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An Investigation into the Relationship between Stock Market Fluctuations and Mental Health

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A thesis submitted in fulfilment of the requirements for the Degree of Doctor of
Philosophy in Business

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Declaration

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Summary

This thesis explores the relationship between stock market fluctuations and mental health, investigating the link between immigrants' mental health and stock market fluctuations in their home countries, and examining asymmetry and mental health spillover effects in the relationship between people's mental health and stock market fluctuations in their country of residence. Firstly, despite the fact that many countries have experienced a large influx of immigrants in recent years, little attention is paid to how the mental health of immigrants is affected by stock markets in their home countries. Using panel data from the UK based Understanding Society dataset from 2010 to 2021, I conduct a longitudinal study to investigate the impact of stock market volatility in immigrants' home countries on their subjective mental health and the level of diagnosed clinical depressions as a measure of objective mental health. I measure subjective mental health using the 12-Item General Health Questionnaire (GHQ-12) and the Mental Component Summary of the 12-Item Short-Form Health Survey (SF-12 MCS). I employ the random effects model and pooled ordinary least squares (OLS) regression to analyse the impact of stock market volatility on subjective mental health, and the random effects probit model to investigate the impact on diagnosed clinical depression. I provide novel evidence that the mental health of immigrants is negatively impacted by stock market volatility in their home countries, with the effect reducing as immigrants disintegrate from their home country (measured by the time since first arrived in the UK) and increasing with the immigrant's age at the time of arrival in the UK. Diagnosed clinical depressions are not affected by stock market volatility in immigrants' home countries.

Secondly, although the equity home bias puzzle has received a great deal of attention in the literature, little is known about the role familiarity plays in the relationship between immigrants' mental health and stock market fluctuations in their home country. I use the Understanding Society dataset from the UK during 2010 to 2023 to investigate how stock market returns in immigrants' home countries impact their subjective mental health, and if familiarity (measured by cultural, geographic and economic distance, and whether the same language is spoken in the home country and the UK) plays a role in this relationship. I employ the fixed effects model and the pooled OLS regression to investigate the link

between home country stock market returns and the subjective mental health of immigrants which I measure using the GHQ-12 and SF-12 MCS. Interaction terms, such as income from interest or dividends, retirement, and retirement income from savings or investments, are utilised to specifically examine how stock market returns impact immigrants' mental health through changes in their wealth. I also investigate the role of familiarity by including several measures of familiarity in the interaction terms, including the cultural, geographic and economic distance, and whether the same language is spoken in the home country and the UK. I also test if economic development moderates this relationship. I find that immigrants' subjective mental health is positively impacted by one-day lagged returns in their home country, with the effect being stronger for immigrants who have retirement income from savings or investments. Daily returns have an immediate impact on immigrants' mental health only if they have income from interest or dividends or if they are retired. I also find that stock market returns have a positive impact on the subjective mental health of immigrants from countries that are developed, and geographically or economically close to the UK, and a negative impact on immigrants from countries that are culturally, geographically and economically distant to the UK, from developing countries, or from countries where English is commonly spoken.

Thirdly, despite the arguments made by prospect theory, stating that losses have a greater impact than equivalent gains when making decisions under risk, the majority of studies investigating the relationship between stock market fluctuations and mental health employ symmetric regression models. Using the UK based Understanding Society dataset during the period 2010 to 2023, I investigate asymmetry and spillover effects in the relationship between people's subjective mental health and stock market fluctuations in their country of residence. I employ a standard fixed effects model and the pooled OLS regression to capture symmetric effects, and an asymmetric fixed effects model using first differences to test if stock market fluctuations have an asymmetric impact on people's subjective mental health, measured by GHQ-12 and SF-12 MCS. I provide evidence that 52-week returns have a symmetric positive impact on the GHQ-12, while 52-week volatility has a symmetric negative impact on subjective mental health. I also find that the impact of negative changes in the level of stock market index on the GHQ-12 is stronger than the effect of positive ones, which supports prospect theory and indicates that this relationship is asymmetric.

Furthermore, I provide evidence that the mental health impairment due to negative 52-week returns spills over to affect investors' household members.

Dedication

To my beloved grandmother.

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Table of Contents

Declaration	ii
Summary	iii
Dedication	vi
Acknowledgements	vii
List of Figures.....	xi
List of Tables	xii
List of Appendices.....	xiv
List of Abbreviations	xv
Chapter 1 Introduction and Overview	1
1.1 Background and Motivation	1
1.2 Research Aims and Objectives.....	5
1.3 Research Questions	6
1.4 Research Contribution	6
1.4.1 Home Country Stock Markets and Immigrants’ Mental Health	6
1.4.2 Familiarity and the Link between Stock Markets and Mental Health	7
1.4.3 Stock Markets and Mental Health – Asymmetry and Spillover Effects	8
1.5 Research Philosophy	9
1.6 Structure of the Thesis	9
1.7 Conference Presentations based on the Thesis	10
1.8 Publications and Journal Submissions based on the Thesis	10
Chapter 2 Literature Review	11
2.1 Theory.....	11
2.1.1 Healthy Migrant Paradox	11
2.1.2 Assimilation Model and Disintegration Theory.....	11
2.1.3 Salmon Bias Hypothesis.....	12
2.1.4 Home Bias Puzzle	13
2.1.5 Prospect Theory.....	15
2.1.6 Lifecycle Theory of Consumption	17
2.1.7 Jacobson Model	20
2.2 Stock Markets and Mental Health	20

2.3 Macroeconomic Conditions and Mental Health.....	23
2.4 Qualitative Studies on Immigrants' Mental Health	24
2.5 Conclusion	25
Chapter 3 Home Country Stock Markets and Immigrants' Mental Health	26
3.1 Introduction.....	26
3.2 Research Hypotheses	29
3.3 Data	30
3.3.1 Dependent Variables	30
3.3.2 Independent Financial and Economic Variables	35
3.3.3 Independent Socio-Demographic Variables	36
3.4 Econometric Models	37
3.5 Results and Discussion	39
3.5.1 Descriptive Statistics.....	39
3.5.2 Impact of Stock Market Volatility on Immigrants' Mental Health	40
3.5.3 Economic Control Variables.....	45
3.5.4 Socio-Demographic Determinants of Mental Health	46
3.5.5 Testing Disintegration Theory from a Financial Market-Based Perspective.....	48
3.5.6 Exposure to Stock Markets	50
3.5.7 Age as a Determinant of Mental Health	51
3.5.8 Robustness Analysis	53
3.6 Conclusion	62
Chapter 4 Familiarity and the Link between Stock Markets and Mental Health	64
4.1 Introduction.....	64
4.2 Research Hypotheses	67
4.3 Data	68
4.3.1 Dependent Variables	68
4.3.2 Independent Variables	70
4.3.3 Interaction Terms.....	71
4.4 Econometric Models	73
4.5 Results and Discussion	75
4.5.1 Descriptive Statistics.....	75
4.5.2 Stock Market Returns in Immigrants' Home Countries	78

4.5.3 Testing the Familiarity Hypothesis	88
4.5.4 Robustness Analysis	90
4.6 Conclusion	94
Chapter 5 Stock Markets and Mental Health – Asymmetry and Spillover Effects	96
5.1 Introduction	96
5.2 Research Hypotheses	99
5.3 Data	99
5.3.1 Dependent Variables	99
5.3.2 Independent Variables.....	103
5.3.3 Control Variables	103
5.4 Econometric Models.....	103
5.5 Results and Discussion.....	105
5.5.1 Descriptive Statistics	105
5.5.2 Main Regression Results	108
5.5.3 Testing the Lifecycle Theory of Consumption	114
5.5.4 Spillover Effects on other Household Members	119
5.5.5 Reliance on Investment Income.....	123
5.5.6 Robustness Analysis.....	127
5.6 Conclusion	128
Chapter 6 Conclusion.....	130
6.1 Summary of Key Findings	130
6.2 Policy Implications	132
6.3 Limitations of the Research	133
6.4 Avenues for Future Work.....	134
6.5 Concluding Remarks	135
Bibliography.....	136
Appendices	150
Appendix A.1 Robustness Analysis for Chapter 3	151
Appendix A.2 Robustness Analysis for Chapter 5	152

List of Figures

Figure 2.1 Interconnections between Migration and Health through Three Mechanisms	13
Figure 2.2 Prospect Theory Value Function.....	16
Figure 2.3 Illustration of the Life Cycle Hypothesis	18
Figure 2.4 Revised Illustration of the Life Cycle Hypothesis	19
Figure 3.1 Relative Frequency of Observations by Home Country.....	31
Figure 3.2 Frequency Distribution of GHQ-12	34
Figure 3.3 Frequency Distribution of SF-12 MCS.....	34
Figure 3.4 Coefficients of GHQ-12	43
Figure 3.5 Coefficients of SF-12 MCS.....	44
Figure 3.6 Marginal Effects on Diagnosed Clinical Depression	45
Figure 3.7 Distance from London to each Home Country	48
Figure 3.8 Effect of Stock Market Volatility on GHQ-12 by Time Since Arrived in UK.....	50
Figure 3.9 Effect of Stock Market Volatility on GHQ-12 by Age when Arrived in UK.....	53
Figure 3.10 Correlations between Volatilities of Stock Markets.....	59
Figure 4.1 Daily Log Returns by Home Country	77
Figure 4.2 Coefficients of GHQ-12	81
Figure 4.3 Coefficients of SF-12 MCS.....	82
Figure 4.4 Predicted Mean of GHQ-12 by Daily Return with Interactions with 95% CIs	85
Figure 5.1 Frequency Distribution of GHQ-12	102
Figure 5.2 Frequency Distribution of SF-12 MCS.....	102
Figure 5.3 52-Week Return, Level of Stock Market Index and 52-Week Volatility	106
Figure 5.4 Effect of Return, Stock Market Index and Volatility on GHQ-12 by Age Group	118

List of Tables

Table 3.1 Variable Descriptions.....	32
Table 3.2 Stock Market Indices by Home Country	36
Table 3.3 Hausman Test Results.....	38
Table 3.4 Descriptive Statistics.....	40
Table 3.5 Regression Results.....	42
Table 3.6 Effect of Stock Market Volatility on GHQ-12 by Time Since Arrived in UK	50
Table 3.7 Effect of Stock Market Volatility on GHQ-12 by Age when Arrived in UK.....	52
Table 3.8 Results of Multicollinearity Test	54
Table 3.9 Robustness Tests on Impact of Stock Market Volatility	55
Table 3.10 Correlations between Volatilities of Stock Markets	57
Table 3.11 Regression Results with the Level of Capital Controls.....	60
Table 3.12 Interactions with the Level of Capital Controls	61
Table 3.13 Regression Results with 52-week Volatility	62
Table 4.1 Variable Descriptions.....	69
Table 4.2 Stock Market Indices by Home Country	71
Table 4.3 Hausman Test Results.....	74
Table 4.4 Descriptive Statistics.....	76
Table 4.5 Main Regression Results.....	80
Table 4.6 Interactions with Return, Income from Interest or Dividends, and Retirement..	83
Table 4.7 Interactions with Return and Retirement Income from Savings or Investments	87
Table 4.8 Interaction Terms	89
Table 4.9 Robustness Analysis	91
Table 4.10 Results of Multicollinearity Test	92
Table 4.11 Correlation Analysis.....	94
Table 5.1 Variable Descriptions.....	101
Table 5.2 Descriptive Statistics.....	108
Table 5.3 Results of Multicollinearity Test	109
Table 5.4 Regression Results for Total Sample and Gender Groups	111
Table 5.5 Regression Results for Age Groups.....	115
Table 5.6 Spillover Effects Regression Results.....	120

Table 5.7 Interactions between Symmetric Effects and Reliance on Investment Income	124
Table 5.8 Interactions between Asymmetric Effects and Reliance on Investment Income	127
Table A.1 Robustness Analysis using Fixed Effects	151
Table A.2 Regression Results for Total Sample and Gender Groups	152
Table A.3 Regression Results for Age Groups	154
Table A.4 Spillover Effects Regression Results	156
Table A.5 Interactions between Symmetric Effects and Reliance on Investment Income	158
Table A.6 Interactions between Asymmetric Effects and Reliance on Investment Income	159

List of Appendices

Appendix A.1 Robustness Analysis for Chapter 3	151
Appendix A.2 Robustness Analysis for Chapter 5	152

List of Abbreviations

Abbreviation	Definition
AFE	Asymmetric Fixed Effects
CI	Confidence Interval
CPI	Consumer Price Index
FE	Fixed Effects
FTSE	Financial Times Stock Exchange
GBP	Pound Sterling
GDP	Gross Domestic Product
GHQ	General Health Questionnaire
GHQ-12	12-Item General Health Questionnaire
MCS	Mental Component Summary
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
POLS	Pooled Ordinary Least Squares
RE	Random Effects
SDG	Sustainable Development Goal
SF-12	12-Item Short-Form Health Survey
SF-12 MCS	Mental Component Summary of the 12-Item Short-Form Health Survey
SFE	Standard Fixed Effects

Chapter 1 Introduction and Overview

1.1 Background and Motivation

Mental health is included in one of the 17 Sustainable Development Goals (SDGs) that were established and adopted by world leaders at the United Nations Summit in September 2015 in New York. The third SDG includes mental health and is named 'Ensure healthy lives and promote well-being for all at all ages' (United Nations. Department of Economic and Social Affairs, 2023). However, mental health issues cost the UK economy £118 billion a year, which is the equivalent of approximately 5% of its gross domestic product (GDP) (McDaid et al., 2022). The National Centre for Social Research performed a survey in 2017 and finds that 65% of the UK's population have experienced a mental health issue and more than 40% of the population have suffered from depression, whereas only 13% claim to have good mental health (Mental Health Foundation, 2017). Another study conducted across 29 countries, including low-income, middle-income and high-income countries, suggests that 50% of the world's population will develop a mental health disorder by the age of 75 (McGrath et al., 2023). The estimated economic impact of mental health disorders globally amounts to approximately USD 5 trillion annually (Arias et al., 2022). At the regional level, the financial burden of mental illness in Eastern Europe and high-income North American countries may account for 8% of their GDP, while the cost for countries in Western Europe and Australasia may amount to 6% of their GDP (Arias et al., 2022).

