts people below age 45 experience a 0.0172 increase

in the probability of scoring one CESD-10 point higher as they age while those above 45 experience a decrease in the probability of increasing CESD-10 score by a single point as they age ceteris paribus. Model 3, meanwhile, predicts people below age 49 experience a 0.0213 increase in the probability of scoring one CESD-10 point higher as they age while those above 49 experience a decrease in the probability of increasing CESD-10 score by a single point ceteris paribus.

Each year one spends in education where one either obtains a new qualification or successfully progresses to the next year decreases the probability of increasing CESD-10 score by a single point by 0.03 in model 2 and 0.026 in model 3 ceteris paribus. Not living in an urban domicile increases the probability of scoring one CESD-10 point higher relative to those living in an urban domicile. The wave predictor shows us that those in waves 2, 3, 4, 5 have a lower probability of increasing CESD-10 score by 1 by 0.258, 0.271, 0.312, 0.287 lower respectively relative to those in wave 1.

We will now move to the fixed effects models now to get a clearer idea of the factors driving changes in CESD-10 score and its factors, regression models predicting change in the CESD-10 score and its factors were run across all 5 waves of the NIDS data. The models considered labour market status, age, years in education, domicile and wave.

Table 23: Ordinary Least Squares Fixed Effects on Full CESD-10

VARIABLES	(1) Model 1: Simple Specification	(2) Model 2: Some Controls	(3) Model 3: Broad Specification
Labour market Status (Base: Employed)			
Not Economically Active	0.352***	0.340***	0.436***
	(0.0712)	(0.0738)	(0.0741)
Unemployed (Discouraged)	0.222	-0.114	-0.0853
	(0.148)	(0.150)	(0.150)
Unemployed (Strict)	0.214**	0.127	0.171*
	(0.0919)	(0.0921)	(0.0919)
Age		-0.0739***	-0.164**
		(0.0210)	(0.0721)
Age^2		-0.000614***	-0.000914***
		(0.000225)	(0.000225)
Years in Education		0.0345	0.0356
		(0.0319)	(0.0318)
Domicile (Base: Urban)			
Not Urban (Traditional or Farm)		-0.271*	-0.285*
		(0.150)	(0.149)
Wave (Base: Wave 1)			
Wave 2			-0.542***
			(0.181)
Wave 3			-0.173
			(0.302)
Wave 4			0.228
			(0.476)
Wave 5			0.925
			(0.632)
Constant	7.010***	11.31***	15.61***
	(0.0456)	(0.506)	(2.663)
Observations	30,578	30,502	30,502
R-squared	0.001	0.014	0.022
Number of pid	6,139	6,138	6,138

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

First, we have an OLS Fixed Effects Model on the full CESD-10 in table 23. Model 1 is a specification controlling only for labour market status. Model 2 controls for age as well, and model 3 controls for years in education, domicile and wave too. In regards to labour market status, one can expect that an employed-to-NEA move will have a positive and significant coefficient. The greatest increase in model 3 at a 0.436 point increase in score as such a transition is made. This is interesting since this increase occurs as controls are added.

Those who moved from employed to unemployed (strict) have greater expected CESD-10 scores than those who remained employed. This is significant in models 1 and 3, with the greatest

significant predictor for model 1 at a 0.214 greater CESD-10 on average score due to an employed to unemployed (strict) ceteris paribus.

Turning to the controls, with age, model 2 and 3 show that with each year's increase in age, CESD-10 score decreases by 0.0739 and 0.164 points respectively. This continues until the turning points $-\frac{-0.0739}{2(-0.000614)} = -60.18$ for model 1 and $-\frac{-0.164}{2(-0.001228)} = -89$ for model 2. Model 2 predicts people below age 60 will experience a decrease in CESD-10 score as they age, while those above 60 experience a decreasing decrease in CESD-10 score as they age ceteris paribus. Model 3, meanwhile predicts below age 89 experience a decrease in in CESD-10 score as they age and those above 89 experience decreasing decrease in CESD-10 score and they age.

The predictor Years in Education is not significant in any of the three models. This is because there are relatively few individuals who change their education status in the sample across waves. The urban domicile is significant and negative for both of the models it is included in. This suggests that those who lived in an urban domicile, then moved to a non-urban domicile, have lower expected CESD-10 scores by -0.271 and 0.285 ceteris paribus, in models 2 and 3 respectively. The wave predictor is only significant for wave 2. This predictor suggests the CESD-10 scores in wave 2 are lower than those in wave 1 by 0.542 on average ceteris paribus.

4.4.2 Sub-Group Analysis of Mental Health by Gender, Population Group and Combined

Below in table 24 are the coefficients of a fixed effects logit on the CESD-10 dummy. Each of these six models have been subsampled according to gender and population group, with the combined sample included for reference.

Table 24: Fixed Effects Logit on Depression (CESD-10) Dummy by Gender, Population Group & Combined

VARIABLES	(1) Model 1: Combined	(2) Model 2: Male	(3) Model 3: Female	(4) Model 4: Black	(5) Model 5: Coloured	(6) Model 6: White
Labour market Status (Base: Employed)						
Not Economically Active	0.171***	0.275***	0.134**	0.189***	-0.0455	0.300
	(0.0445)	(0.0844)	(0.0527)	(0.0471)	(0.151)	(0.483)
Unemployed (Discouraged)	-0.190**	-0.217	-0.198*	-0.223**	0.0915	-13.95
	(0.0919)	(0.192)	(0.105)	(0.0984)	(0.265)	(1,014)
Unemployed (Strict)	0.109*	0.186*	0.0714	0.0980*	0.316	-14.60
	(0.0558)	(0.0978)	(0.0680)	(0.0583)	(0.204)	(923.8)
Age	-0.0973**	-0.00736	-0.134***	-0.1000**	-0.169	0.332
	(0.0430)	(0.0849)	(0.0502)	(0.0456)	(0.153)	(0.462)
Age^2	-0.000300**	-0.000689***	-0.000121	-0.000357**	-0.000367	0.00171
	(0.000134)	(0.000262)	(0.000157)	(0.000142)	(0.000464)	(0.00154)
Years in Education	0.0195	0.0259	0.0146	0.0165	0.0544	0.0784
	(0.0190)	(0.0327)	(0.0236)	(0.0200)	(0.0701)	(0.203)
Domicile						
Not Urban (Traditional or Farm)	-0.179*	-0.118	-0.213*	-0.211**	0.0956	-13.54
	(0.0930)	(0.148)	(0.120)	(0.0961)	(0.415)	(1,572)
Wave (Base: Wave 1)						
Wave 2	-0.285***	-0.442**	-0.228*	-0.260**	-0.285	-1.462
	(0.108)	(0.214)	(0.125)	(0.114)	(0.383)	(1.019)
Wave 3	0.0102	-0.214	0.0904	0.0307	0.455	-2.943
	(0.179)	(0.357)	(0.209)	(0.190)	(0.640)	(1.790)
Wave 4	0.182	-0.100	0.279	0.167	1.072	-3.034
	(0.283)	(0.566)	(0.329)	(0.299)	(1.039)	(2.799)
Wave 5	0.575	0.127	0.732*	0.634	1.219	-4.691
	(0.376)	(0.752)	(0.437)	(0.397)	(1.367)	(3.747)
Observations	22,268	6,444	15,824	19,725	2,149	280
Number of pid	4,475	1,296	3,179	3,962	434	56

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

Firstly, we see that the Coloured and White models do not contain any statistically significant predictors. Besides those two models, we see, in regards to the labour market status predictor, that the NEA coefficients for Male, Female, Black and combined models are significant and positive. It is clear that the effect of depressive symptoms being observed is increased for Males, Females, Black Africans and everyone on average ceteris paribus. This effect is most strongly seen in males and is greater than the effect seen for everyone on average, telling us that it is countered by the lower than average effect seen in females.

Next we see the significant coefficients for the unemployed (discouraged) predictor in the Female, Black African and Combined models (-0.198, -0.223 and -0.19). Thus, a move from employed to unemployed (discouraged) is estimated to lower observations of depressive symptoms in Females and Black Africans, and as a result across all on average ceteris paribus. This effect is most strongly observed in black people, which is decently lower than that seen for all on average, suggesting a countering effect to be exhibited by the other population groups. The effect on females is very close to the effect seen on both Males and Females.

Thus, while the effect in males may counter that of females, it is not too far removed from its score. However, it should be noted that very few individuals have made an employed-to-unemployed (discouraged) transition, which explains the negative sign.

The coefficients for a move from employed to unemployed (strict) are significant in the Male (0.186), Black African (0.098) and Combined (0.109) models. This indicates that one can expect to see an increase of Males, Black Africans with depressive symptoms being observed for this labour market status change ceteris paribus. The effect is strongest amongst Males, a group which contains Black Africans, and is greater than the effect in the Combined model, suggesting it is countered by the effect observed in Males. The effect observed in Black Africans is lower than the effect in the combined model, indicating that it is pulling down the average effect in the other population groups.

With the age predictor we see significant coefficients of -0.134 for Females, -0.1 for Black Africans and -0.0973 for the entire sample. We see that the effect for Females and Black Africans are greater than that seen in Combined sample. Meaning that there should be some countering effects in the Male sample for the Females and in the other population groups for Black Africans. For Females, we expect to see a reduction of individuals with depressive symptoms ceteris paribus. We expect to see the same effect, to a lesser degree, for Black Africans, and even lower so for all on average ceteris paribus.

The Domicile predictor contains significant coefficients for an urban-to-non-urban move for Females at -0.213, Black Africans at -0.211 and -0.179 for the Combined dataset. Therefore, for a move from an urban domicile to a non-urban one move we expect to observe less depressive symptoms in Females, Black Africans and for all on average ceteris paribus. This effect is strongest in Females from all population groups, and is stronger than the effect in the Combined model,

suggesting males have an effect closer to zero. The effect seen in Black Africans is also stronger than that seen in the Combined model, indicating the other population groups have an effect closer to zero on average.