Concurrently, worldwide migration is at an all-time high, with immigrants accounting for a sizable share of the population in many nations. In 2022, the Organisation for Economic Co-operation and Development (OECD) countries counted more than 6 million new permanent immigrants, with the UK alone experiencing an increase in permanent immigration in 2022 of 35.1% compared to 2021 and 37.9% compared to pre-pandemic levels in 2019 (OECD, 2023). Looking further back, the number of foreign-born residents in the UK increased by 81% from 5.3 million in 2004 to over 9.5 million in 2021 (Rienzo & Vargas-Silva, 2022). This implies that in 2021 one in seven UK residents was born outside of the country.

Previous studies have shown that the mental health status of immigrants often differs from that of the native-born population. According to the healthy migrant paradox, immigrants tend to have better mental health than their native-born counterparts at the time of arrival (Lu & Zhang, 2016; Stawarz et al., 2021). However, this initial mental health advantage of immigrants tends to decline over time as they assimilate into the host country (Constant et al., 2018). In fact, research indicates that immigrants may become more vulnerable to mental health issues during their stay in the host country, with a higher risk of developing mental illnesses compared to the native population (Close et al., 2016). This trend is particularly relevant to the UK, where people from ethnic minority background often show inferior mental health and face greater challenges in accessing mental health services, including more negative experiences, than the white UK-born population (Bansal et al., 2022).

According to previous literature, some of the most prevalent determinants of mental health are age, gender, income, educational status and economic factors (Allen et al., 2014), with prevailing economic conditions and stock market performance being two of the most salient influences on mental health within the economic spectrum (Ratcliffe & Taylor, 2015), and the effect of stock market performance being stronger for individuals with large investments (McInerney et al., 2013). However, previous research indicates that the factors influencing mental health vary between immigrants and the native-born population. Akay et al. (2017) and Nguyen and Connelly (2018) suggest that the mental health of immigrants is influenced not only by macroeconomic conditions, such as the inflation rate and the GDP, in their country of residence, but also in their home country. Despite the existence of an extensive amount of literature investigating the relationship between people's mental health and stock market fluctuations or economic conditions in their country of residence (Frijters et al., 2015; Cotti et al., 2015; Rohde et al., 2016; Schwandt, 2018), it is surprising that few research papers investigate how the mental health of immigrants is influenced by macroeconomic conditions in their home country. Akay et al. (2017), Nguyen and Connelly (2018), and Nguyen and Duncan (2020) provide the only studies I am aware of that include the macroeconomic conditions in immigrants' home countries in their analysis. To my knowledge, no research has yet examined how stock market fluctuations in immigrants' home countries affect their mental health after

moving abroad. Thus, my empirical studies presented in chapters 3 and 4 are the first to investigate how the mental health of immigrants is affected by stock market volatility and stock market returns in their home countries respectively.

This study is particularly relevant to the UK, where stock market participation is the highest among other European countries, according to recent data. In 2024, the participation rate reached 33%, implying that approximately 22.11 million UK residents hold investments in the stock market. On a global scale, the UK ranks fourth in the stock market participation rate, following the United States, Canada, and Australia (HelloSafe, 2024).

The rationale this research is based on is twofold. Firstly, it is influenced by the home bias puzzle, which suggests that investors' portfolios tend to be biased towards domestic stock markets and geographically close firms rather than being internationally diversified (Baltzer et al., 2013; Solnik & Zuo, 2017). One of the explanations provided by the literature to explain this phenomenon is the familiarity hypothesis which states that investors tend to invest more in firms and markets they have a connection with. This connection can be emotional (such as a common language or place attachment), cultural, or due to psychological factors (Grinblatt & Keloharju, 2001; Baltzer et al., 2015; Lindblom et al., 2018; Ardalan, 2019). Immigrants may have a strong emotional and cultural connection with their home country after moving abroad (Siar, 2014; Lemish, 2022). Therefore, I hypothesise that the home bias puzzle may not be limited to investments made geographically close to the investor, but may also include investments in stock markets they are familiar with, such as stock markets in their home country. Therefore, in my study presented in chapter 4, I not only investigate the link between immigrants' mental health and stock market returns in their home country, but also the role familiarity plays in this relationship. I measure familiarity as the geographic distance, economic distance, and cultural distance between the host country and the immigrant's home country, and whether the same language is spoken.

Secondly, the rationale this research is based on is also influenced by disintegration theory, which was developed by Nekoei (2013) and provides a natural counterpart to Chiswick's (1978) assimilation model. The assimilation model by Chiswick (1978) proposes that the wage gap between immigrants and the native-born population diminishes as the time

spent in the host country increases, suggesting that immigrants assimilate financially into the host country over time. Nekoei (2013) adapts this theory and proposes a disintegration theory by providing evidence of a diminishing impact of exchange rates between the immigrants' host and home country on their earnings over time, suggesting that immigrants disintegrate financially from their home country as they assimilate into the host country. I test disintegration theory from a different perspective by investigating how the impact of stock market volatility in immigrants' home countries on their mental health changes with increasing time spent in the host country.

Furthermore, Kahneman and Tversky (1979) propose prospect theory, which posits that losses have a greater impact on people than equivalent gains when making decisions under risk. Tversky and Kahneman (1991) later expand this theory to encompass decisions made under certainty as well. As a result, their work suggests that people have a natural tendency towards loss aversion. Despite the increasing importance of prospect theory in behavioural finance research and its growing application in models of economic behaviour (Barberis, 2013), the vast majority of studies analysing the relationship between people's mental health and stock market fluctuations in their country of residence employ symmetric regression models, assuming that both increases and decreases in the independent variables equally impact the dependent variable (Ratcliffe & Taylor, 2015; Frijters et al., 2015; Cotti & Simon, 2018; Engelberg & Parsons, 2016). McNerney et al. (2013), Cotti et al. (2015) and Schwandt (2018) provide the only studies I am aware of investigating how people's mental health is impacted by wealth shocks, including stock market booms and crashes, thereby capturing asymmetric effects. Liu and Fan (2024) aim to capture asymmetric effects of stock market returns on antidepressant drug usage by employing dummy variables to proxy positive and negative returns in a linear regression model. However, there is no study to date investigating the impact of stock market fluctuations on mental health using an asymmetric fixed effects model for panel data.

The asymmetric fixed effects model for panel data, which was developed by York and Light (2017) and later revised by Allison (2019), provides a general method for investigating asymmetric relationships in panel data analysis. The novelty of this model is its ability to separately estimate and quantify the individual-specific effects of both positive and negative changes in independent variables in a panel data setting, using first differences.

My study presented in chapter 5 provides the first study to investigate the asymmetric effects of stock market fluctuations on mental health using Allison's (2019) asymmetric fixed effects model for panel data. My study overcomes the challenges experienced by previous research (Cotti et al., 2015; Liu & Fan, 2024). Moreover, Cotti and Simon (2018) represent the only study I am aware of that analyses how children's mental health is affected by stock market fluctuations through spillover effects. To my knowledge, I also provide the first study that examines spillover effects of both symmetric and asymmetric effects of stock market fluctuations on the mental health of other adult household members.

The research presented in this thesis follows the call by Talamonti et al. (2024) who conduct a systematic literature review on the impact of financial crises on mental health and well-being and highlight the urgent need to conduct longitudinal studies investigating the full impact of recent financial crises, such as the COVID-19 stock market crash, on people's mental health and well-being. Furthermore, Silva et al. (2020) also perform a systematic literature review, concluding that while economic crises adversely affect mental health, further empirical evidence is required to adapt mental health care systems to the population's specific needs during periods of economic instability.

1.2 Research Aims and Objectives

This research aims to deepen our understanding of the relationship between stock market fluctuations and mental health by investigating the link between immigrants' mental health and stock market fluctuations in their home countries, and exploring asymmetry and spillover effects in the relationship between people's mental health and stock market fluctuations in their country of residence.

To make the research aim more actionable, it is broken down into more specific research objectives. The research objectives I intend to pursue in this thesis are as follows:

1. To determine how immigrants' mental health is affected by stock market fluctuations in their home countries;

2. To assess the role familiarity plays in the relationship between immigrants' mental health and stock market fluctuations in their home country;
3. To examine asymmetry in the relationship between people's mental health and stock market fluctuations in their country of residence and;
4. To investigate mental health spillover effects on other household members due to stock market fluctuations in people's country of residence.

1.3 Research Questions

The research questions were developed in line with existing theory and are strongly influenced by the research gaps identified in the literature. The research questions I investigate in the three studies presented in chapters 3–5 are as follows:

1. How is the mental health of immigrants influenced by stock market fluctuations in their home country?
2. Does the impact of stock market fluctuations in immigrants' home countries on their mental health diminish as the time spent in the host country increases?
3. What role does familiarity play in the relationship between stock market fluctuations and the mental health of immigrants?
4. Is there an asymmetric relationship between people's mental health and stock market fluctuations in their country of residence?
5. Does the mental health impairment due to stock market fluctuations in people's country of residence spill over on other household members?

1.4 Research Contribution

1.4.1 Home Country Stock Markets and Immigrants' Mental Health

In chapter 3, I make both theoretical and empirical contributions to the existing literature. I present the first study to analyse the link between the mental health of immigrants and stock market volatility in their home country. According to the existing theory, immigrants' mental health is determined by factors such as gender, living in a rural or urban area,

moving with or without family members (Lu & Zhang, 2016), language proficiency (Giuntella & Nicodemo, 2018), marital status, their level of education (Nguyen & Connelly, 2018), immigrant status, immigration policy (Giuntella et al., 2021), and home country's macroeconomic conditions measured by the GDP and consumer price index (CPI) (Akay et al., 2017; Nguyen & Connelly, 2018; Nguyen & Duncan, 2020). I add stock market volatility in immigrants' home countries as another determinant of subjective mental health to the existing body of literature.

Furthermore, I investigate disintegration theory from a novel, financial market-based perspective, analysing how the impact of home country stock market volatility on immigrants' mental health changes over time. In terms of my empirical analysis, I add to the literature by expanding the existing evidence on the impact of macroeconomic conditions in immigrants' home countries on their mental health (Akay et al., 2017; Nguyen & Connelly, 2018; Nguyen & Duncan, 2020). I also expand the evidence investigating how people's mental health is affected by stock market fluctuations in their country of residence (McInerney et al., 2013; Ratcliffe & Taylor, 2015; Lin et al., 2015; Cotti et al., 2015; Schwandt, 2018) by examining if stock markets continue to influence people's mental health when they move abroad. Finally, I use measures of both subjective and objective mental health to provide a more robust analysis.

1.4.2 Familiarity and the Link between Stock Markets and Mental Health

In chapter 4, I also make both theoretical and empirical contributions to the literature. Firstly, I provide the first study to investigate the relationship between immigrants' mental health and stock market returns in their home country, and the role familiarity plays in this relationship. Secondly, I make an important contribution to the financial economics literature by providing novel evidence to support the familiarity hypothesis from a perspective based on familiarity between the host country and the home country. Thirdly, I provide a possible extension to the familiarity hypothesis, suggesting that it may not only apply to investors' portfolio compositions, but also to the choice of stock market that is used to evaluate the overall stock market performance or a country's economic prospects.

Fourthly, I build on the work done in chapter 3 by analysing the relationship between home country stock market returns and immigrants' mental health, thereby adding home country stock market returns as another determinant of immigrants' subjective mental health to the existing literature. Fifthly, I expand the existing evidence on how people's mental health is impacted by stock markets in their country of residence (Ratcliffe & Taylor, 2015; Lin et al., 2015; Engelberg & Parsons, 2016; Chen et al., 2016; Schwandt, 2018), providing novel evidence on how mental health is impacted by stock market returns in people's home country. Finally, I provide evidence of an immediate impact of daily stock market returns on immigrants' subjective mental health, suggesting that the longevity of the mental health impairment due to stock market returns may be as short as one day.