Lastly, the wave predictor contains significant wave 2 coefficients in the Male (-0.442), Female (-0.228), Black (-0.260) and Combined (-0.285) models. Thus, we can expect to observe fewer wave 2 depressive symptom classifications, relative to wave 1 classifications, for Males, Females, Black Africans and for all on average. The strongest effect is seen amongst Males at -0.442. This effect is greater than the one seen in the Combined model because it is countered by Female coefficient at -0.228. The effect on Black Africans is lower than the effect in the Combined model, suggesting it is countering the effect in the other population groups on average.

4.5 Mental Health Factors (Somatic Symptoms, Depressed Affect and Positive Affect)

The tables below present ordered probit econometric model on the three CESD-10 Factors. Each of the models control for labour market status, age, years in education, domicile and wave. The models differ in terms of dependent variable, which are somatic symptoms, depressed affect and positive affect.

4.5.1 Cross-Sectional Analysis of Mental Health Factors

Table 25 below is an ordered probit of the CESD-10 factors (somatic symptoms, depressed affect and positive affect). Cut points were estimated but omitted in this table. Full output can be found in the appendix 6. All of the labour market predictors are statistically significant save for unemployed (discouraged) in the somatic symptoms model.

Table 25 – Ordered Probit on CESD-10 Factors (Somatic Symptoms, Depressed Affect & Positive Affect)

VARIABLES	(1) Model 1: CESD-10	(2) Model 2: Somatic Symptoms	(3) Model 3: Depressed Affect	(4) Model 4: Positive Affect
Labour market Status (Base: Employed)				
Not Economically Active	0.178***	0.118***	0.114***	0.125***
	(0.0140)	(0.0143)	(0.0148)	(0.0144)
Unemployed (Discouraged)	0.0363	-0.0217	-0.0775**	0.144***
	(0.0330)	(0.0341)	(0.0352)	(0.0341)
Unemployed (Strict)	0.127***	0.0880***	0.141***	0.0334*
	(0.0194)	(0.0198)	(0.0204)	(0.0200)
Age	0.0213***	0.0219***	0.0187***	0.00535***
	(0.00187)	(0.00192)	(0.00199)	(0.00193)
Age^2	-0.000215***	-0.000212***	-0.000197***	-5.68e-05***
	(2.00e-05)	(2.05e-05)	(2.12e-05)	(2.06e-05)
Years in Education	-0.0260***	-0.0178***	-0.0169***	-0.0199***
	(0.00171)	(0.00174)	(0.00180)	(0.00176)
Domicile (Base: Urban)				
Not Urban (Traditional or Farm)	0.0787***	0.0166	-0.000280	0.152***
	(0.0121)	(0.0124)	(0.0127)	(0.0125)
Wave (Base: Wave 1)				
Wave 2	-0.258***	-0.381***	-0.258***	0.107***
	(0.0184)	(0.0190)	(0.0194)	(0.0189)
Wave 3	-0.271***	-0.210***	-0.134***	-0.166***
	(0.0184)	(0.0189)	(0.0193)	(0.0190)
Wave 4	-0.312***	-0.202***	-0.145***	-0.242***
	(0.0186)	(0.0190)	(0.0195)	(0.0192)
Wave 5	-0.287***	-0.118***	-0.203***	-0.237***
	(0.0189)	(0.0192)	(0.0198)	(0.0194)
Observations	30,502	30,492	30,502	30,502

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

The expected value of the NEA predictor is 0.118, 0.114 and 0.125 for somatic symptoms, depressed affect and positive affect respectively. The expected values of the unemployed (discouraged) predictor are -0.0775 for depressed affect and 0.144 for positive affect, which have different signs suggesting they behave differently from each other. Lastly, the expected values for the unemployed (strict) predictor are 0.088 for somatic symptoms, 0.141 depressed affect and 0.0334 for positive affect. It should be noted that the effect on depressed affect is greater than the effect on the full CESD-10 itself.

For somatic symptoms, being not economically active (NEA) increases the expected value of the probability of scoring one point higher for somatic symptoms, relative to being employed, by 0.118

on average ceteris paribus. The expected value of the change in probability of scoring a point higher in depressed affect is a 0.114 average increase in the probability compared to being employed ceteris paribus. With positive affect, being not economically active compared to being employed increases the expected value of the probability of scoring one point higher for somatic symptoms by an average of 0.125 ceteris paribus.

Being discouraged unemployed, meanwhile, decreases the probability of scoring a depressed affect point higher by 0.0775 on average relative to being employed ceteris paribus. Meanwhile, the change in probability of scoring a point higher in positive affect is a 0.144 increase in the probability on average ceteris paribus from being unemployed (discouraged) relative to being employed.

While the expected change in the probability of increasing somatic symptoms score one point higher due being unemployed (strict) compared with being employed, being employed increases the probability by 0.088. The expected change in the probability of having an increased depressed affect score by one point is a 0.141 average increase in that probability ceteris paribus. For positive affect, the expected average change in the probability of having a positive affect score higher by a single point is a 0.0334 increase of the probability ceteris paribus.

In summation, we see that those who are NEA are suffering to a greater extent from positive affect than in the other two factors relative to the employed. Those who are unemployed (discouraged) also experience the strongest detrimental effect to be in positive affect relative to the employed, but experience lower depressed affect scores relative to the employed. Those who are unemployed (strict), meanwhile, experience greater depressed affect scores out of the three factors when compared to the employed.

As we move onto the controls, we see that the age predictors across the three models of the CESD-10 factors are significant and positive. The expected values for the age predictors for somatic symptoms, depressed affect and positive affect models show that with each year, there is a growing probability of the CESD-10 factor score increasing. The average change in the expected value of the probability of scoring one point higher from getting older is by 0.0219 for somatic symptoms, 0.0187 for depressed affect and 0.00535 for positive affect ceteris paribus. This continues until

turning points $-\frac{0.0219}{2(-0.000212)} = 51.651$ for somatic symptoms, $-\frac{0.0187}{2(-0.000197)} = 47.462$ for depressed affect and $-\frac{0.00535}{2(-0.0000568)} = 47.095$ for positive affect.

This means that the somatic symptoms model predicts people below age 52 experience a 0.0187 average increase in the probability of scoring one somatic symptoms point higher as they age while those above 51 experience a decrease in the probability of increasing somatic symptoms score by a single point as they age ceteris paribus. The depressed affect model predicts that people below age 47 will experience a 0.0213 average increase in the probability of scoring one depressed affect point higher as they age, while those above 49 experience a decrease in the probability of increasing depressed affect score by a single point ceteris paribus. The positive affect model, meanwhile, predicts individuals below the age of 47 can expect a 0.00535 average increase in the probability of scoring higher positive affect scores by one, and that those below 47 can expect to experience a decrease.

The Years in Education predictor is significant and negative for all three models. The expected value of the decrease in probability of scoring a higher somatic symptoms result by 1 from increasing the years one spends in study to progress one's attained qualification is a 0.0178 decrease in the probability on average ceteris paribus. The average expected value of the decrease in the probability of scoring one point higher in depressed affect from increasing years of study to attain the next qualification is 0.0169 ceteris paribus. Meanwhile, the expected value of the average decrease in the probability of getting a one point higher positive affect score from increasing one's education and thereby increasing years of study is 0.0199 ceteris paribus.

In terms of domicile, we see that only positive affect has a significant predictor, which is also positive. What this tells us about the expected value of the change in probability is living in a non-urban domicile increases the probability of scoring a one point higher positive affect score than one would have if they had remained in the urban domicile. For the wave predictor we see that all of them are significant across all three of the models. They are also all negative save for wave 2 positive affect predictor.

The wave predictor tells us that on average, we can expect those who had their somatic symptom scores recorded in waves 1, 2, 3, 4 and 5 to have the probability of having the scores increase them by 1 relative to their wave 1 score. The decrease in probability is by 0.381 for wave 2, by 0.21 for

wave 3, by 0.202 for wave 4, and by 0.118 for wave 5, relative to their somatic symptom score recorded in wave 1.

For those who had their depressed affect scores recorded in wave 1, 2, 3, 4 and 5, the change in probability of these scores being greater by one than their wave 1 score is a probability change of -0.258 for wave 2, -0.134 for wave 3, -0.145 for wave 4 and -0.203 for wave 5. The average predicted change of probability of a single point increase in positive affect score recorded in waves 2, 3, 4, 5 relative to the probability of a single point increase of score recorded in wave 1 is slightly different for positive affect.

Wave 2 shows a 0.107 average increase in probability of a one point increase in positive affect ceteris paribus relative to the wave 1 probability. Wave 3 shows a 0.166 average decrease in probability of a one point increase of the wave 1 probability of a one point increase of positive affect score. Waves 4 and 5 show a 0.242 and 0.237 average decrease in the probability of a one-point increase in positive affect relative to the wave 1 probability of the same increase ceteris paribus.

4.6 Fixed Effect Analysis of Mental Health Factors (Somatic Symptoms, Depressed Affect & Positive Affect)

In this sub-chapter we move onto to fixed effect logit and fixed effect OLS analysis of the CESD-10 factor for the purpose of investigating the individual effects of changes labour market status. The fixed effect logit models on the factors are dummies, where for somatic symptoms dummy 0 is low somatic symptoms and 1 is high somatic symptoms. For depressed affect, 0 is low depressed affect and 1 is high depressed affect. For positive affect, meanwhile, 0 is low positive affect and 1 is high positive affect. This was explained in table 20 under section 4.3.1.

4.6.1 Factor Sub-Group Analysis

We now estimate each CESD-10 factor by sub-group to consolidate the discussion of how they differ from each other in their relationship as a response to change in labour market status.

Table 26 – Fixed Effects Ordinary Least Squares on CESD-10 Factors (Somatic Symptoms, Depressed Affect & Positive Affect)

VARIABLES	(1) Model 1: CESD-10	(2) Model 2: Somatic Symptoms (FE)	(3) Model 3: Depressed Affect (FE)	(4) Model 4: Positive Affect (FE)
Labour market Status (Base: Employed)				
Not Economically Active	0.436***	0.00855	0.0143**	0.0320***
	(0.0741)	(0.00657)	(0.00658)	(0.00847)
Unemployed (Discouraged)	-0.0853	-0.00502	-0.0212	0.0182
	(0.150)	(0.0133)	(0.0133)	(0.0171)
Unemployed (Strict)	0.171*	0.00396	0.0136*	-0.00691
	(0.0919)	(0.00815)	(0.00816)	(0.0105)
Age	-0.164**	-0.00896	-0.00381	-0.0264***
	(0.0721)	(0.00639)	(0.00640)	(0.00824)
Age^2	-0.000914***	-6.74e-05***	-4.15e-05**	1.95e-06
	(0.000225)	(2.00e-05)	(2.00e-05)	(2.58e-05)
Years in Education	0.0356	-0.00194	0.00349	-0.000674
	(0.0318)	(0.00282)	(0.00282)	(0.00364)
Domicile (Base: Urban)				
Not Urban (Traditional or Farm)	-0.285*	-0.0283**	-0.0300**	0.0239
	(0.149)	(0.0132)	(0.0132)	(0.0170)
Wave (Base: Wave 1)				
Wave 2	-0.542***	-0.0458***	-0.0268*	0.0733***
	(0.181)	(0.0161)	(0.0161)	(0.0207)
Wave 3	-0.173	-0.0267	-0.0170	0.0350
	(0.302)	(0.0268)	(0.0269)	(0.0346)
Wave 4	0.228	0.00367	-0.00654	0.0463
	(0.476)	(0.0422)	(0.0423)	(0.0545)
Wave 5	0.925	0.0564	0.000364	0.138*
	(0.632)	(0.0561)	(0.0561)	(0.0723)
Constant	15.61***	0.702***	0.384	1.721***
	(2.663)	(0.236)	(0.237)	(0.305)
Observations	30,502	30,502	30,502	30,502
R-squared	0.022	0.013	0.005	0.022
Number of pid	6,138	6,138	6,138	6,138

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

In table 26, the expected values for the labour market status of individuals who were employed and then became NEA experiences a 0.0143 increase in somatic symptom score ceteris paribus. In regards to model 3, the increase in positive affect score from an employed to then being NEA move is 0.0320 ceteris paribus.

While somatic symptoms and positive affect move in the same direction, the magnitude by which this effect is exhibited is greater in positive affect that somatic symptoms. The expected score from

an employed to unemployed (strict) move is only significant for model 2 depressed affect. The predictor is expected to be a 0.0136 increase in depressed affect score.

Age is not significant for any model. Likewise, is the predictor for Years in Education is not significant in any of the three models. Domicile is significant and negative for somatic symptoms and depressed affect, suggesting those who move from urban to non-urban domiciles experience decreased somatic symptom and depressed affect scores by -0.0283 and 0.03 respectively ceteris paribus. The wave predictor is only significant for wave 2 for all the factors.

The expected value of the predictor for somatic symptoms in wave 2 is -0.0458 tells that, on average, one's somatic symptoms score in wave 2 is expected to be 0.0458 lower than their score in wave 1 ceteris paribus. Depressed affect's expected value for its wave 2 predictor is -0.0268. Thus we expect, on average, that a wave 1 to wave 2 will decreases one's depressed symptoms by 0.0268 ceteris paribus. Lastly, the expected value of the predictor for positive affect behaves differently to the other two factors in that it has the opposite sign. The central finding from these estimations is that positive affect moves differently from somatic symptoms and depressed affect, and, by extension, differently from the CESD-10. For positive affect, the expected value of the wave 2 predictor is 0.0733 suggesting on average, one's positive affect score in wave 2 is expected to be 0.0733 higher than their score in wave 1 ceteris paribus.

Table 27 – Somatic Symptoms Fixed Effects Logit

VARIABLES	(1) Model 1: Combined	(2) Model 2: Male	(3) Model 3: Female	(4) Model 4: Black	(5) Model 5: Coloured	(6) Model 6: White
Labour market Status (Base: Employed)						
Not Economically Active	0.0816	0.195*	0.0361	0.106*	-0.260	0.302
	(0.0542)	(0.104)	(0.0639)	(0.0573)	(0.188)	(0.591)
Unemployed (Discouraged)	-0.0589	-0.230	-0.0273	-0.0431	-0.236	-14.38
	(0.112)	(0.240)	(0.128)	(0.119)	(0.342)	(2,336)
Unemployed (Strict)	0.0253	0.176	-0.0448	0.0199	0.131	-17.37
	(0.0696)	(0.122)	(0.0848)	(0.0725)	(0.267)	(3,061)
Age	-0.0819	0.0721	-0.130**	-0.0569	-0.224	-0.864*
	(0.0507)	(0.104)	(0.0598)	(0.0532)	(0.185)	(0.520)
Age^2	-0.000340**	-0.000379	-0.000301	-0.000411**	-0.000230	0.000924
	(0.000160)	(0.000313)	(0.000188)	(0.000170)	(0.000549)	(0.00176)
Years in Education	-0.0201	-0.0155	-0.0220	-0.0196	-0.0538	0.149
	(0.0236)	(0.0384)	(0.0301)	(0.0247)	(0.0899)	(0.214)
Domicile						
Not Urban (Traditional or Farm)	-0.240**	-0.285	-0.224	-0.273**	0.00672	
	(0.112)	(0.187)	(0.141)	(0.115)	(0.578)	
Wave (Base: Wave 1)						
Wave 2	-0.331***	-0.656**	-0.238	-0.357***	-0.232	0.564
	(0.126)	(0.261)	(0.148)	(0.133)	(0.464)	(1.231)
Wave 3	-0.193	-0.807*	-0.0114	-0.301	0.651	2.308
	(0.210)	(0.438)	(0.247)	(0.220)	(0.780)	(2.067)
Wave 4	0.0240	-0.905	0.294	-0.177	1.214	5.809*
	(0.331)	(0.691)	(0.389)	(0.346)	(1.259)	(3.256)
Wave 5	0.448	-0.842	0.829	0.291	1.481	6.027
	(0.439)	(0.919)	(0.517)	(0.459)	(1.657)	(4.330)
Observations	15,981	4,628	11,353	14,123	1,533	215
Number of pid	3,211	931	2,280	2,836	310	43

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

Above in table 27 are the coefficients of a fixed effects logit on the somatic symptoms dummy, where 0 is being classified as having no somatic symptom disorder and 1 is being classified as having a somatic symptoms disorder (SSD) with a cut point of 6. This table contains subsets of gender and racial groups, along with the combined dataset. When looking at labour market status, the NEA predictor is only significant for the male and Black African models, and the predictors is positive. Therefore, as from the result of an employed-to-NEA move we expect the observations of SSD classifications to increase for both Male and Black African models. This effect is greater in the Male model.

The age predictor is significant for the Female and White models. Both of these coefficients are negative, which indicates that as white and female individuals age by year the expected

observations of SSD classifications decreases, with the effect being greater in the White model. The domicile predictor is significant and negative for Black African and Combined models indicating that moving from an urban to a non-urban domicile reduces observations of SSD classifications. This effect is greater in the Black African model than in the combined model.

The wave predictor is significant and negative for wave 2 in the Male, Black African and combined models. We therefore we expect to observe more SSD classifications from a wave 1 to wave 2 move to be lower in the Male, Black African and Combined models. The wave predictor is significant and positive for wave 4 in the White model. This suggests that we expect an increase in observing a SSD classifications in wave 4 relative to wave 1.

Table 28 – Depressed Affect Fixed Effects Logit

VARIABLES	(1) Model 1: Combined	(2) Model 2: Male	(3) Model 3: Female	(4) Model 4: Black	(5) Model 5: Coloured	(6) Model 6: White
Labour market Status (Base: Employed)						
Not Economically Active	0.123**	0.342***	0.0509	0.164***	-0.337*	0.105
	(0.0544)	(0.105)	(0.0641)	(0.0578)	(0.182)	(0.600)
Unemployed (Discouraged)	-0.185	-0.198	-0.205	-0.138	-0.497	-15.37
	(0.115)	(0.249)	(0.130)	(0.122)	(0.361)	(2,838)
Unemployed (Strict)	0.111*	0.159	0.0884	0.141**	-0.107	-15.85
	(0.0672)	(0.122)	(0.0808)	(0.0704)	(0.244)	(2,977)
Age	-0.0428	0.179*	-0.112*	-0.0718	0.113	0.454
	(0.0502)	(0.106)	(0.0577)	(0.0534)	(0.187)	(0.518)
Age^2	-0.000230	-0.000846**	-7.48e-06	-0.000383**	0.000588	0.00167
	(0.000165)	(0.000338)	(0.000192)	(0.000176)	(0.000583)	(0.00175)
Years in Education	0.0267	0.0486	0.0164	0.0260	0.0547	-0.141
	(0.0231)	(0.0392)	(0.0287)	(0.0242)	(0.0887)	(0.258)
Domicile						
Not Urban (Traditional or Farm)	-0.257**	-0.153	-0.330**	-0.284**	-0.357	-15.74
	(0.113)	(0.181)	(0.145)	(0.117)	(0.498)	(3,598)
Wave (Base: Wave 1)						
Wave 2	-0.186	-0.540**	-0.0876	-0.0620	-1.058**	-1.654
	(0.125)	(0.264)	(0.143)	(0.133)	(0.468)	(1.154)
Wave 3	-0.0988	-0.859*	0.125	0.0573	-0.805	-3.351*
	(0.206)	(0.443)	(0.236)	(0.220)	(0.777)	(2.012)
Wave 4	-0.0113	-1.046	0.275	0.189	-1.117	-3.765
	(0.326)	(0.703)	(0.372)	(0.346)	(1.264)	(3.149)
Wave 5	0.0397	-1.455	0.465	0.393	-1.944	-5.380
	(0.433)	(0.936)	(0.494)	(0.460)	(1.665)	(4.174)
Observations	15,931	4,450	11,481	14,097	1,506	219
Number of pid	3,201	894	2,307	2,831	304	44