1.4.3 Stock Markets and Mental Health – Asymmetry and Spillover Effects

My study presented in chapter 5 makes important methodological and empirical contributions to the literature. I provide the first study to investigate asymmetry in the relationship between people's mental health and stock market fluctuations in their country of residence using Allison's (2019) asymmetric fixed effects model for panel data to overcome the challenges experienced by previous research (Cotti et al., 2015; Liu & Fan, 2024). Furthermore, I present the first study to examine if the mental health impairment due to stock market fluctuations spills over on other household members aged 15 and over. In terms of my empirical analysis, I expand on the existing literature investigating the impact of stock market fluctuations on mental health (Ratcliffe & Taylor, 2015; Frijters et al., 2015; Cotti & Simon, 2018; Engelberg & Parsons, 2016) by providing novel evidence of asymmetry and spillover effects in this relationship. Furthermore, I suggest reliance on investment income as a critical moderator of the relationship between stock market fluctuations and mental health. Finally, I suggest that prospect theory does not hold for males in explaining the relationship between stock market fluctuations and mental health, as my results indicate that the relationship between men's mental health and stock market fluctuations is symmetric.

1.5 Research Philosophy

While conducting my research, I have given some thought to epistemological and ontological issues as part of my research philosophy. My ontological stance is that reality is independent from me as a researcher and it exists without me as an observer. This ontological stance also includes the existence of a social world independent of labels. For my research, I consider immigrants as a social group that may show different behaviour compared to other social groups such as the local-born population. As a researcher in Social Science, my epistemological stance is that I am an observer who tries to discover patterns governing reality and to predict effects of certain variables on others. In general, this refers to the positivism paradigm of research (Monti & Tingen, 2006).

However, I am aware that my dataset, which is based on surveys, contains observations that may be subject to bias. In particular, the subjective variables, such as my measures of subjective mental health, may be biased because the respondents may not describe their actual feelings when being interviewed. This issue is exacerbated by mental health stigma among immigrants which is investigated by numerous studies, highlighting that immigrants experience labelling, stereotyping and discrimination in terms of their mental health status (Saechao et al., 2012; Hatzenbuehler et al., 2013; Pederson et al., 2021). Hence, I adopt post-positivism as my research paradigm as I assume that it is not possible for social science researchers to observe unbiased reality (Letourneau & Allen, 2006). This paradigm seems more appropriate particularly in relation to subjective answers given by respondents. Giving thought to my philosophical stance will advance my work when interpreting my research results in relation to subjective mental health variables.

1.6 Structure of the Thesis

This thesis is divided into six main chapters. Chapter 1 provides an introduction and overview of the thesis. The purpose of chapter 2 is to present the current state of the literature relevant to this research project, including relevant theories on which this thesis is based and which will be tested as part of this research project, as well as research findings provided by previous literature in the field. Chapter 3 includes the results of my

first empirical investigation which investigates the impact of stock market volatility in immigrants' home countries on their mental health, and if the impact changes over time as the immigrants assimilate into the host country. Chapter 4 provides the results of the second study which examines the impact of home country stock market returns on immigrants' mental health and if familiarity influences this relationship. In chapter 5, I present the results of my third study on asymmetry and spillover effects in the relationship between people's mental health and stock market fluctuations in their country of residence. Chapter 6 provides a conclusion to the thesis, highlighting the key findings, implications for policymakers, limitations of this study, and directions for future research.

1.7 Conference Presentations based on the Thesis

Over the course of the PhD programme, I presented my research at both local and international research conferences. I presented chapter 3 at the 50th Academy of International Business (AIB) UK & Ireland Chapter Conference (Birmingham, UK, April, 2024), at the 5th Annual Irish Academy of Finance (IAF) Conference (Dunboyne, Ireland, May 2024), and at the 84th Academy of Management (AOM) Annual Meeting (Chicago, IL, August 2024). Chapter 4 was presented at the 3rd Conference on International Finance; Sustainable and Climate Finance and Growth (CINSC) (Reading, UK, June 2024), and at the 36th Annual Irish Accounting & Finance (IAFA) Conference (Belfast, UK, June 2024). At the conferences, I received valuable feedback from researchers from various disciplines, which was subsequently incorporated into my research project.

1.8 Publications and Journal Submissions based on the Thesis

The three studies presented in this thesis are at different stages of the publication process. Chapters 3 and 4 are currently being prepared for submission to academic journals. A version of chapter 5 has been published in *Health Economics*.

Chapter 2 Literature Review

2.1 Theory

This section reviews the various theoretical frameworks that will form the basis of my empirical analysis. I will begin by discussing the healthy migrant paradox, followed by migration-related theories, including the assimilation model, disintegration theory, and the salmon bias hypothesis. Next, I will explore relevant theories from Finance and Economics, such as the home bias puzzle, prospect theory, and the lifecycle theory of consumption. Finally, I will present the Jacobson model which provides a theoretical framework for the interconnectedness of health among family members.

2.1.1 Healthy Migrant Paradox

Literature on the mental health of immigrants differentiates between their mental health at the time of arrival and during their stay in the host country. Several studies (Huang et al., 2011; Jatrana et al., 2018; Stawarz et al., 2021) suggest that, at the time of arriving, immigrants show better subjective mental health than comparable natives. This phenomenon has been theorised and is termed the ‘healthy migrant paradox’, ‘healthy migrant bias’ or ‘healthy immigrant effect’ (Lu & Zhang, 2016; Stawarz et al., 2021). In contrast, Constant et al. (2018) provide evidence that natives in Israel have a better overall health status than immigrants upon arrival in Israel. Conversely, they also find that immigrants moving to other European countries show better overall health than natives. However, both the health advantage and health disadvantage of immigrants only persist for a few years before the health status of immigrants assimilates into the health status of natives.

2.1.2 Assimilation Model and Disintegration Theory

According to Chiswick’s (1978) assimilation model, the wage disparity between immigrants and natives decreases as the amount of time spent in the host country increases, regardless of whether the immigrants are citizens of the host country. Nekoei (2013)

investigates the assimilation model from a different perspective and reports that the impact of exchange rates on immigrants' salaries diminishes over time. Nekoei's (2013) evidence also indicates that the longer an immigrant has stayed in the host country, the lower the amount of remittances sent to the home country and the less likely they are to return back to their home country. Based on this evidence, Nekoei (2013) proposes a disintegration theory, suggesting that immigrants lose their ties to their home country over time as they assimilate into the host country. This theory can be considered as the natural counterpart to Chiswick's (1978) assimilation theory in that immigrants not only assimilate into the host country but also disintegrate from their home country at the same time (Nekoei, 2013).

2.1.3 Salmon Bias Hypothesis

Lu and Zhang (2016) outline the 'salmon bias hypothesis' which states that immigrants with poor or deteriorating overall health are more likely to return to their home country or move closer to their origin compared to healthier immigrants. The salmon bias mechanism is one of three main mechanisms of the relationship between migration and health as shown in Figure 2.1 which is based on Lu and Zhang's (2016) model of interconnections between migration and health through three mechanisms. The three mechanisms are based on the selection effect which refers to the selection of migrants according to their health status and other characteristics prior to migrating due to the psychological and physical burden as a result of moving and resettling. The selection effect therefore implies that migrants must be healthier than natives which can be linked to the healthy migrant bias as described in section 2.1.1. The migrants then either stay in the host country or return to their origin as their health deteriorates which contributes to the fact that migrants tend to be healthier than non-migrants. The second mechanism of how migration impacts migrant health is the change in the migrants' physical, socioeconomic, and cultural environment they are living in upon moving to the host country. Finally, the third mechanism describes the way migration affects those left behind. While these non-migrants may benefit from remittances, their mental health may also be impacted negatively because of the stress they face from family separation (Lu & Zhang, 2016).

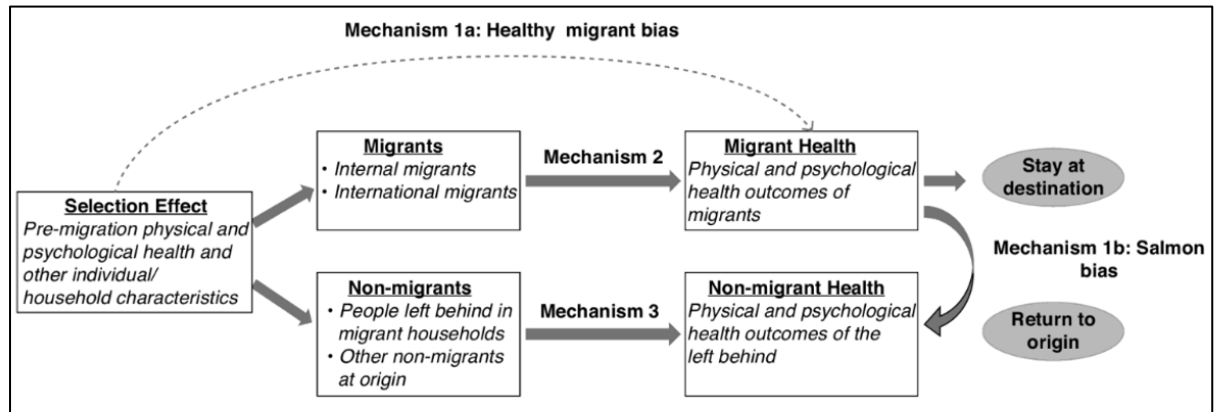


Figure 2.1 Interconnections between Migration and Health through Three Mechanisms

Note: From *The link between migration and health* (p. 20), by Y. Lu & A. T. Zhang, 2016, In *Handbook of Migration and Health* (pp. 19–43), by F. Thomas (Ed.), Edward Elgar Publishing. Copyright 2016 by Felicity Thomas, Yao Lu, and Alice Tianbo Zhang. Adapted from *Rural-urban migration and health: Evidence from longitudinal data in Indonesia* (p. 414), by Y. Lu, 2010, *Social Science & Medicine*, 70(3), 412–419, and *Rural-to-Urban Migration and Changes in Health Among Young Adults in Thailand* (p. 238), by E. Nauman, M. Van Landingham, P. Anglewicz, U. Patthavanit, & S. Punpuing, 2015, *Demography*, 52, 233–257.

2.1.4 Home Bias Puzzle

There is a myriad of research on equity home bias investigating if investors' portfolios are biased towards companies that are located close to their place of residence (Coval & Moskowitz, 2001; Ivkovic & Weisbenner, 2005; Baltzer et al., 2013). The two main explanations provided by the literature to explain this phenomenon are information asymmetry and familiarity. Chan et al. (2005) suggest that this phenomenon is driven by the investors' familiarity with geographically close firms, while Ivkovic and Weisbenner (2005) explain local bias with information asymmetry between local and foreign investors. The logic behind the information asymmetry hypothesis is that local investors have a time advantage compared to foreign investors when it comes to receiving value-relevant information on local firms (Coval & Moskowitz, 2001; Ivkovic & Weisbenner, 2005; Lindblom et al., 2018). Both the information asymmetry hypothesis and the familiarity hypothesis have been investigated by an extensive body of literature (Coval & Moskowitz, 2001; Grinblatt & Keloharju, 2001; Amadi, 2004; Anderson, 2011). Another more recent explanation of local bias is relative optimism which was proposed by Solnik and Zuo (2017). This hypothesis suggests that investors tend to be more optimistic about their local stock

market than foreign stock markets which explains why they tend to overweight local stocks in their investment portfolio.

The investors' familiarity with firms as an explanation of home bias can be broken down into several components, such as language, culture, feelings of belonging, place attachment, and psychological factors (Grinblatt & Keloharju, 2001; Baltzer et al., 2015; Lindblom et al., 2018; Ardalan, 2019). Grinblatt and Keloharju (2001) investigate how investment decisions are influenced by geographic distance, language and culture, providing evidence that both households and institutional investors tend to invest more in companies that are headquartered close to their place of residence, communicate in the investor's native language, and have a chief executive officer from a similar cultural background. Ferreira and Miguel (2011) suggest that a common language, geographic distance, and economic development play a role for investors when investing in bonds overseas. Amadi (2004) reports that investors who invest in foreign stocks favour foreign companies that are headquartered in countries where the investor's language is spoken and in countries that are economically close. Anderson et al. (2011) investigate the influence of culture and familiarity on home bias of institutional investors and find that investors prefer to invest in markets that are both culturally and geographically close to them.

Karlsson and Nordén (2007) investigate the determinants of local bias and suggest that investors with a low level of education, being employed in the public sector, having previous experience with risky investments, and male investors are more likely to hold portfolios that are biased towards local companies. Unlike the literature on local bias, there is limited research investigating if portfolios of individual investors are biased towards their place of birth. Lindblom et al. (2018) examine birthplace bias of individual investors and suggest that their portfolios are biased towards both their place of residence and their place of birth. Conversely, Li et al. (2023) provide evidence from China suggesting that investors are more likely to invest in firms that are close to their place of residence than in firms close to their place of birth. Foad (2011) investigates the relationship between immigration and foreign equity positions and finds that an increase in a country's inward migration is associated with reduced home bias and an increase in foreign equity

positions, suggesting that immigrants' portfolios may be either more internationally diversified or biased towards their home country.