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

In table 28 above are the coefficients of a fixed effects logit on the depressed affect dummy, where 0 is being classified as having no depressed affect disorder (DAD) and 1 is being classified as having a depressed affect disorder with a cut point of 4. This table contains subsets of gender and racial groups along with the combined dataset. The labour market predictor is significant for an employed-to-NEA move for the Male, Black African, Coloured and Combined models. It is positive for Male, Black and combined models and negative for the Coloured model. For the Male, Black African and Combined models we expect an increase in DAD classifications for those who made the employed to NEA move. This effect is greatest in the male model followed by the Black African model and then the Combined.

For the Coloured model, the effect on probability is the opposite; where the expected effect on the probability is a decrease in a DAD classification for the NEA relative to the employed. The labour market status predictor for unemployed (strict) is positive and significant for the Black African and Combined models. The expected effect on the probability of observing DAD classifications is increased due to an employed to unemployed (strict) move.

Age is significant for the gender models, Male and Female. The age predictor for the Male model is positive and negative for the Female. This tells us the expected effect on observing DAD classifications resulting from individuals growing a year older results in an increases in the male model. It is the opposite in the Female model. This goes on until a turning point in the Male model where the effect is reversed and the probability decreases for observing a DAD classifications. In the Female model the effect of decreasing the observations of DAD classifications begins to decrease at a further rate.

When it comes to the Domicile predictor, it is significant and negative for the Female, Black and Combined models. This means we expect the an increase DAD classifications for those in non-urban residences to be decreased and thus lower relative to those in urban residences, ceteris paribus. This effect is greatest in the Female model. For the wave predictor we see that wave 2 and 3 are significant.

Wave 2 is significant and negative in the Male and Coloured models while wave 3 is significant and negative in the male and white models. Relative to wave 1 the expected change in the log-odds of seeing a higher DAD classifications is negative which tells us they decrease. This is the

same for the expected change in in observing DAD classifications for the wave 3 predictor. The greatest decreasing effect in wave 2 lies in the Coloured model and the greatest decreasing effect for wave 3 is in the White model.

Table 29 – Positive Affect Fixed Effects Logit

VARIABLES	(1) Model 1: Combined	(2) Model 2: Male	(3) Model 3: Female	(4) Model 4: Black	(5) Model 5: Coloured	(6) Model 6: White
Labour market Status (Base: Employed)						
Not Economically Active	0.156***	0.120	0.175***	0.171***	0.0908	-0.356
	(0.0429)	(0.0771)	(0.0521)	(0.0473)	(0.113)	(0.374)
Unemployed (Discouraged)	0.108	0.0279	0.133	0.124	0.0435	1.085
	(0.0884)	(0.184)	(0.101)	(0.0988)	(0.210)	(1.196)
Unemployed (Strict)	-0.0367	-0.0504	-0.0249	-0.0383	0.0788	-1.142
	(0.0520)	(0.0902)	(0.0638)	(0.0557)	(0.159)	(0.839)
Age	-0.140***	-0.148*	-0.140***	-0.193***	0.0122	-0.381
	(0.0436)	(0.0755)	(0.0534)	(0.0485)	(0.115)	(0.301)
Age^2	-0.000176	-0.000293	-9.69e-05	-0.000291*	0.000519	0.00215**
	(0.000134)	(0.000248)	(0.000161)	(0.000150)	(0.000346)	(0.00108)
Years in Education	0.000596	-0.0488	0.0274	0.00283	0.00413	-0.106
	(0.0180)	(0.0302)	(0.0225)	(0.0194)	(0.0503)	(0.170)
Domicile						
Not Urban (Traditional or Farm)	0.107	0.0736	0.132	0.115	0.297	-14.80
	(0.0828)	(0.129)	(0.108)	(0.0866)	(0.314)	(1,353)
Wave (Base: Wave 1)						
Wave 2	0.429***	0.465**	0.417***	0.595***	-0.184	0.462
	(0.110)	(0.192)	(0.135)	(0.123)	(0.290)	(0.688)
Wave 3	0.260	0.322	0.237	0.631***	-1.083**	-0.745
	(0.183)	(0.318)	(0.225)	(0.204)	(0.490)	(1.185)
Wave 4	0.396	0.536	0.338	0.805**	-1.049	0.175
	(0.289)	(0.500)	(0.354)	(0.321)	(0.785)	(1.890)
Wave 5	0.897**	1.142*	0.789*	1.492***	-1.238	0.566
	(0.384)	(0.665)	(0.471)	(0.427)	(1.030)	(2.532)
Observations	24,458	7,838	16,620	20,139	3,559	511
Number of pid	4,919	1,578	3,341	4,047	719	103

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

In table 29 above are the coefficients of a fixed effects logit on the positive affect dummy, where 0 is being classified as having no positive affect disorder (PAD) and 1 is being classified as having a positive affect disorder with a cut point of 2. In this instance scoring low is good and scoring high is not. This table contains subsets of gender and racial group along with the combined dataset. The NEA coefficients of the labour market status predictor are the only coefficients that are statistically significant. These are in the Female, Black African and Combined models in which

the coefficients are all positive. Thus, we can expect an increase of high positive affect classifications due to employed-to-NEA moves across the five waves ceteris paribus.

Age has significant coefficients in the Male, Female, Black African and Combined models which are all negative. While the Age^2 predictor is significant in the Black African and Coloured models, it is negative in the Black African model and positive in the White model. What these predictors tell us is that we can expect PAD classifications to decrease as one ages year by year and to decrease by an increasing amount each year in the Black African model.

Looking at the wave variable, we see that all of the wave predictors are significant across the 6 models. The wave 2 predictor is significant, since the Female, Male, Black African and Combined models in which it is positive all across. Thus, the effect we expect is for individuals to have higher high positive affect classifications in wave 2 than their wave 1 scores across the five waves ceteris paribus. With the greatest increase to be those among the Black African population. The wave 3 predictor is significant in the Black African and Coloured models, wherein it is positive in the Black African model and negative in the Coloured one.

Thus, the effect we expect is for those among the Black African population group to have higher PAD classifications in wave 3 relative to their wave 1 classifications. The opposite effect, meanwhile, can be expected for the Coloured population group, in that we expect individuals to observe lower high PAD classifications in wave 3 relative to wave 1 ceteris paribus. The wave 4 predictor is only significant in the Black African model and is positive.

This tells us that the Black African population group can expect to have higher PAD classifications in wave 4 than in wave 1 across the five waves ceteris paribus. Lastly, the wave 5 predictor is significant in the Male, Female, Black African and Combined models where it is positive in all of them. Here, we expect the effect to be higher wave 5 high PAD classifications than wave 1 high PAD classifications in the Males, Females and Black African individuals across the five waves ceteris paribus. This expected effect is greatest amongst the Black African population.

Chapter 5: Discussion

This is where the discussion that consolidates differences between mental health and factor response to labour market status changes occurs.

5.1 Econometric Analysis – Fixed Effects Logit Comparison Across CESD-10, Somatic Symptoms, Depressed Affect and Positive Affect

In table 30, we have a comparison table of CESD-10, somatic symptoms, depressed affect and positive affect fixed effects logits. The age, years in education, domicile and wave predictors are included in the model but are omitted from the output. What is left are the coefficients for the labour market predictor.

Table 30 – CESD-10 & Factors Fixed Effects Logit Comparison

VARIABLES	(1) Model 1: CESD-10	(2) Model 2: Somatic Symptoms	(3) Model 3: Depressed Affect	(4) Model 4: Positive Affect
Labour market Status (Base: Employed)				
Not Economically Active	0.171***	0.0816	0.123**	0.156***
	(0.0445)	(0.0542)	(0.0544)	(0.0429)
Unemployed (Discouraged)	-0.190**	-0.0589	-0.185	0.108
	(0.0919)	(0.112)	(0.115)	(0.0884)
Unemployed (Strict)	0.109*	0.0253	0.111*	-0.0367
	(0.0558)	(0.0696)	(0.0672)	(0.0520)
Age	-0.0973**	-0.0819	-0.0428	-0.140***
	(0.0430)	(0.0507)	(0.0502)	(0.0436)
Age^2	-0.000300**	-0.000340**	-0.000230	-0.000176
	(0.000134)	(0.000160)	(0.000165)	(0.000134)
Years in Education	0.0195	-0.0201	0.0267	0.000596
	(0.0190)	(0.0236)	(0.0231)	(0.0180)
Domicile (Base: Urban)				
Not Urban (Traditional or Farm)	-0.179*	-0.240**	-0.257**	0.107
	(0.0930)	(0.112)	(0.113)	(0.0828)
Wave (Base: Wave 1)				
Wave 2	-0.285***	-0.331***	-0.186	0.429***
	(0.108)	(0.126)	(0.125)	(0.110)
Wave 3	0.0102	-0.193	-0.0988	0.260
	(0.179)	(0.210)	(0.206)	(0.183)
Wave 4	0.182	0.0240	-0.0113	0.396
	(0.283)	(0.331)	(0.326)	(0.289)
Wave 5	0.575	0.448	0.0397	0.897**
Observations	22,268	15,981	15,931	24,458
Number of pid	4,475	3,211	3,201	4,919

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

We see the factor fixed effects logit predictors for labour market status contain significant NEA coefficients for depressed affect and positive affect models. While not being significant in the somatic symptoms model. As such a move from employed to NEA, holding a coefficient of 0.171, we expect to see an average increase in high depressive symptoms in individuals across all five waves ceteris paribus. For depressed affect, the effect of an employed to NEA move with coefficient 0.123 is likely to be an average increase in the effect of seeing individuals with high DAD classifications across the five waves ceteris paribus. As for positive affect we can expect, due to moving from employed-to-NEA (with a coefficient of 0.156), an increase in the effect of observing PAD classifications in individuals across the five NIDS waves ceteris paribus.

The CESD-10 model contains the only significant coefficient for the unemployed (discouraged) predictor. With a coefficient of 0.19, we expect a small increase in the effect of being identified as

having depressive symptoms ceteris paribus due to a move from employed to unemployed (discouraged). For the unemployed (strict) predictor the CESD-10 and depressed affect models contain the only significant coefficients for it. A CESD-10 coefficient of 0.109 from a move from employed to unemployed (strict) leads us to expect an average increase in observing individual depressive symptoms ceteris paribus. While with a 0.111 depressed affect coefficient we can expect an almost negligible larger increase in the effect of observing more cases of DAD classification as a result of that move ceteris paribus.

The only models with significant coefficients for the age predictor are the CESD-10 and positive affect models with -0.0973 and -0.14 coefficients respectively. From this we can expect the effect of observing lower depressive symptoms and high positive affect scores for each year an individual ages ceteris paribus. Including the Age^2 predictor we see the effect on age for the CESD-10 to be while the decreasing effect aging has on depressive symptoms being observed this effect becomes stronger with each years aged. Similarly, the effect on age for somatic symptoms is also a decreasing one as aging increases an SSD classification being observed, which also becomes stronger.

In terms of the domicile predictor, the models for the CESD-10, somatic symptoms and depressed affect models have significant predictors of -0.179, -0.24 and -0.257 respectively. Thus, for the CESD-10, the average expected effect of observing individual depressive symptoms due to moving from an urban domicile to a non-urban domicile is decreased ceteris paribus, where the effects are similar for SSD and high DAD classifications being observed for the same move, with both showing stronger effects than what are seen in depressive symptoms being observed.

Lastly, we have the wave predictor where we see the CESD-10, somatic symptoms and positive affect models being significant, where wave 2 CESD-10 and somatic symptoms coefficients have negative signs (-0.285 and -0.331) while the positive affect coefficient has a positive sign (0.429). The wave 5 positive affect coefficient is also positive (0.897). Therefore the effect on the number of individuals being identified with depressive symptoms and high somatic symptom scores are expected to be less in wave 2 than in wave 1 ceteris paribus. With this effect of seeing more SSD classifications being stronger. For positive affect, meanwhile, the effect on individual wave 2 scores is a moderate increase in high positive affect scores seen ceteris paribus, with a similar effect on wave 5 positive affect scores. However, the effect is much stronger than the one seen in wave 2.

Chapter 6: Conclusion

In this dissertation, we endeavoured to investigate the relationship between mental health and labour market changes in South Africa. We started by understanding the relationship between the aggregate CESD-10 and labour market status and then explored whether this aggregate relationship holds true for each of the three mental health factors that make up the CESD-10 score.

Using data from NIDS, waves 1-5, we documented mental health symptoms among the employed, and those in various states of unemployment. This followed for somatic symptoms, depressed affect and positive affect, but the source driving the effects differ between factors, and with the CESD-10 as well. We modelled the relationship between the CESD-10 by labour market status with a set of controls. The same was done for somatic symptoms, depressed affect and positive affect.

We found that those who are NEA suffer to a greater extent in positive affect than in the other two factors relative to the employed. Those who are unemployed (discouraged) also experience the strongest detrimental effect in positive affect relative to the employed, but experience lower depressed affect scores relative to the employed. Those who are unemployed (strict), meanwhile, experience greater depressed affect scores out of the three factors when compared to the employed.

As such, we expect to see an average increase in DAD classifications among those moving from employment to NEA. We can expect an average increase in DAD classifications, meanwhile, among those moving from employment to NEA. Positive affect, meanwhile, can be expected to be higher among individuals moving from employment-to-NEA moves an increase in the effect of observing an individual PAD classifications across the five waves.

We find that, after controlling for observed individual characteristics and utilizing the panel structure of the data by allowing for individual specific fixed effects, negative labour market shifts have a significant negative impact on mental health. The sub-group analysis shows that this has a particularly adverse effect on Black Africans and Males.

In order to sharpen the discussion of the differences across factors, table 30 below elucidates the differences and reveals that the CESD-10 behaves differently to its factors. The only factor that behaves in a similar way to the CESD-10 is somatic symptoms. The effects of movement from

employment to NEA on high depressive symptoms (CESD-10 dummy) is strongest among the male gender and the Black African population group. The impact on SSD classifications (Somatic Symptoms dummy) are likewise highest among the male gender and the Black African population group. The increase of DAD classifications (Depressed Affect dummy), meanwhile, is highest among the male gender and the Coloured population group. Lastly, the impact on PAD classifications (Positive Affect dummy) is highest among the female gender and the Black African population group.

Table 30 - Strongest Significant Effects on CESD-10 & Factors (FE Logit)

	CESD-10		**Somatic Symptoms**		**Depressed Affect**		**Positive Affect**	
	Gender	*Pop. Group*	*Gender*	*Pop. Group*	*Gender*	*Pop. Group*	*Gender*	*Pop. Group*
NEA	Male	Black	Male	Black	Male	Coloured	Female	Black
Unemployed (Discouraged)	Female	Black	-	-	-	-	-	-
Unemployed (Strict)	Male	Black	-	-	-	Black	-	-

This is corroborated with the fixed effect comparison table 29, which demonstrates that the NEA coefficients are significant and positive across all models. The exception is the NEA coefficient under somatic symptoms, where the effect is less. This coefficient, however, is not significant. What this tells us about the effects of a move from employment-to-NEA is that it increases mental health scores across the board. This increase is quite similar across the CESD-10 and its factors, but the effect is largest in the CESD-10 itself. In the unemployed (strict) coefficient, the depressed affect coefficient is only slightly higher than the CESD-10 coefficient. This hints to a small effect on the CESD-10 coefficient by the somatic symptoms and positive affect, with the strongest effect being from depressed affect.

We see that, in regards to the NEA predictor (simplified in table 30), depressed affect and positive affect behave differently to the CESD-10. This is in terms of gender for positive affect and population group for depressed affect. Looking at the factors themselves, only two factors ever behave in a similar way under gender or population group for the NEA predictor. If we look at the ordered probit results (in appendices 5, 7, 8, 9) of the CESD-10 and the factors we see that, for all but positive affect, as the wave control is introduced the NEA coefficient increase.

In a general way, the results presented in this paper have shown how common measures in the realm of psychology may be used productively in economics research to investigate phenomena in labour market activity. Introducing such variables for use by economists increases the engagement with interdisciplinary work in the social sciences.

Having sought to sharpen the way we view the impact of job loss and job gain, we have demonstrated the importance of having a job. It is not the sole driver of mental health, but it is clearly a very important driver of mental health in South Africa. This is daunting given our high levels of unemployment. Given the importance of mental health in and of itself and for a productive workforce, this is particularly important. [23075 Words]

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Appendices

Appendix 1 - Logit on Depression (CESD-10) Dummy by Gender, Population Group & Combined

VARIABLES	(1) Model 1: Combined	(2) Model 2: Male	(3) Model 3: Female	(4) Model 4: Black	(5) Model 5: Coloured	(6) Model 6: White
Labour Market Status (Base: Employed)						
Not Economically Active	0.267***	0.385***	0.176***	0.253***	0.286***	0.960***
	(0.0319)	(0.0614)	(0.0382)	(0.0342)	(0.107)	(0.303)
Unemployed (Discouraged)	-0.0816	0.0381	-0.176**	-0.108	0.351	
	(0.0773)	(0.167)	(0.0877)	(0.0834)	(0.216)	
Unemployed (Strict)	0.206***	0.330***	0.112**	0.137***	0.534***	
	(0.0447)	(0.0798)	(0.0543)	(0.0469)	(0.162)	
Age	0.0351***	0.0423***	0.0313***	0.0402***	0.0326**	0.0287
	(0.00427)	(0.00862)	(0.00507)	(0.00451)	(0.0157)	(0.0553)
Age^2	-0.000340***	-0.000486***	-0.000280***	-0.000372***	-0.000278*	-0.000381
	(4.54e-05)	(9.68e-05)	(5.24e-05)	(4.78e-05)	(0.000167)	(0.000511)
Years in Education	-0.0385***	-0.0475***	-0.0347***	-0.0340***	-0.0341**	-0.0314
	(0.00384)	(0.00731)	(0.00455)	(0.00421)	(0.0137)	(0.0434)
Domicile						
Not Urban (Traditional or Farm)	0.0697**	0.170***	0.0221	-0.0909***	0.0909	0.318
	(0.0276)	(0.0517)	(0.0327)	(0.0300)	(0.132)	(0.359)
Wave (Base: Wave 1)						
Wave 2	-0.553***	-0.548***	-0.553***	-0.558***	-0.756***	-0.325
	(0.0409)	(0.0774)	(0.0484)	(0.0436)	(0.140)	(0.401)
Wave 3	-0.478***	-0.412***	-0.502***	-0.506***	-0.388***	-0.663
	(0.0407)	(0.0764)	(0.0482)	(0.0435)	(0.131)	(0.436)
Wave 4	-0.611***	-0.441***	-0.678***	-0.700***	-0.332**	0.452
	(0.0418)	(0.0779)	(0.0497)	(0.0450)	(0.131)	(0.364)
Wave 5	-0.506***	-0.349***	-0.565***	-0.547***	-0.628***	0.0878
	(0.0417)	(0.0779)	(0.0496)	(0.0447)	(0.139)	(0.383)
Constant	-1.267***	-1.528***	-1.090***	-1.218***	-1.971***	-2.235
	(0.113)	(0.208)	(0.140)	(0.121)	(0.400)	(1.512)
Observations	30,502	9,576	20,926	25,775	3,908	549