2.1.5 Prospect Theory

Prospect theory states that a loss has a greater impact than an equivalent gain in both decisions under risk (Kahneman & Tversky, 1979) and in riskless choices (Tversky & Kahneman, 1991), suggesting that people are naturally loss averse. In their seminal work, Kahneman and Tversky (1979) propose an S-shaped value function that describes the impact of gains and losses on the value (utility) of individuals. The value function presented in Figure 2.2 shows an S-shaped function that is convex for losses, concave for gains, and steeper for losses than for gains (Kahneman & Tversky, 1979). The origin of the graph represents the reference point, the y-axis illustrates the level of utility and the x-axis represents the gains and losses perceived by individuals. The value function illustrates that a monetary loss leads to a greater loss in an individual's utility than an equivalent monetary gain leading to a gain in utility. In other words, the negative impact of a monetary loss is stronger than the positive impact of a monetary gain, which demonstrates that individuals are loss averse.

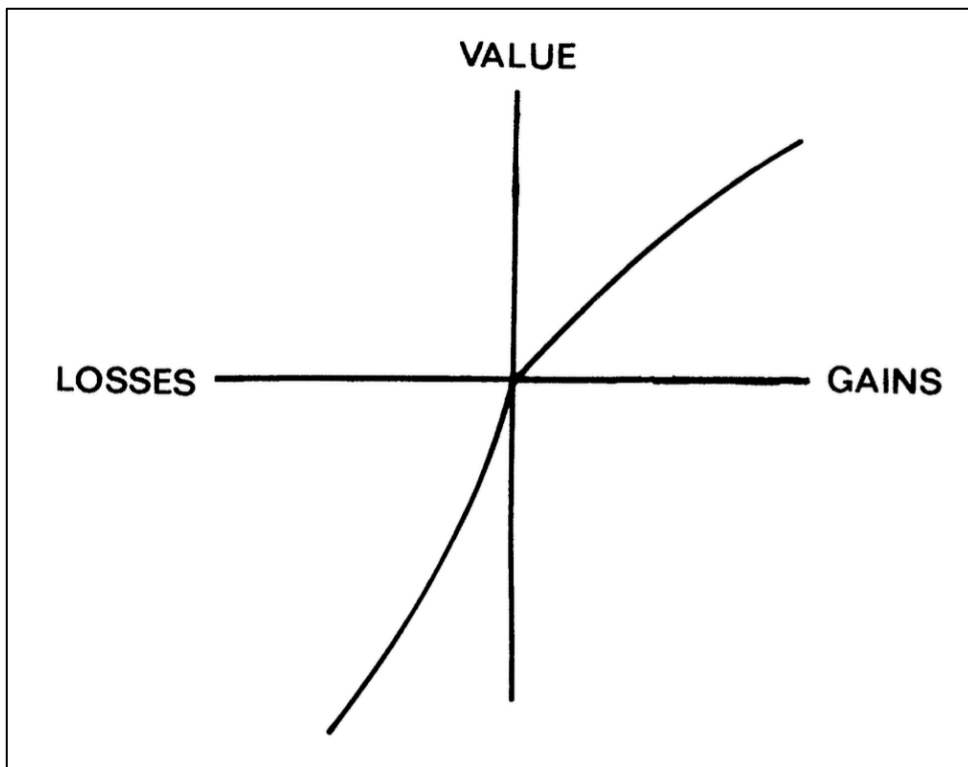


Figure 2.2 Prospect Theory Value Function

Note: From Prospect Theory: An Analysis of Decision under Risk (p. 279), by D. Kahneman & A. Tversky, 1979, *Econometrica*, 47(2), 263–292. Copyright 1979 by Daniel Kahneman and Amos Tversky.

Prospect theory can be tested by using subjective well-being or happiness as measures of an individual's utility (Jervis, 2004). Thus, numerous studies test prospect theory by investigating asymmetry in the relationship between income and mental health or well-being (Boyce et al., 2013; Watson & Osberg, 2019), and in the relationship between economic conditions and happiness (Beja, 2017). The literature provides largely concordant findings suggesting that losses affect people more than gains, which supports prospect theory. Boyce et al. (2013) provide evidence that losses in income have a greater impact on well-being than an equivalent increase in income. Watson and Osberg (2019) find that the effect of negative income anxieties on people's psychological distress is considerably larger than the impact of positive income expectations. Finally, Beja (2017) reports that the impact of negative economic growth on happiness is two times stronger than an equivalent increase in economic growth. Easterlin (2023) provides an explanation for the phenomenon of asymmetry in the relationship between changes in the level of

income and happiness, stating that the effect depends on the benchmark used. While during a recession an individual's current income is compared with the previous peak income, in times of economic growth people use other people's income as a reference level.

2.1.6 Lifecycle Theory of Consumption

Modigliani and Brumberg's (1954) lifecycle theory of consumption suggests that young and middle-aged people accumulate wealth over the course of their lives up until retirement and consume it during their retirement. Figure 2.3 shows a graphical illustration of income, consumption, saving and wealth as a function of age (Modigliani, 1966). The graph shows that people's wealth A at age T peaks at the start of their retirement N and declines until the end-of-life L . The consumption curve C shows that people save and thereby accumulate wealth until retirement and dissave during their retirement. The income curve Y lies above the consumption curve before retirement, indicating that individuals have the means to save money and accumulate wealth, and below the consumption curve from the start of retirement until the end-of-life, which represents a period of dissaving.

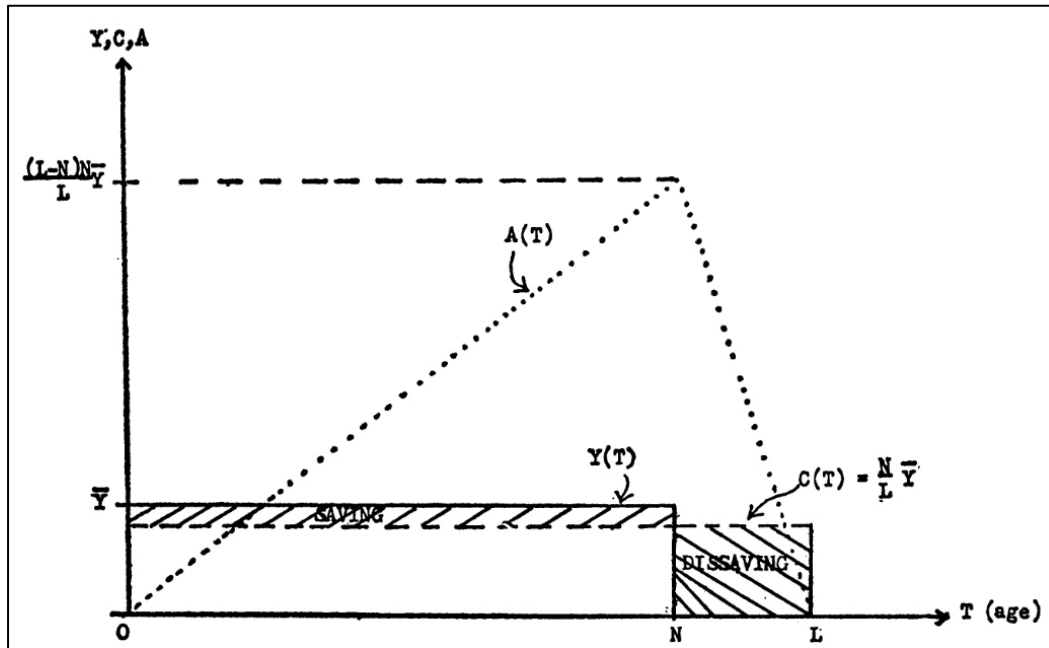


Figure 2.3 Illustration of the Life Cycle Hypothesis

Note: From *The Life Cycle Hypothesis of Saving, the Demand for Wealth and the Supply of Capital* (p. 165), by F. Modigliani, 1966, *Social Research*, 33(2), 160–217. Copyright 1966 by Franco Modigliani.

The lifecycle theory of consumption has been developed further by the literature to include a period of dissaving for young individuals as presented in Figure 2.4 (Naruetharadhol et al., 2021). This inclusion seems reasonable, as young individuals may need to take out student loans to finance their education (Holzmann et al., 2019). The model presented in Figure 2.4 shows that there are two periods of dissaving which occur when the income curve Y lies below the consumption curve C . This is the case for young individuals between the ages of 15–25 and older individuals from the age of 65. Middle-aged individuals between the ages of 25–65 pay off any student loans that were previously taken out and accumulate wealth which will be consumed during retirement. The revised model presented in Figure 2.4 also shows that the consumption curve increases over an individual's life time to represent the increasing consumption expenditure over the course of people's lives.

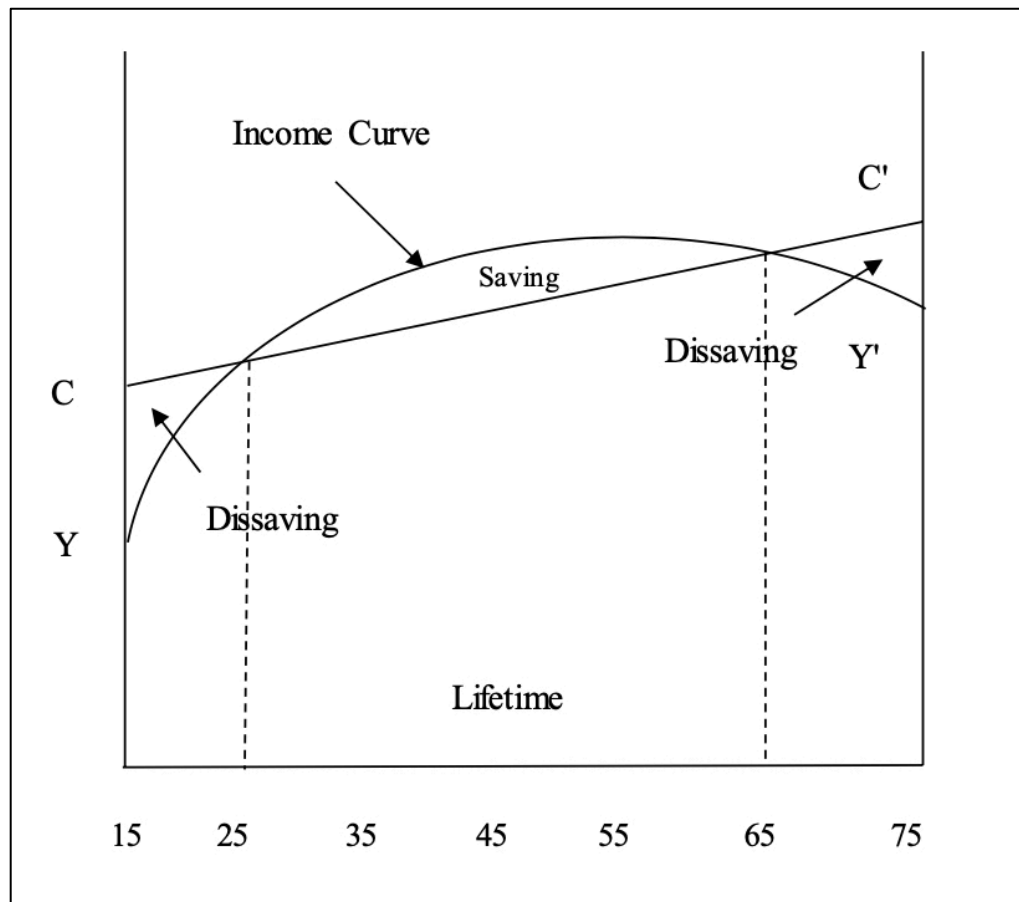


Figure 2.4 Revised Illustration of the Life Cycle Hypothesis

Note: From Career status, retirement readiness, and age differences: Empirical evidence from skilled immigrants in Thailand (p. 3), by P. Naruetharadhol, S. Wongsachia, M. Van Wouwe, & C. Ketkaew, 2021, *Cogent Business & Management*, 8(1), Article 1885572. Copyright 2021 by Phaninee Naruetharadhol, Sasichakorn Wongsachia, Martine Van Wouwe and Chavis Ketkaew. Adapted from The Life Cycle Hypothesis of Saving, the Demand for Wealth and the Supply of Capital (p. 165), by F. Modigliani, 1966, *Social Research*, 33(2), 160–217.

The lifecycle theory of consumption has been tested by numerous studies that support the lifecycle hypothesis (Ando & Modigliani, 1957; Ando & Modigliani, 1963; Tobin, 1967; White, 1978). Frijters et al. (2015) apply the lifecycle theory in a different context and examine the impact of stock market performance on people's well-being. Their findings suggest that the positive impact of stock market performance on well-being is strongest for young (25–44) and middle-aged (45–60) males. Their findings support the lifecycle hypothesis as, according to Modigliani and Brumberg (1954), young and middle-aged individuals are in the process of accumulating wealth.

2.1.7 Jacobson Model

The Jacobson model suggests that individuals are producers of both their own and other family members' health (Jacobson, 2000). This model is an extension of the Grossman model of health capital and the demand for health (Grossman, 1972) which was extended by Jacobson (2000) to provide a theoretical framework for the interconnectedness of health among family members. The Jacobson model can be linked to a growing body of literature investigating mental health spillover effects on family members (Lee et al., 2021; Jung et al., 2024). Previous research suggests that mental health impairments due to unemployment or job displacement are contagious, particularly for the spouse (Nikolova & Ayhan, 2019; Zhao, 2023). Cotti and Simon (2018) investigate the impact of stock market fluctuations on the mental health of children, suggesting a spillover effect of stock markets on children's self-reported health status.