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

Appendix 2 – Somatic Symptoms Logit

VARIABLES	(1) Model 1: Male	(2) Model 2: Female	(3) Model 3: Black	(4) Model 4: Coloured	(5) Model 5: White	(6) Model 6: Combined
Labour market Status (Base: Employed)						
Not Economically Active	0.360***	0.108**	0.186***	0.174	0.660*	0.203***
	(0.0752)	(0.0463)	(0.0417)	(0.131)	(0.343)	(0.0389)
Unemployed (Discouraged)	0.00957	-0.0682	0.0101	0.0391		-0.00576
	(0.207)	(0.103)	(0.0981)	(0.282)		(0.0918)
Unemployed (Strict)	0.265***	0.00615	0.0590	0.213		0.106*
	(0.0990)	(0.0674)	(0.0581)	(0.211)		(0.0555)
Age	0.0403***	0.0270***	0.0364***	0.0162	-0.0114	0.0311***
	(0.0106)	(0.00618)	(0.00552)	(0.0189)	(0.0581)	(0.00522)
Age^2	-0.000446***	-0.000238***	-0.000340***	-3.92e-05	5.19e-06	-0.000295***
	(0.000119)	(6.38e-05)	(5.86e-05)	(0.000198)	(0.000545)	(5.54e-05)
Years in Education	-0.0409***	-0.0331***	-0.0332***	-0.0196	-0.107*	-0.0353***
	(0.00893)	(0.00550)	(0.00509)	(0.0167)	(0.0569)	(0.00466)
Domicile						
Not Urban (Traditional or Farm)	-0.0953	-0.0731*	-0.211***	-0.0249	-0.174	-0.0743**
	(0.0636)	(0.0399)	(0.0364)	(0.167)	(0.471)	(0.0337)
Wave (Base: Wave 1)						
Wave 2	-0.540***	-0.591***	-0.564***	-0.853***	-0.986*	-0.579***
	(0.0924)	(0.0574)	(0.0516)	(0.172)	(0.520)	(0.0487)
Wave 3	-0.592***	-0.654***	-0.674***	-0.441***	-0.620	-0.639***
	(0.0942)	(0.0582)	(0.0528)	(0.155)	(0.479)	(0.0494)
Wave 4	-0.577***	-0.755***	-0.790***	-0.574***	0.734*	-0.706***
	(0.0951)	(0.0599)	(0.0546)	(0.160)	(0.385)	(0.0506)
Wave 5	-0.427***	-0.597***	-0.557***	-0.869***	-0.496	-0.553***
	(0.0934)	(0.0587)	(0.0527)	(0.173)	(0.471)	(0.0496)
Constant	-2.013***	-1.571***	-1.702***	-2.247***	-0.397	-1.737***
	(0.254)	(0.170)	(0.148)	(0.486)	(1.594)	(0.138)
Observations	9,576	20,926	25,775	3,908	549	30,502

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

Appendix 3 – Depressed Affect Logit

VARIABLES	(1) Model 1: Male	(2) Model 2: Female	(3) Model 3: Black	(4) Model 4: Coloured	(5) Model 5: White	(6) Model 6: Combined
Labour market Status (Base: Employed)						
Not Economically Active	0.329***	0.139***	0.211***	0.0165	1.316***	0.217***
	(0.0769)	(0.0472)	(0.0425)	(0.132)	(0.375)	(0.0396)
Unemployed (Discouraged)	-0.124	-0.227**	-0.131	-0.276		-0.165*
	(0.219)	(0.112)	(0.105)	(0.315)		(0.0993)
Unemployed (Strict)	0.229**	0.192***	0.195***	0.254		0.227***
	(0.100)	(0.0655)	(0.0572)	(0.201)		(0.0546)
Age	0.0404***	0.0250***	0.0321***	0.0282	0.0327	0.0288***
	(0.0111)	(0.00629)	(0.00565)	(0.0197)	(0.0638)	(0.00535)
Age^2	-0.000506***	-0.000228***	-0.000317***	-0.000252	-0.000399	-0.000295***
	(0.000126)	(6.52e-05)	(6.02e-05)	(0.000209)	(0.000585)	(5.71e-05)
Years in Education	-0.0435***	-0.0269***	-0.0291***	-0.0349**	-0.0464	-0.0317***
	(0.00920)	(0.00560)	(0.00521)	(0.0168)	(0.0528)	(0.00476)
Domicile						
Not Urban (Traditional or Farm)	0.0241	-0.105***	-0.189***	-0.0837	-0.163	-0.0640*
	(0.0651)	(0.0403)	(0.0369)	(0.167)	(0.469)	(0.0342)
Wave (Base: Wave 1)						
Wave 2	-0.247***	-0.359***	-0.309***	-0.698***	-0.426	-0.331***
	(0.0945)	(0.0586)	(0.0525)	(0.184)	(0.481)	(0.0497)
Wave 3	-0.341***	-0.347***	-0.374***	-0.137	-0.823	-0.347***
	(0.0972)	(0.0584)	(0.0532)	(0.161)	(0.537)	(0.0499)
Wave 4	-0.229**	-0.480***	-0.506***	0.00322	0.440	-0.411***
	(0.0965)	(0.0604)	(0.0551)	(0.158)	(0.423)	(0.0511)
Wave 5	-0.364***	-0.546***	-0.543***	-0.423**	0.181	-0.498***
	(0.101)	(0.0619)	(0.0562)	(0.174)	(0.440)	(0.0526)
Constant	-2.175***	-1.774***	-1.855***	-2.398***	-2.822	-1.909***
	(0.264)	(0.173)	(0.151)	(0.499)	(1.771)	(0.141)
Observations	9,576	20,926	25,775	3,908	549	30,502

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

Appendix 4 – Positive Affect Logit

VARIABLES	(1) Model 1: Combined	(2) Model 2: Male	(3) Model 3: Female	(4) Model 4: Black	(5) Model 5: Coloured	(6) Model 6: White
Labour market Status (Base: Employed)						
Not Economically Active	0.216***	0.226***	0.205***	0.192***	0.342***	0.263
	(0.0306)	(0.0566)	(0.0373)	(0.0343)	(0.0810)	(0.217)
Unemployed (Discouraged)	0.186**	0.297*	0.141	0.221***	0.201	1.406
	(0.0752)	(0.159)	(0.0861)	(0.0855)	(0.174)	(1.122)
Unemployed (Strict)	0.0938**	0.114	0.0778	0.0412	0.187	-0.119
	(0.0412)	(0.0721)	(0.0507)	(0.0443)	(0.129)	(0.709)
Age	0.0178***	0.0204***	0.0156***	0.0209***	0.0207*	0.0513
	(0.00416)	(0.00786)	(0.00505)	(0.00461)	(0.0117)	(0.0395)
Age^2	-0.000166***	-0.000194**	-0.000145***	-0.000173***	-0.000218*	-0.000488
	(4.49e-05)	(8.84e-05)	(5.31e-05)	(5.00e-05)	(0.000127)	(0.000368)
Years in Education	-0.0462***	-0.0478***	-0.0458***	-0.0506***	-0.00987	0.00497
	(0.00380)	(0.00679)	(0.00460)	(0.00440)	(0.0106)	(0.0285)
Domicile						
Not Urban (Traditional or Farm)	0.311***	0.276***	0.326***	0.155***	0.134	-0.0216
	(0.0261)	(0.0461)	(0.0318)	(0.0294)	(0.102)	(0.277)
Wave (Base: Wave 1)						
Wave 2	0.0566	0.0468	0.0612	0.0727	-0.0785	0.0938
	(0.0426)	(0.0742)	(0.0522)	(0.0477)	(0.107)	(0.291)
Wave 3	-0.374***	-0.385***	-0.368***	-0.280***	-0.826***	-1.327***
	(0.0409)	(0.0715)	(0.0499)	(0.0459)	(0.105)	(0.286)
Wave 4	-0.615***	-0.594***	-0.625***	-0.645***	-0.645***	-0.762***
	(0.0407)	(0.0714)	(0.0497)	(0.0453)	(0.106)	(0.282)
Wave 5	-0.471***	-0.393***	-0.507***	-0.462***	-0.696***	-0.732**
	(0.0416)	(0.0730)	(0.0506)	(0.0465)	(0.107)	(0.286)
Constant	0.784***	0.718***	0.848***	0.898***	0.112	-0.713
	(0.108)	(0.188)	(0.136)	(0.121)	(0.296)	(1.063)
Observations	30,502	9,576	20,926	25,775	3,908	565

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

Appendix 5 – CESD-10 Ordered Probit

VARIABLES	(1) Model 1: Simple Specification	(2) Model 2: Some Controls	(3) Model 3: Broad Specification
Labour market Status (Base: Employed)			
Not Economically Active	0.221***	0.172***	0.178***
	(0.0125)	(0.0139)	(0.0140)
Unemployed (Discouraged)	0.127***	0.0867***	0.0363
	(0.0325)	(0.0328)	(0.0330)
Unemployed (Strict)	0.0983***	0.124***	0.127***
	(0.0190)	(0.0194)	(0.0194)
Age		0.0172***	0.0213***
		(0.00186)	(0.00187)
Age^2		-0.000187***	-0.000215***
		(2.00e-05)	(2.00e-05)
Years in Education		-0.0300***	-0.0260***
		(0.00169)	(0.00171)
Domicile			
Not Urban (Traditional or Farm)		0.0787***	0.0787***
		(0.0121)	(0.0121)
Wave (Base: Wave 1)			
Wave 2			-0.258***
			(0.0184)
Wave 3			-0.271***
			(0.0184)
Wave 4			-0.312***
			(0.0186)
Wave 5			-0.287***
			(0.0189)
Constant cut1	-1.655***	-1.558***	-1.642***
	(0.0147)	(0.0504)	(0.0508)
Constant cut2	-1.354***	-1.254***	-1.338***
	(0.0127)	(0.0498)	(0.0502)
Constant cut3	-1.109***	-1.006***	-1.088***
	(0.0116)	(0.0496)	(0.0499)
Constant cut4	-0.745***	-0.638***	-0.718***
	(0.0107)	(0.0493)	(0.0497)
Constant cut5	-0.486***	-0.375***	-0.454***
	(0.0103)	(0.0493)	(0.0497)
Constant cut6	-0.252***	-0.138***	-0.216***
	(0.0102)	(0.0493)	(0.0496)
Constant cut7	0.0975***	0.215***	0.138***
	(0.0101)	(0.0493)	(0.0496)
Constant cut8	0.330***	0.450***	0.374***
	(0.0102)	(0.0493)	(0.0497)
Constant cut9	0.541***	0.664***	0.589***
	(0.0104)	(0.0494)	(0.0497)
Constant cut10	0.748***	0.873***	0.800***
	(0.0106)	(0.0494)	(0.0498)
Constant cut11	0.945***	1.071***	1.000***
	(0.0109)	(0.0495)	(0.0498)
Constant cut12	1.148***	1.277***	1.207***
	(0.0114)	(0.0496)	(0.0499)
Constant cut13	1.363***	1.493***	1.425***
	(0.0121)	(0.0498)	(0.0501)
Constant cut14	1.535***	1.667***	1.601***
	(0.0128)	(0.0500)	(0.0503)
Constant cut15	1.701***	1.835***	1.771***

	(0.0138)	(0.0502)	(0.0506)
Constant cut16	1.879***	2.015***	1.953***
	(0.0151)	(0.0506)	(0.0509)
Constant cut17	2.042***	2.180***	2.119***
	(0.0166)	(0.0511)	(0.0514)
Constant cut18	2.208***	2.347***	2.289***
	(0.0186)	(0.0518)	(0.0521)
Constant cut19	2.354***	2.495***	2.440***
	(0.0209)	(0.0527)	(0.0530)
Constant cut20	2.483***	2.626***	2.574***
	(0.0234)	(0.0538)	(0.0541)
Constant cut21	2.612***	2.757***	2.707***
	(0.0265)	(0.0552)	(0.0556)
Constant cut22	2.737***	2.883***	2.836***
	(0.0301)	(0.0571)	(0.0575)
Constant cut23	2.826***	2.973***	2.928***
	(0.0333)	(0.0588)	(0.0593)
Constant cut24	2.915***	3.063***	3.020***
	(0.0369)	(0.0609)	(0.0615)
Constant cut25	3.115***	3.264***	3.227***
	(0.0474)	(0.0679)	(0.0687)
Constant cut26	3.205***	3.354***	3.319***
	(0.0534)	(0.0723)	(0.0733)
Constant cut27	3.388***	3.538***	3.509***
	(0.0692)	(0.0847)	(0.0862)
Constant cut28	3.630***	3.779***	3.759***
	(0.101)	(0.112)	(0.114)
Constant cut29	3.847***	3.996***	3.985***
	(0.145)	(0.153)	(0.157)
Constant cut30	4.116***	4.270***	4.269***
	(0.237)	(0.245)	(0.253)
Observations	30,578	30,502	30,502

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

Appendix 6 – CESD-10 Factors Ordered Probit

VARIABLES	(1) Model 1: Somatic Symptoms	(2) Model 2: Depressed Affect	(3) Model 3: Positive Affect
Labour market Status (Base: Employed)			
Not Economically Active	0.118***	0.114***	0.125***
	(0.0143)	(0.0148)	(0.0144)
Unemployed (Discouraged)	-0.0217	-0.0775**	0.144***
	(0.0341)	(0.0352)	(0.0341)
Unemployed (Strict)	0.0880***	0.141***	0.0334*
	(0.0198)	(0.0204)	(0.0200)
Age	0.0219***	0.0187***	0.00535***
	(0.00192)	(0.00199)	(0.00193)
Age^2	-0.000212***	-0.000197***	-5.68e-05***
	(2.05e-05)	(2.12e-05)	(2.06e-05)
Years in Education	-0.0178***	-0.0169***	-0.0199***
	(0.00174)	(0.00180)	(0.00176)
Domicile (Base: Urban)			
Not Urban (Traditional or Farm)	0.0166	-0.000280	0.152***
	(0.0124)	(0.0127)	(0.0125)
Wave (Base: Wave 1)			
Wave 2	-0.381***	-0.258***	0.107***
	(0.0190)	(0.0194)	(0.0189)
Wave 3	-0.210***	-0.134***	-0.166***
	(0.0189)	(0.0193)	(0.0190)
Wave 4	-0.202***	-0.145***	-0.242***
	(0.0190)	(0.0195)	(0.0192)
Wave 5	-0.118***	-0.203***	-0.237***
	(0.0192)	(0.0198)	(0.0194)
Constant cut10	2.402***		
	(0.0535)		
Constant cut11	2.667***		
	(0.0555)		
Constant cut12	2.839***		
	(0.0576)		
Constant cut13	3.025***		
	(0.0611)		
Constant cut14	3.149***		
	(0.0645)		
Constant cut15	3.248***		
	(0.0681)		
Constant cut7	1.594***	2.353***	
	(0.0515)	(0.0553)	
Constant cut8	1.883***	2.680***	
	(0.0519)	(0.0581)	
Constant cut9	2.144***	2.945***	
	(0.0525)	(0.0626)	
Constant cut1	-0.587***	-0.232***	-0.913***
	(0.0510)	(0.0525)	(0.0514)
Constant cut2	-0.151***	0.288***	-0.507***
	(0.0509)	(0.0525)	(0.0513)
Constant cut3	0.210***	0.740***	-0.0639
	(0.0509)	(0.0526)	(0.0512)
Constant cut4	0.587***	1.229***	0.461***
	(0.0510)	(0.0528)	(0.0513)
Constant cut5	0.938***	1.602***	0.935***
	(0.0511)	(0.0531)	(0.0514)
Constant cut6	1.272***	1.963***	1.285***

	(0.0512)	(0.0538)	(0.0516)
Observations	30,492	30,502	30,502

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

Appendix 7 – Somatic Symptoms Ordered Probit

VARIABLES	(1) Model 1: Simple Specification	(2) Model 2: Some Controls	(3) Model 3: Broad Specification
Labour market Status (Base: Employed)			
Not Economically Active	0.122***	0.0944***	0.118***
	(0.0128)	(0.0142)	(0.0143)
Unemployed (Discouraged)	-0.0216	-0.0231	-0.0217
	(0.0335)	(0.0338)	(0.0341)
Unemployed (Strict)	0.0438**	0.0855***	0.0880***
	(0.0195)	(0.0198)	(0.0198)
Age		0.0197***	0.0219***
		(0.00191)	(0.00192)
Age^2		-0.000189***	-0.000212***
		(2.05e-05)	(2.05e-05)
Years in Education		-0.0186***	-0.0178***
		(0.00172)	(0.00174)
Domicile			
Not Urban (Traditional or Farm)		0.0175	0.0166
		(0.0123)	(0.0124)
Wave (Base: Wave 1)			
Wave 2			-0.381***
			(0.0190)
Wave 3			-0.210***
			(0.0189)
Wave 4			-0.202***
			(0.0190)
Wave 5			-0.118***
			(0.0192)
Constant cut1	-0.748***	-0.463***	-0.587***
	(0.0108)	(0.0506)	(0.0510)
Constant cut2	-0.319***	-0.0302	-0.151***
	(0.0103)	(0.0505)	(0.0509)
Constant cut3	0.0374***	0.329***	0.210***
	(0.0102)	(0.0506)	(0.0509)
Constant cut4	0.409***	0.703***	0.587***
	(0.0103)	(0.0506)	(0.0510)
Constant cut5	0.755***	1.052***	0.938***
	(0.0107)	(0.0507)	(0.0511)
Constant cut6	1.085***	1.384***	1.272***
	(0.0114)	(0.0509)	(0.0512)
Constant cut7	1.404***	1.704***	1.594***
	(0.0125)	(0.0511)	(0.0515)
Constant cut8	1.688***	1.991***	1.883***
	(0.0141)	(0.0515)	(0.0519)
Constant cut9	1.945***	2.249***	2.144***
	(0.0162)	(0.0522)	(0.0525)
Constant cut10	2.198***	2.504***	2.402***
	(0.0193)	(0.0532)	(0.0535)
Constant cut11	2.458***	2.765***	2.667***
	(0.0242)	(0.0552)	(0.0555)
Constant cut12	2.625***	2.934***	2.839***
	(0.0286)	(0.0572)	(0.0576)
Constant cut13	2.807***	3.117***	3.025***
	(0.0349)	(0.0607)	(0.0611)
Constant cut14	2.928***	3.238***	3.149***
	(0.0404)	(0.0640)	(0.0645)
Constant cut15	3.024***	3.335***	3.248***