2.2 Stock Markets and Mental Health

There appears to be a consensus in the literature that people's mental health is impacted by stock market movements in their country of residence. Ratcliffe and Taylor (2015) and Cotti et al. (2015) find that increases in annual and monthly stock market returns are positively associated with people's self-reported mental health. Ratcliffe and Taylor (2015) and Lin et al. (2015) also find that there is an inverse relationship between stock market volatility and people's subjective and objective mental health respectively. In other words, the more volatile the stock market, the weaker people's mental health. Both Engelberg and Parsons (2016) and Lin et al. (2015) provide evidence that a decrease in daily stock market returns is associated with an immediate increase in the number of hospital admissions for mental disorders, including anxiety, panic disorder, and major depression. Consistent with this, Chen et al. (2016) report that a decline in daily stock market returns leads to more neurotic disorder doctor visits. Frijters et al. (2015) include income from dividends as a moderator in their model and find that an increase in the stock market index leads to better mental health and life satisfaction, with the effect being strongest for those who have income from dividends. Sargent-Cox et al. (2011) investigate the impact of the global financial crisis on the mental health of retirees and report that they show increased

levels of depression and anxiety as a result of the crisis. These findings build on earlier literature on the mental health of retirees which suggests that their self-reported mental health is particularly vulnerable to a significant decline in income and financial strain, with the latter referring to an individual's subjective perception that their income is inadequate (Lindeboom et al., 2002; Angel et al., 2003).

While most studies assume a symmetric relationship between stock market fluctuations and mental health, few research papers also investigate the impact of wealth shocks on mental health, thereby capturing asymmetric effects in their analysis (McInerney et al., 2013; Cotti et al., 2015; Schwandt, 2018). McInerney et al. (2013) investigate how people's mental health was impacted by the 2008 stock market crash. They provide evidence of an increase in people's feelings of depression and use of antidepressant drugs after the crash, with the effect being stronger for investors with large investments prior to the crash. Schwandt (2018) restricts their sample to stock-holding retirees in the US and finds that shocks in the US stock market have a strong impact on their mental health, physical health, and survival rates. It should be noted that the evidence provided by Schwandt (2018) suggests that the impact of stock market returns on the mental health of stock-holding retirees is symmetric. Cotti et al. (2015) provide evidence of a negative effect on mental health of monthly returns that are less than -10%, while positive returns larger than 10% do not affect people's mental health.

Liu and Fan (2024) investigate the asymmetric effect of stock market returns on the use of anti-depressant drugs during 2005 and 2006 and suggest that negative stock market returns lead to an increase in the consumption of antidepressant drugs, while positive returns do not have an impact. However, this study is limited in that a linear regression model is used with dummy variables as proxies for positive and negative stock market returns to capture their asymmetric effects. As a result, the coefficients are biased, and the magnitude of the effect cannot be determined due to the absence of numeric variables to measure stock market returns. Besides, Liu and Fan (2024) analyse a period of two years, which can be considered relatively short compared to other studies in the field (Cotti et al., 2015; Ratcliffe & Taylor, 2015; Engelberg & Parsons, 2016; Schwandt, 2018).

Research on the impact of stock markets is not limited to mental health. Several studies expand the literature by studying the impact of stock markets in people's country of residence on suicide rates. Research using stock market data from South Korea and Taiwan suggests that a decrease in the level of stock market index leads to an increase in suicide rates or the number of attempted suicides in the respective country (Lin et al., 2017; Kim, 2019a). Another study (Wisniewski et al., 2020) using stock market indices from 36 countries provides evidence of an inverse relationship between stock market returns and suicide rates. In contrast, most of the literature using stock market data from the US predominantly suggests that there is no relationship between stock market movements and suicide rates (Pierce, 1967; Nandi et al., 2012). However, Abdou et al. (2020) suggest that suicide rates in the US among males aged 15-24 and females aged 55-64 are affected by stock market volatility and suicide rates among females aged 15-34 are affected by the level of stock market index, albeit a population-wide impact cannot be reported.

There are two main channels proposed in the literature to explain why stock markets affect people's mental health, a pure wealth effect and stock markets as a barometer of economic prospects, social movements, and social mood (Ratcliffe & Taylor, 2015). Firstly, the pure wealth effect suggests that a decline in the stock market will result in a reduction in wealth for stock-holders, which then affects their mental health (McInerney et al., 2013; Frijters et al., 2015). This explanation is in line with literature suggesting that income and wealth are determinants of mental health (Allen et al., 2014; Hidrobo et al., 2023). Secondly, a stock market index may be an indicator for economic prospects, social movements, and social mood. The literature suggests the direction of causality to be from economic prospects to mental health, suggesting that better economic prospects lead to increasing mental health because of increasing income expectations (Ratcliffe & Taylor, 2015). For social movements and social mood, causality is reversed. The behavioural finance literature suggests that the social mood, including pessimism and optimism, can lead to overreactions in stock markets. Examples of such phenomena include stock market crashes and bubbles (Prechter & Parker, 2007). These channels are important in addressing endogeneity problems when interpreting the findings of studies investigating the relationship between stock market fluctuations and mental health.

2.3 Macroeconomic Conditions and Mental Health

Literature on the impact of macroeconomic conditions in people's country of residence on their mental health reports concordant findings. Kopasker et al. (2018) classify economic insecurity as a socioeconomic determinant of mental health. Their study includes several measures of economic insecurity, including a significant loss in income, an individual's expectation of their financial situation within the next year, and their satisfaction with their job security. They find an inverse relationship between economic insecurity, which tends to be correlated with stock market volatility (Asgharian et al., 2023), and subjective mental health. Reichert and Tauchmann (2017) investigate the relationship between workforce reduction, subjective job insecurity and mental health and find that a reduction in a firm's workforce has a negative impact on people's mental health, mediated through increased feelings of job insecurity. Rohde et al. (2016) suggest that an increase in economic volatility adversely affects subjective mental health. They further report that job insecurity, financial dissatisfaction, and reductions and volatility in income have a negative impact on self-reported mental health. Janke et al. (2023) identify an inverse relationship between the employment growth rate in local areas in the UK and the mental health of local residents.

Apart from that, there is widespread agreement in the literature that an increase in economic growth inversely associates with suicide rates (Pereira dos Santos et al., 2016; Yin et al., 2016). Breuer (2015) suggests that an increase in unemployment rates leads to a rise in suicide rates. Vondra and Kawachi (2021) and Vondra et al. (2019) look at the relationship between economic uncertainty and suicide rates, providing evidence that economic uncertainty leads to an increase in suicide rates. Furthermore, Abdou et al. (2022) investigate how suicide rates are impacted by economic uncertainty in the US and find that there is an asymmetric relationship between economic uncertainty and suicide. While increases in economic uncertainty result in an increased number of suicides among males aged 25–64 and females aged 65 and over, decreases in economic uncertainty do not affect suicide rates (Abdou et al., 2022).

Furthermore, the literature provides evidence on how immigrants' mental health is affected by macroeconomic conditions in their home countries, albeit research in this area

is limited. Akay et al. (2017) conclude that an increase in GDP in the immigrants' home country decreases their subjective well-being. They explain this phenomenon by stating that migrants immigrate to other countries in order to improve their standard of living, and therefore improving macroeconomic conditions in the immigrants' home countries may cause them to question their decision to migrate. Notwithstanding, the authors summarise that this effect fades as immigrants assimilate into the host country, supporting the disintegration theory. They further report that immigrants who arrive in the host country as children are the least affected by macroeconomic conditions in their home countries. According to their research, exchange rates between the host country and home country do not affect immigrants' subjective well-being. However, Nguyen and Connelly (2018) and Nguyen and Duncan (2020) partly disagree with these findings. They find evidence that an increasing GDP and a decreasing CPI in the immigrants' home countries do have a positive effect on their subjective mental health and well-being, bearing in mind that the effect weakens as the immigrants assimilate into the host country, supporting the disintegration theory. Nguyen and Connelly (2018) also report that unemployment rates in the immigrants' home countries and exchange rates between the immigrants' host country and home country do not affect their self-reported mental health.

2.4 Qualitative Studies on Immigrants' Mental Health

Qualitative research on the mental health of immigrants identifies several post-migration stressors and determinants of their mental health through interviews and analyses of lived experiences. Several studies in this field consistently highlight employment-related difficulties, such as unemployment and deteriorating employment conditions resulting from economic crises and poor economic conditions, as important factors influencing the mental health of immigrants (Jafari et al., 2010; Ronda et al., 2016; Mwanri et al., 2022). In line with this, Simich et al. (2006) and Sellers et al. (2006) emphasise that economic hardship and financial concerns can significantly affect immigrants' mental health. During times of economic crises, Briones-Vozmediano et al. (2014) report that immigrants may

experience increased insecurity due to fears that equality policies are deprioritised by governments, and that migration-related resources will be the first to face cuts.

In addition to economic concerns, other prevalent post-migration stressors include language barriers, cultural differences between the host and the home country, and the emotional toll of being separated from family members (Jafari et al., 2010; Pinedo et al., 2021; Mwanri et al., 2022; Ojurongbe, 2023; Shankar et al., 2024). Lastly, racism towards immigrants is found to have a negative impact on their mental health, contributing to increased symptoms of depression (Sellers et al., 2006; Ojurongbe, 2023).

2.5 Conclusion

Chapter 2 includes a review of relevant literature to provide an overview of existing theory relevant to the topic investigated in this thesis and previous studies investigating topics similar to this thesis. While most theories have been applied by previous literature studying people's mental health, the home bias puzzle has not previously been used in studies investigating the relationship between stock markets and the mental health of immigrants. The literature on the link between stock markets and mental health agrees that stock market performance is positively associated with people's mental health, while stock market volatility has a negative impact on mental health. Stock market performance is also negatively associated with suicide rates. Furthermore, there is a consensus in the literature that macroeconomic conditions in people's country of residence are positively associated with their mental health and inversely associated with suicide rates, albeit some studies suggest that these findings do not apply to the impact of the US stock market on suicide rates in the US. Literature investigating how immigrants' mental health is impacted by macroeconomic conditions in their home countries provides mixed evidence. Qualitative research identifies additional factors affecting immigrants' mental health, including employment-related difficulties, financial concerns, economic hardship, and language barriers.

Chapter 3 Home Country Stock Markets and Immigrants' Mental Health

Abstract

Despite the fact that immigrants make up a considerable proportion of the population in many countries, little is known about how their mental health is affected by stock markets in their home countries. I use panel data from the Understanding Society dataset to conduct a longitudinal study investigating this relationship for foreign-born residents in the UK, during the period 2010 to 2021. I provide novel evidence that immigrants' subjective mental health is negatively impacted by stock market volatility in their home countries. This effect weakens as immigrants assimilate into the host country and increases with the immigrants' age when they first arrive in the UK. I also find that diagnosed clinical depression as an objective measure of mental health is not affected. I recommend that immigrants be provided with both psycho-education and financial education upon arrival in the host country to alleviate mental health issues.

3.1 Introduction

Each year, mental health issues cost the UK economy £118 billion, approximately 5% of the UK's GDP (McDaid et al., 2022). According to a survey conducted in 2017 by the National Centre for Social Research, 65% of the UK's population have experienced a mental health issue and more than 40% of the population have suffered from depression. In contrast, only 13% claim to have good mental health (Mental Health Foundation, 2017). In many countries immigrants make up a considerable proportion of the population. In the UK, the number of foreign-born residents increased by 81% from 5.3 million in 2004 to over 9.5 million in 2021, implying that in 2021 one in seven UK residents was born outside of the country (Rienzo & Vargas-Silva, 2022).

Some of the most prevalent determinants of mental health are gender, educational status, age, income and economic factors (Allen et al., 2014). With prevailing economic conditions and stock market performance being two of the most salient influences on mental health within the economic spectrum (Ratcliffe & Taylor, 2015), it is surprising that few research

papers explore the association between immigrants' mental health and macroeconomic conditions in their home countries. Exceptions include Akay et al. (2017), Nguyen and Connelly (2018), and Nguyen and Duncan (2020). The majority of research in this area investigates the relationship between a person's mental health and macroeconomic conditions or stock market movements in their country of residence rather than their home country (Frijters et al., 2015; Cotti et al., 2015; Rohde et al., 2016; Schwandt, 2018). To my knowledge, there is no research to date investigating how immigrants' mental health is affected by stock markets in their home countries and my study is the first to investigate if stock market volatility in immigrants' home countries impacts their mental health. This study follows the call by Silva et al. (2020) who conduct a systematic literature review and conclude that while periods of economic crises may have a negative effect on mental health, more empirical evidence is required to adapt mental health care systems to the population's specific needs in times of economic instability.

The theory behind this investigation is grounded in the assimilation model by Chiswick (1978), which suggests that the pay gap between immigrants and natives dissipates with increasing time spent in the host country. Nekoei (2013) adapts this theory and proposes a disintegration theory which suggests that immigrants reduce their ties to their home country over time by providing evidence that the impact of exchange rates on immigrants' earnings weakens over time. I test the disintegration theory from an alternative angle by investigating the impact of stock market volatility in immigrants' home countries on their mental health.

While my results predominantly contribute to the literature on the social determinants of mental health, they also have implications for the financial economics literature. The home bias theory proposes that investors are biased towards domestic stock markets and do not avail of cross-border diversification opportunities that may offer potential gains (Chan et al., 2005). Numerous empirical studies find evidence to support this hypothesis (Coval & Moskowitz, 2001; Ivkovic & Weisbenner, 2005). If the mental health of immigrants is strongly influenced by stock market volatility in their home country, it may suggest that they have strong financial connections with that market and their personal portfolios may be biased towards their home country rather than internationally

diversified as theory suggests, that is their home bias is towards their country of origin rather than their country of residence.

I use panel data from the Understanding Society dataset to conduct a longitudinal study on foreign-born residents in the UK, during the period 2010 to 2021. My dataset includes immigrants from the 23 most common home countries of foreign-born UK residents surveyed. I use the 12-Item General Health Questionnaire (GHQ-12) and the Mental Component Summary of the 12-Item Short-Form Health Survey (SF-12 MCS) to measure subjective mental health, and diagnosed clinical depression as my measure of objective mental health. I use stock market volatility to measure financial instability and uncertainty (Bryan & Rafferty, 2014; Dowling & Harvie, 2014) which I calculate using the annualised standard deviation of each home country's primary stock market index based on daily logarithmic returns. I employ the random effects (RE) model, pooled ordinary least squares (POLS) regression and the random effects probit model to study the relationship between immigrants' mental health and stock market volatility in their home countries. In addition, I check the robustness of my results using a sub-period analysis, and I determine the Pearson product-moment correlation coefficient between stock market volatility of each home country to check if there is cross-sectional dependence in the dataset. Finally, I compute the variance inflation factors to ensure my regression results are not biased due to multicollinearity between my independent variables.

I provide robust evidence that immigrants' subjective mental health is negatively associated with stock market volatility in their home countries. This effect diminishes as immigrants assimilate into the host country and increases with the immigrants' age when they first arrived in the UK. These findings support the disintegration theory and imply that immigrants aged 50 or above when they arrive in the UK may have invested for their retirement in their home country before immigrating to the UK. I also find that while subjective mental health is affected, there is no impact on the level of diagnosed clinical depressions. Furthermore, I find that males, married immigrants and immigrants with a high level of education show better subjective and objective mental health, whereas low income is associated with a decrease in subjective mental health. The distance between the UK and immigrants' home countries is also found to have a negative impact on their subjective mental health.

In this chapter, I make both theoretical and empirical contributions to the existing literature. According to the existing theory, immigrants' mental health is determined by factors such as gender, moving with or without family members, living in a rural or urban area (Lu & Zhang, 2016), education, marital status (Nguyen & Connelly, 2018), language proficiency (Giuntella & Nicodemo, 2018), immigrant status, immigration policy (Giuntella et al., 2021), and the home country's macroeconomic conditions measured by GDP and CPI (Nguyen & Connelly, 2018; Nguyen & Duncan, 2020). I add another determinant of immigrants' subjective mental health, namely, stock market volatility in their home countries.

Furthermore, I investigate disintegration theory using a novel, financial market-based perspective. In terms of my empirical analysis, I add to the literature by expanding the existing evidence on the impact of macroeconomic conditions in immigrants' home countries on their mental health. I also expand the evidence investigating how a person's mental health is affected by stock market movements by using measures of both subjective and objective mental health to provide a more robust analysis. Finally, I recommend to policy makers that immigrants be provided with psycho-education upon arrival in the UK to help them manage their mental health and mitigate any negative effects arising from challenges in accessing mental healthcare in the host country.

The remainder of this chapter is organised as follows. First, I present the research hypotheses, followed by a description of the dataset and the econometric models used to conduct this study. Next, I present the results along with a discussion, including an examination of the robustness of my findings. The chapter concludes with a summary of the study's key findings and their implications for policymakers.

3.2 Research Hypotheses

The literature provides evidence that peoples' mental health is inversely impacted by stock market volatility in their country of residence (Ratcliffe & Taylor, 2015; Lin et al., 2015). There is also evidence that immigrants' mental health is affected by the macroeconomic conditions in their home countries (Akay et al., 2017; Nguyen & Connelly, 2018; Nguyen &

Duncan, 2020). Furthermore, the disintegration theory suggests that immigrants reduce their financial ties to their home country over time (Nekoei, 2013). Based on the existing theory and previous research I develop the following research hypotheses:

H1. Immigrants' mental health is affected by stock market volatility in their home country.

H2. The impact of stock market volatility on immigrants' mental health weakens as the time spent in the host country increases.

3.3 Data

3.3.1 Dependent Variables

I use a UK based panel dataset, Understanding Society (University of Essex. Institute for Social and Economic Research, 2022), covering the period 2010 to 2021. The dataset consists of immigrants from 23 countries which represent the 23 most common home countries of immigrants surveyed, including Australia, Bangladesh, Canada, China, Cyprus, France, Germany, Ghana, India, Ireland, Italy, Jamaica, Kenya, New Zealand, Nigeria, Pakistan, Poland, South Africa, Spain, Sri Lanka, Türkiye, Uganda and the United States. Figure 3.1 shows the relative frequency of observations by home country, indicating that the largest share of immigrants was born in India, Pakistan or Bangladesh. A full description of all variables used in my analysis can be found in Table 3.1. My sample comprises a total of 42,807 observations and includes 9,584 individuals interviewed over several years.

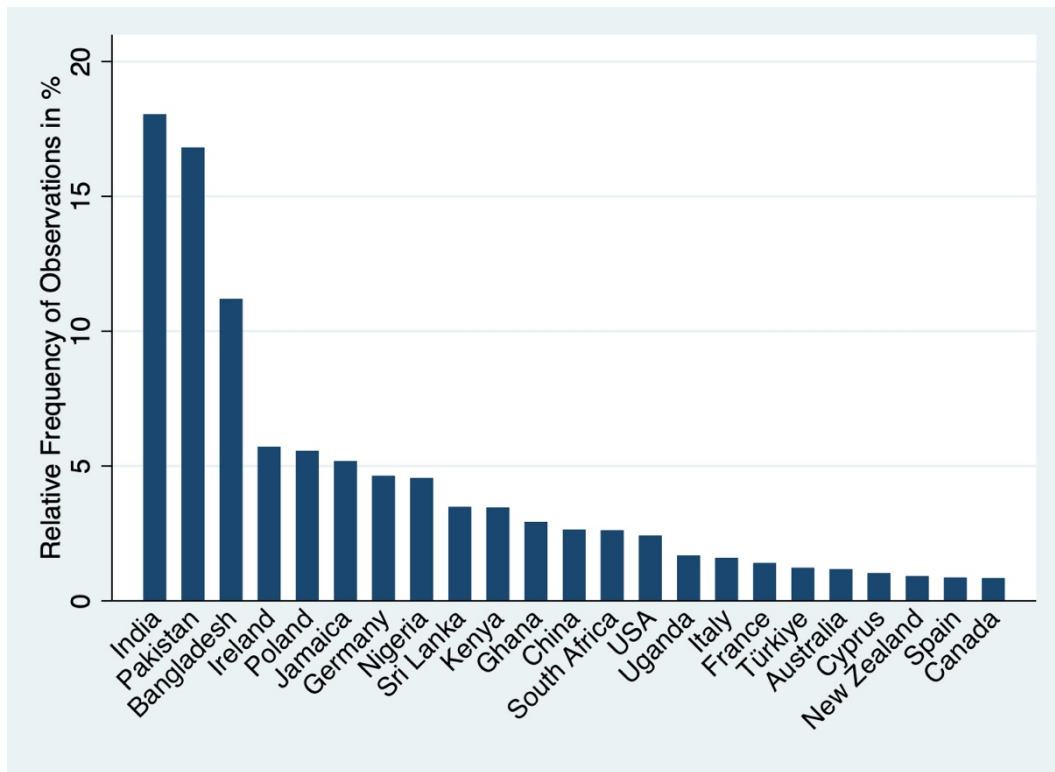


Figure 3.1 Relative Frequency of Observations by Home Country

Table 3.1 Variable Descriptions

Variable	Definition
Dependent variables	
GHQ-12	12-Item General Health Questionnaire (GHQ-12) score. The lower the score the better the mental health. The score's range is 0 – 36.
SF-12 MCS	Mental Component Summary (MCS) of the 12-Item Short-Form Health Survey (SF-12). The higher the score the better the mental health. The score's range is 0 – 100.
Diagnosed clinical depression	Dummy variable: =1 if the individual has ever been diagnosed with clinical depression by a doctor or other health professional.
Independent variables	
Stock market volatility	Annualised standard deviation of home country's stock market index based on daily logarithmic returns.
Exchange rate	Home country's annual foreign exchange rate to Pound Sterling (GBP) at year-end. An increasing value indicates a weakening foreign currency.
GDP	Home country's real gross domestic product per capita in constant 2015 USD.
CPI	Home country's Consumer Price Index.
Female	Dummy variable: =1 if sex assigned at birth is female. Coefficients are relative to male.
Age	The research participant's age in years at the time of the interview.
Low level of education	Dummy variable: =1 if level of education is other than Higher Degree (Masters, PhD), First Degree (Bachelors) and Diploma in Higher Education. Coefficients are relative to higher education.
Single	Dummy variable: =1 if current marital status is single. Coefficients are relative to married.
Divorced	Dummy variable: =1 if current marital status is divorced. Coefficients are relative to married.
Widowed	Dummy variable: =1 if current marital status is widowed. Coefficients are relative to married.
Other marital status	Dummy variable: =1 if current marital status is other than married, single, divorced, or widowed. Coefficients are relative to married.
Resident in rural area	Dummy variable: =1 if research participant is a rural resident. Coefficients are relative to urban residents.
Resident in England	Dummy variable: =1 if research participant is a resident of England. Coefficients are relative to residents of Northern Ireland.
Resident in Wales	Dummy variable: =1 if research participant is a resident of Wales. Coefficients are relative to residents of Northern Ireland.
Resident in Scotland	Dummy variable: =1 if research participant is a resident of Scotland. Coefficients are relative to residents of Northern Ireland.
Born in non-English speaking country	Dummy variable: =1 if research participant was born in a country other than Ireland, Australia, New Zealand, Canada, United States, or Jamaica. Coefficients are relative to residents born in English speaking countries.
No exposure to stock markets	Dummy variable: =1 if research participant has no interest or dividend income. Coefficients are relative to research participants with interest or dividend income.
Low income	Dummy variable: =1 if research participant's monthly individual income is less than the median income (£1,206.33). Coefficients are relative to research participants with a monthly individual income greater than the median income.
Home distance	Distance from London to home country's capital city in km.
Time since first arrived in UK	Time in years since research participant arrived in UK to live for a minimum of 3 months or with the intention to settle indefinitely.

My dependent variables include two measures of subjective mental health, GHQ-12 and SF-12 MCS, and also diagnosed clinical depression as a measure of objective mental health. The GHQ-12 is the sum of 12 items which make up the short form of the General Health Questionnaire (GHQ) created to measure self-reported psychiatric illness (Goldberg, 1972). Each question can be answered on a 4-point Likert scale with scores from 0 to 3. The GHQ-12 score is calculated by adding the scores from all answers. The lower the score, the better the individual's mental health. The 12-Item Short-Form Health Survey (SF-12) is a short version of the SF-36 questionnaire that measures subjective mental health of individuals. The SF-12 questionnaire includes 12 questions which are answered on 3-point and 5-point Likert scales. The responses to each question are weighted and transformed into a Mental Component Summary (MCS) which results in a score between 0 and 100. The higher the score, the better the individual's mental health (Ware et al., 1995).

While the GHQ is specifically designed to capture psychiatric disorders such as anxiety and depression (Goldberg, 1972), the SF-12 MCS is a more general measure to assess a person's mental health status. Its components include vitality, social functioning, mental health, and role-emotional, with the latter assessing difficulties in daily activities caused by emotional problems (Ware et al., 1995; Nguyen & Connelly, 2018). I use both variables to measure subjective mental health from two different perspectives. Figures 3.2 and 3.3 show the frequency distribution of the GHQ-12 and the SF-12 MCS respectively. Diagnosed clinical depression is a dummy variable where 1 indicates if the individual has ever been diagnosed with clinical depression by a doctor or other health professional and 0 otherwise.