	(0.0456)	(0.0675)	(0.0681)
Observations	30,568	30,492	30,492

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

Appendix 8 – Depressed Affect Ordered Probit

VARIABLES	(1) Model 1: Simple Specification	(2) Model 2: Some Controls	(3) Model 3: Broad Specification
Labour market Status (Base: Employed)			
Not Economically Active	0.112***	0.101***	0.114***
	(0.0132)	(0.0147)	(0.0148)
Unemployed (Discouraged)	-0.0521	-0.0621*	-0.0775**
	(0.0346)	(0.0349)	(0.0352)
Unemployed (Strict)	0.116***	0.143***	0.141***
	(0.0200)	(0.0204)	(0.0204)
Age		0.0163***	0.0187***
		(0.00197)	(0.00199)
Age^2		-0.000178***	-0.000197***
		(2.12e-05)	(2.12e-05)
Years in Education		-0.0192***	-0.0169***
		(0.00178)	(0.00180)
Domicile			
Not Urban (Traditional or Farm)		-0.000228	-0.000280
		(0.0127)	(0.0127)
Wave (Base: Wave 1)			
Wave 2			-0.258***
			(0.0194)
Wave 3			-0.134***
			(0.0193)
Wave 4			-0.145***
			(0.0195)
Wave 5			-0.203***
			(0.0198)
Constant cut1	-0.332***	-0.170***	-0.232***
	(0.0104)	(0.0521)	(0.0525)
Constant cut2	0.183***	0.348***	0.288***
	(0.0104)	(0.0522)	(0.0525)
Constant cut3	0.631***	0.798***	0.740***
	(0.0107)	(0.0523)	(0.0526)
Constant cut4	1.117***	1.286***	1.229***
	(0.0117)	(0.0525)	(0.0528)
Constant cut5	1.487***	1.658***	1.602***
	(0.0131)	(0.0528)	(0.0531)
Constant cut6	1.846***	2.017***	1.963***
	(0.0154)	(0.0534)	(0.0538)
Constant cut7	2.234***	2.406***	2.353***
	(0.0199)	(0.0549)	(0.0553)
Constant cut8	2.559***	2.732***	2.680***
	(0.0266)	(0.0577)	(0.0581)
Constant cut9	2.821***	2.995***	2.945***
	(0.0354)	(0.0623)	(0.0626)
Observations	30,578	30,502	30,502

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

Appendix 9 – Positive Affect Ordered Probit

VARIABLES	(1) Model 1: Simple Specification	(2) Model 2: Some Controls	(3) Model 3: Broad Specification
Labour market Status (Base: Employed)			
Not Economically Active	0.210***	0.145***	0.125***
	(0.0129)	(0.0144)	(0.0144)
Unemployed (Discouraged)	0.292***	0.224***	0.144***
	(0.0335)	(0.0339)	(0.0341)
Unemployed (Strict)	0.0413**	0.0307	0.0334*
	(0.0196)	(0.0200)	(0.0200)
Age		0.00205	0.00535***
		(0.00192)	(0.00193)
Age^2		-4.34e-05**	-5.68e-05***
		(2.06e-05)	(2.06e-05)
Years in Education		-0.0244***	-0.0199***
		(0.00174)	(0.00176)
Domicile			
Not Urban (Traditional or Farm)		0.151***	0.152***
		(0.0125)	(0.0125)
Wave (Base: Wave 1)			
Wave 2			0.107***
			(0.0189)
Wave 3			-0.166***
			(0.0190)
Wave 4			-0.242***
			(0.0192)
Wave 5			-0.237***
			(0.0194)
Constant cut1	-0.771***	-0.934***	-0.913***
	(0.0109)	(0.0510)	(0.0514)
Constant cut2	-0.375***	-0.532***	-0.507***
	(0.0104)	(0.0509)	(0.0513)
Constant cut3	0.0586***	-0.0934*	-0.0639
	(0.0103)	(0.0508)	(0.0512)
Constant cut4	0.575***	0.427***	0.461***
	(0.0105)	(0.0509)	(0.0513)
Constant cut5	1.043***	0.899***	0.935***
	(0.0113)	(0.0510)	(0.0514)
Constant cut6	1.389***	1.245***	1.285***
	(0.0124)	(0.0512)	(0.0516)
Observations	30,578	30,502	30,502

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

Appendix 10 – Sensitivity Test of CESD-10 Cut-Off

VARIABLES	(1) Model 1: Logit Cut 8 (FE)	(2) Model 2: Logit Cut 10 (FE)	(3) Model 3: Logit Cut 12 (FE)
Labour market Status (Base: Employed)			
Not Economically Active	0.202***	0.171***	0.167***
	(0.0405)	(0.0445)	(0.0541)
Unemployed (Discouraged)	-0.124	-0.190**	-0.109
	(0.0821)	(0.0919)	(0.111)
Unemployed (Strict)	0.0645	0.109*	0.0329
	(0.0500)	(0.0558)	(0.0698)
Age	-0.0861**	-0.0973**	-0.108**
	(0.0391)	(0.0430)	(0.0513)
Age^2	-0.000291**	-0.000300**	-0.000337**
	(0.000123)	(0.000134)	(0.000161)
Years in Education	0.0307*	0.0195	-0.0159
	(0.0175)	(0.0190)	(0.0232)
Domicile			
Not Urban (Traditional or Farm)	-0.264***	-0.179*	-0.279**
	(0.0821)	(0.0930)	(0.114)
Wave (Base: Wave 1)			
Wave 2	-0.326***	-0.285***	-0.189
	(0.0986)	(0.108)	(0.127)
Wave 3	0.00198	0.0102	0.0124
	(0.164)	(0.179)	(0.212)
Wave 4	0.218	0.182	0.184
	(0.258)	(0.283)	(0.335)
Wave 5	0.557	0.575	0.658
	(0.343)	(0.376)	(0.444)
Observations	26,080	22,268	15,898
Number of pid	5,243	4,475	3,194

Notes: * p<0.1, ** p<0.05, *** p<0.01; Robust standard errors are clustered at the individual level and reported in parentheses. The dependent variable is the CESD-10. The sample is comprised of individuals that were successfully interviewed with the adult survey questionnaire in all 5 waves and answered the relevant questions to construct the measures of mental health. Restricted to working age population (16 to 65). Post-stratified weights were applied.

Appendix 11 – Hausman Test (CESD-10)

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
w_employ				
0	.4355247	.6284458	-.1929211	.0437683
1	-.0852988	.0603503	-.1456491	.0648349
2	.1706588	.4079052	-.2372465	.0446836
w_age	-.1640543	.089927	-.2539813	.0715287
w_age2	-.0009144	-.0008966	-.0000178	.0002045
w_edyrs	.0355873	-.1050742	.1406615	.0306892
1.w_domicile	-.2852869	.2227639	-.5080507	.1374036
wave				
2	-.5417846	-1.136144	.5943595	.16649
3	-.1732766	-1.194873	1.021596	.2935974
4	.2277386	-1.405981	1.63372	.4704063
5	.9248027	-1.265582	2.190384	.6275883

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 89.60
Prob>chi2 = 0.0000

Appendix 12 – Hausman Test (Somatic Symptoms)

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
w_employ				
0	.1346558	.2470212	-.1123654	.0264627
1	-.0891548	-.0329495	-.0562053	.0392972
2	.0497862	.1675646	-.1177784	.0270405
w_age	-.0408988	.0519901	-.0928889	.0432025
w_age2	-.0006776	-.0005025	-.0001751	.0001235
w_edyrs	.0147854	-.0433375	.0581229	.0185338
1.w_domicile	-.2068562	-.0010418	-.2058144	.082986
wave				
2	-.6568665	-.9086552	.2517886	.100582
3	-.2191859	-.647678	.4284921	.1773416
4	.0092897	-.6773314	.6866212	.2841363
5	.4712121	-.4530629	.924275	.379076

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 47.44
Prob>chi2 = 0.0000

Appendix 13 – Hausman Test (Depressed Affect)

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
w_employ				
0	.0948955	.1788147	-.0839193	.0204446
1	-.1745059	-.1254142	-.0490917	.0308117
2	.0987702	.2086723	-.1099021	.0211167
w_age	-.0302641	.0293118	-.0595759	.0311479
w_age2	-.0002766	-.0003035	.000027	.0000906
w_edyrs	.0210644	-.0268674	.0479318	.0134384
1.w_domicile	-.1948487	-.022343	-.1725057	.0606992
wave				
2	-.2703157	-.4021385	.1318228	.0724267
3	-.0238935	-.2467407	.2228472	.1277032
4	.0579128	-.2965951	.354508	.2046008
5	.0938386	-.3826513	.4764898	.2729628

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 61.33
Prob>chi2 = 0.0000

Appendix 14 – Hausman Test (Positive Affect)

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
w_employ				
0	.2082707	.2171465	-.0088758	.0220146
1	.2008651	.2451067	-.0442416	.0332985
2	.0214597	.0507882	-.0293284	.02279
w_age	-.0955342	.0091671	-.1047013	.0332296
w_age2	.0000306	-.0000971	.0001277	.0000968
w_edyrs	-.0002069	-.0357673	.0355604	.0143456
1.w_domicile	.1148183	.2553386	-.1405202	.0648642
wave				
2	.4044723	.1848508	.2196214	.0772681
3	.0879092	-.2966709	.3845801	.1362249
4	.1847044	-.4297193	.6144237	.2182471
5	.3917744	-.4269793	.8187536	.2911662

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 25.22
Prob>chi2 = 0.0049