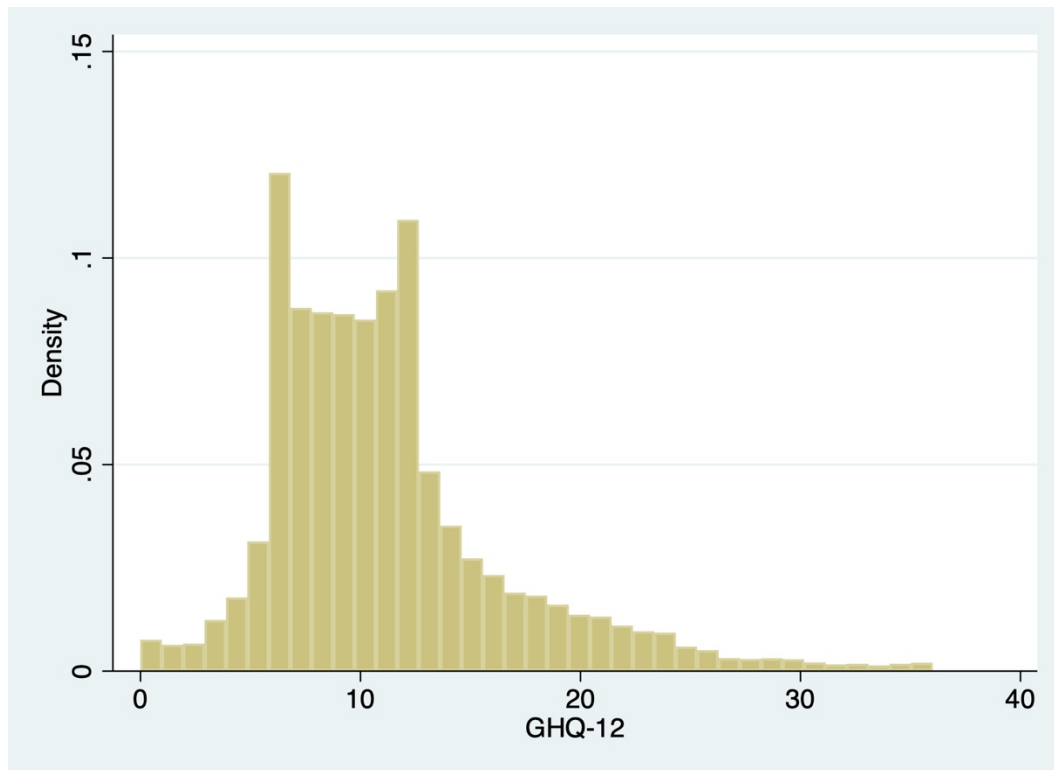


Figure 3.2 Frequency Distribution of GHQ-12

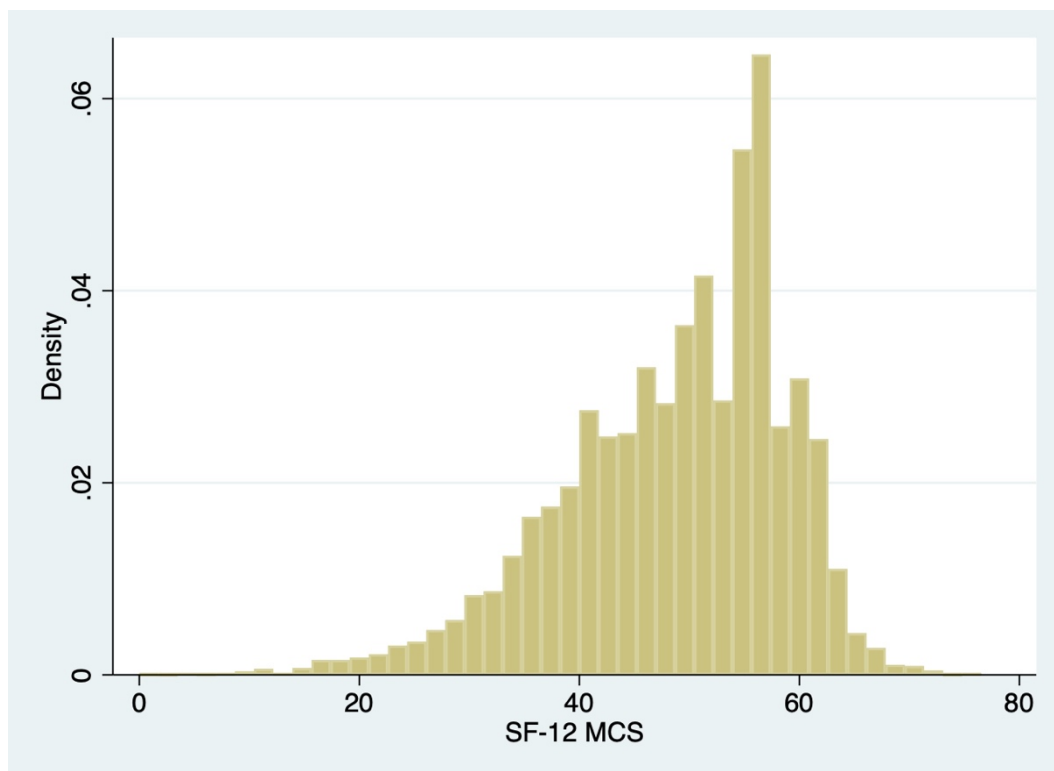


Figure 3.3 Frequency Distribution of SF-12 MCS

Using three different measures of mental health enables this study to provide differentiated insights into the impact stock market volatility has on mental health. Mental health has many different aspects and there are several ways to measure it. Each measure has their unique objective of what aspect of mental health will be measured, and it is important to capture the impact stock market volatility has on each measure, as otherwise incorrect conclusions may be drawn from this relationship. An impact on the GHQ-12 may indicate that stock market volatility leads to psychiatric disorders (Goldberg, 1927), whereas an impact on the SF-12 MCS would show that stock market volatility affects the general mood of immigrants (Ware et al., 1995), which may or may not be an indicator of psychiatric disorders.

Furthermore, a diagnosed mental health issue differs considerably from self-reported mental health, as doctors and other health professionals are trained to identify any disorders a person may have. Using a measure of objective mental health may also help overcome the challenges associated with measuring people's mental health, as subjective measures may be subject to bias due to mental health stigma among immigrants which may result in inaccurate responses from respondents when being interviewed. This illustrates the importance of using several different measures of mental health.

3.3.2 Independent Financial and Economic Variables

My main independent variable is stock market volatility in each immigrant's home country. I measure stock market volatility as the annualised standard deviation of each home country's stock market index listed in Table 3.2, based on daily logarithmic returns. I also use the exchange rate of each home country's currency to Pound Sterling (GBP) as an independent variable. An increasing value indicates a weakening foreign currency relative to GBP. I also control for macroeconomic conditions in each immigrant's home country measured by GDP per capita and CPI. To create my unique dataset, I merge these financial and economic variables to each immigrant from the respective home country in the respective year the interview took place. The stock market data and exchange rates were obtained from Bloomberg. The GDP and CPI were obtained from the World Bank's World Development Indicators database (The World Bank, 2024a).

Table 3.2 Stock Market Indices by Home Country

Home Country	Stock Market Index
Australia	S&P/ASX 200
Bangladesh	Bangladesh Dhaka Stock Exchange Broad Index
Canada	S&P/TSX Composite Index
China	Shanghai Shenzhen CSI 300 Index
Cyprus	Cyprus Stock Exchange General Index
France	CAC 40 Index
Germany	Deutsche Boerse AG German Stock Index DAX
Ghana	Ghana Stock Exchange Composite Index
India	S&P BSE SENSEX Index
Ireland	ISEQ All-Share Index
Italy	FTSE MIB Index
Jamaica	Jamaica Stock Exchange Market Index
Kenya	Nairobi Securities Exchange Ltd 20 Index
New Zealand	S&P/NZX 50 Gross Index
Nigeria	NGX All Share Index
Pakistan	Karachi Stock Exchange KSE-100 Index
Poland	WIG20
South Africa	FTSE/JSE Africa Top 40 Index
Spain	IBEX 35 Index
Sri Lanka	Sri Lanka Colombo Stock Exchange All Share Index
Türkiye	Borsa Istanbul 100 Index
Uganda	Uganda Securities Exchange All Share Index
United States	S&P 500 Index

3.3.3 Independent Socio-Demographic Variables

I use panel data from the Understanding Society dataset to obtain the independent socio-demographic variables, including gender, age, education level, marital status, country of residence, income level and time since the immigrant first arrived in the UK. I also include a variable based on the distance in kilometres from London to the capital of each immigrant's home country. These data were obtained from the Gleditsch and Ward dataset (Gleditsch & Ward, 2001) which calculates the distance between capital cities in kilometres using the shortest path between two points on the spherical surface (Chopde & Nichat, 2013). Finally, I control for time and home country dummy variables in the regression models.

3.4 Econometric Models

I employ two models, the random effects model and pooled ordinary least squares (OLS) regression, for each of the dependent variables, GHQ-12 and SF-12 MCS. The pooled OLS model estimates the mental health y of immigrant i from home country c at time t as follows:

$$y_{itc} = \alpha + x'_{itc}\beta + \varepsilon_{itc} \quad (3.1)$$

In the above equation, y_{itc} represents the dependent variables GHQ-12 and SF-12 MCS of immigrant i from home country c at time t . α is the intercept, x'_{itc} represents the i^{th} independent variable, β is the slope parameter for respective independent variables and ε_{itc} is the error term.

Using the random effects model, I estimate the mental health y of immigrant i from home country c at time t as follows:

$$y_{itc} = \mu + x'_{itc}\beta + u_{itc} \quad (3.2)$$

In the above equation, y_{itc} represents the dependent variables GHQ-12 and SF-12 MCS of immigrant i from home country c at time t . μ is the intercept, x'_{itc} represents the i^{th} independent variable, β is the slope parameter for respective independent variables and u_{itc} is the composite error term which includes the error term ε_{itc} and the individual-specific effects α_i of immigrant i . The random effects model is appropriate for this study given that the time-invariant variables affect the dependent variables of interest (Bartram, 2019).

I run two Hausman tests to determine whether the random effects model or fixed effects (FE) model is more appropriate for my dataset. The Hausman test tests if the independent variables are correlated with the unique errors u_{itc} (Torres-Reyna, 2007). The first Hausman test is a multivariate model including all variables from my study. The second test is a univariate model with stock market volatility as the sole independent variable, as this is the main variable of interest for this study. The results of the Hausman test are presented in Table 3.3.

The Hausman test for the multivariate model suggests that the fixed effects model is appropriate for this study. However, the Hausman test for the univariate model suggests that the random effects model is more suitable for the dataset. Given that the time-invariant variables affect the dependent variables of interest, I conclude that the random effects model is more appropriate for this study (Bartram, 2019). Furthermore, although the coefficients of time-varying variables can be estimated using the fixed effects model, the estimates may be imprecise if there is cross-sectional variation rather than variation over time in the variables of interest (Cameron & Trivedi, 2005). To ensure that using the random effects model does not lead to incorrect estimates, I also run the regressions using a fixed effects model in the robustness analysis of this study.

Table 3.3 Hausman Test Results

	<i>GHQ-12</i>	<i>SF-12 MCS</i>
Multivariate Model		
χ^2	87.31	145.18
p-value	0.000	0.000
Univariate Model		
χ^2	1.34	0.03
p-value	0.248	0.873

Note: I list the results for two Hausman tests using two different dependent variables, GHQ-12 and SF-12 MCS.

Given that diagnosed clinical depression is a dummy variable, I employ a panel data regression that accommodates a binary dependent variable. I use the random effects probit model and estimate the response probabilities $P(y_{itc} = 1)$ of diagnosed clinical depression y of immigrant i from home country c at time t as follows:

$$P(y_{itc} = 1) = \mu + x'_{itc}\beta + u_{itc} \quad (3.3)$$

In the above equation y_{itc} represents the dichotomous variable diagnosed clinical depression of immigrant i from home country c at time t . μ is the intercept, x'_{itc} represents the i^{th} independent variable, β is the slope parameter for respective independent variables and u_{itc} is the composite error term which includes ε_{itc} as well as the individual-specific effects α_i of immigrant i . As the probit model is a non-linear

regression model, coefficients cannot be directly interpreted (Cornelißen & Sonderhof, 2009). Therefore, in Table 3.5 I present the marginal effects rather than the coefficients.

3.5 Results and Discussion

3.5.1 Descriptive Statistics

Table 3.4 shows the descriptive statistics for each variable. The mean of the GHQ-12 score is 11.032 and the mean of SF-12 MCS is 48.782. The mean of diagnosed clinical depression is 0.033, indicating that 3.3% of the respondents have been diagnosed with clinical depression. The mean of the annualised standard deviation of stock market returns across sample countries is 0.159. My sample consists of 54.1% female respondents and the average respondent was 47.466 years old at the time of the interview. 60.6% of respondents are married. On average, the immigrants included in my sample have been living in the UK for 26.699 years and the mean distance to their home country is 5,805 km. 83.7% of respondents were born in a non-English speaking country.

Table 3.4 Descriptive Statistics

	Mean	Standard Deviation	Minimum	Maximum
GHQ-12 (N = 31,343)	11.032	5.650	0	36
SF-12 MCS (N = 29,351)	48.782	10.152	0	76.53
Diagnosed clinical depression (N = 40,893)	0.033	0.179	0	1
Stock market volatility	0.159	0.060	0.057	0.723
Exchange rate	169.445	572.764	1.112	4,998.126
GDP	11,848.299	18,266.580	767.739	88,588.484
CPI	134.956	32.278	100	354.304
Female	0.541	0.498	0	1
Age	47.466	16.453	15	102
Low level of education	0.650	0.477	0	1
Single	0.172	0.377	0	1
Divorced	0.055	0.228	0	1
Widowed	0.047	0.212	0	1
Other marital status	0.120	0.325	0	1
Resident in rural area	0.067	0.250	0	1
Resident in England	0.931	0.254	0	1
Resident in Wales	0.018	0.134	0	1
Resident in Scotland	0.026	0.159	0	1
Born in non-English speaking country	0.837	0.369	0	1
No exposure to stock markets	0.879	0.326	0	1
Low income	0.500	0.500	0	1
Home distance	5,805.142	3,121.375	365	18,817
Time since first arrived in UK	26.699	17.505	0	102

3.5.2 Impact of Stock Market Volatility on Immigrants' Mental Health

Regression results are presented in Table 3.5. Coefficients for the GHQ-12 are interpreted inversely because the GHQ-12 uses an inverse scale to measure mental health with 0 indicating good mental health. I also provide coefficient plots (Jann, 2014) in figures 3.6 and 3.7 to visualise the coefficients and 95% confidence intervals (CIs) for the GHQ-12 and the SF-12 MCS for both the random effects and pooled OLS model. Table 3.5 includes the results for my five regressions where the dependent variables are GHQ-12, SF-12 MCS and diagnosed clinical depression respectively. The random effects model indicates that the subjective mental health of immigrants living in the UK decreases when stock market volatility increases in their home countries. A one-unit increase in the annual standard deviation of the home country's stock market index results in an increase of 1.107 units in the GHQ-12, which indicates a decrease in immigrants' mental health measured by GHQ-12 of 3.1%. These findings support research hypothesis *H1*. To ensure my results are not driven by the choice of regression model, I also run the regression using a fixed effects

model and find that the results for the impact of stock market volatility on the GHQ-12 are in line with each other. The results are reported in Table A.1 in Appendix A.1.

The results imply that immigrants may have strong financial connections with their home country, supporting the home bias theory, and their portfolios may be biased towards their home country rather than internationally diversified. I explain these results by suggestion that stock market volatility may be seen as an indicator of uncertainty and fear, and increases particularly during times of financial stress (Kalotychou & Staikouras, 2009). This may cause immigrants to be apprehensive about their future, such as their retirement, but also about their family and friends in their home country, and therefore affects their subjective mental health. Another explanation is that a reduction in wealth and the fear of a worsening financial situation may result in people becoming more anxious (Lin et al., 2015) which may lead to deteriorating self-reported mental health for immigrants. This finding supports the findings reported by Akay et al. (2017), Nguyen and Connelly (2018), and Nguyen and Duncan (2020) who suggest that immigrants' mental health is affected by macroeconomic conditions in their home country. Both the random effects and pooled OLS model also suggest that the SF-12 MCS is not affected by stock market volatility in the immigrants' home countries. The results of the fixed effects regression I perform as a robustness analysis confirm this finding. The results are also presented in Table A.1 in Appendix A.1.

Table 3.5 Regression Results

	Subjective mental health				Objective mental health
	GHQ-12		SF-12 MCS		Diagnosed clinical depression
	RE	POLS	RE	POLS	RE probit
Stock market volatility	1.107** (0.497)	0.996 (0.635)	-0.747 (0.923)	-0.305 (1.164)	-0.003 (0.009)
Exchange rate	-0.001*** (0.000)	-0.001 (0.001)	0.001* (0.001)	0.001 (0.001)	-0.000 (0.000)
GDP	0.000** (0.000)	0.000* (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000 (0.000)
CPI	0.000 (0.001)	0.000 (0.001)	-0.013*** (0.002)	-0.014*** (0.003)	0.000 (0.000)
Female	0.794*** (0.106)	0.657*** (0.066)	-1.582*** (0.197)	-1.405*** (0.122)	0.008*** (0.002)
Age	0.015*** (0.005)	0.008** (0.003)	0.021** (0.010)	0.045*** (0.006)	-0.000 (0.000)
Low level of education	0.141 (0.108)	0.224*** (0.069)	-0.639*** (0.200)	-0.788*** (0.128)	0.003* (0.002)
Single	0.536*** (0.122)	0.707*** (0.093)	-1.009*** (0.229)	-1.484*** (0.172)	0.005** (0.002)
Divorced	0.889*** (0.175)	1.218*** (0.135)	-1.808*** (0.324)	-2.585*** (0.248)	0.010*** (0.002)
Widowed	0.846*** (0.210)	0.629*** (0.163)	-1.647*** (0.390)	-1.275*** (0.300)	0.009*** (0.003)
Other marital status	1.251*** (0.187)	1.561*** (0.176)	-1.941*** (0.355)	-2.431*** (0.329)	-0.001 (0.002)
Resident in rural area	-0.302 (0.188)	-0.213* (0.127)	0.576* (0.342)	0.614*** (0.229)	-0.002 (0.003)
Resident in England	-0.096 (0.372)	0.147 (0.211)	-0.338 (0.673)	-0.605 (0.382)	0.002 (0.005)
Resident in Wales	-0.289 (0.509)	-0.073 (0.301)	0.067 (0.913)	-0.272 (0.544)	-0.000 (0.007)
Resident in Scotland	0.176 (0.475)	0.359 (0.272)	-0.470 (0.857)	-1.141** (0.492)	0.010* (0.006)
Born in non-English speaking country	0.429 (0.439)	0.844*** (0.294)	-0.698*** (0.815)	-1.120** (0.542)	0.012** (0.006)
No exposure to stock markets	0.219** (0.085)	0.605*** (0.092)	-0.452*** (0.158)	-1.241*** (0.168)	0.001 (0.002)
Low income	0.367*** (0.067)	0.441*** (0.068)	-0.328*** (0.123)	-0.598*** (0.125)	0.000 (0.001)
Home distance	0.000** (0.000)	0.000 (0.000)	-0.001*** (0.000)	-0.000*** (0.000)	-0.000 (0.000)
Time since first arrived in UK	0.026*** (0.005)	0.022*** (0.003)	-0.033*** (0.009)	-0.029*** (0.005)	0.000* (0.000)
Year dummies	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes

Note: I list the results from five models using three different regressions, pooled OLS, random effects regression and random effects probit regression, and three different dependent variables, GHQ-12, SF-12 MCS and diagnosed clinical depression. For the pooled OLS and random effects models, coefficients are reported. For the random effects probit model, marginal effects are reported. Standard errors are in parentheses.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

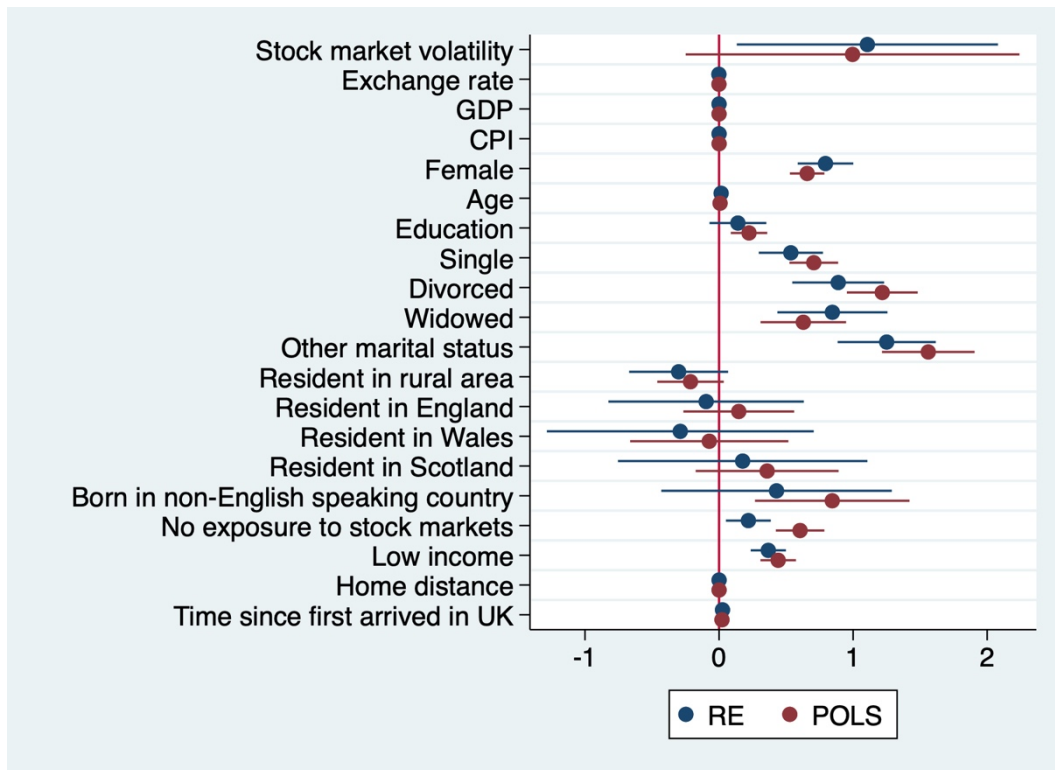


Figure 3.4 Coefficients of GHQ-12

Note: The coefficient plot illustrates the coefficients of the impact of each independent variable on the GHQ-12 using two models, the random effects and pooled OLS regression, with 95% confidence intervals.

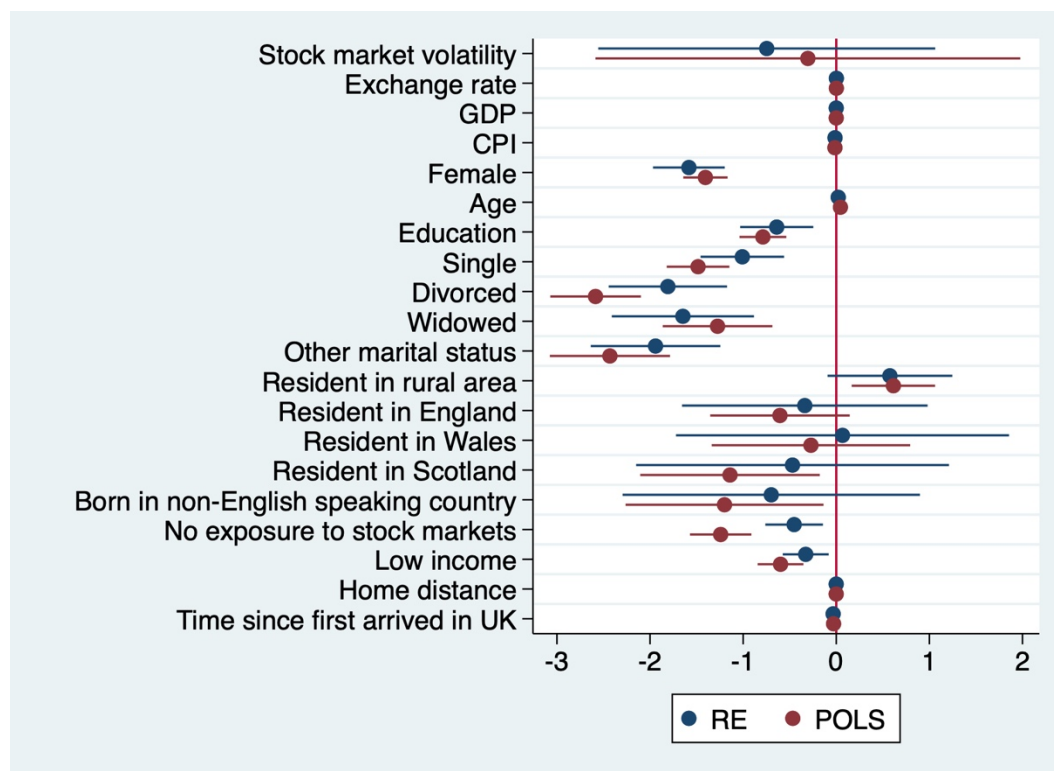


Figure 3.5 Coefficients of SF-12 MCS

Note: The coefficient plot illustrates the coefficients of the impact of each independent variable on the SF-12 MCS using two models, the random effects and pooled OLS regression, with 95% confidence intervals.

I also find that while stock market volatility in the immigrants' home countries does affect self-reported mental health, there is no impact on diagnosed clinical depression among immigrants. I present the marginal effects in a plot in figure 3.8. Thus, I find variation between the impact on immigrants' subjective and objective mental health. The explanation I propose is that the anxiety of immigrants regarding stock markets in their home countries may be transient and therefore only affect their subjective mental health over a limited period of time, as my results not only suggest that an increase in stock market volatility leads to weaker subjective mental health, but also that a reduction in stock market volatility leads to better subjective mental health. This suggests that the longevity of self-reported mental health issues may be shorter than clinical depression diagnosed by a doctor or other health professional, which is considered a more severe form of depression, associated with more serious symptoms and medical treatment (Patten & Juby, 2008) rather than transient worrying. Therefore, I conclude that stock

market volatility in immigrants' home countries impacts their subjective mental health but does not lead to an increase in severe forms of depression. To further investigate the potential short longevity of the mental health impairment due to home country stock market volatility, I include daily stock market returns in immigrants' home countries in my analysis presented in chapter 4.

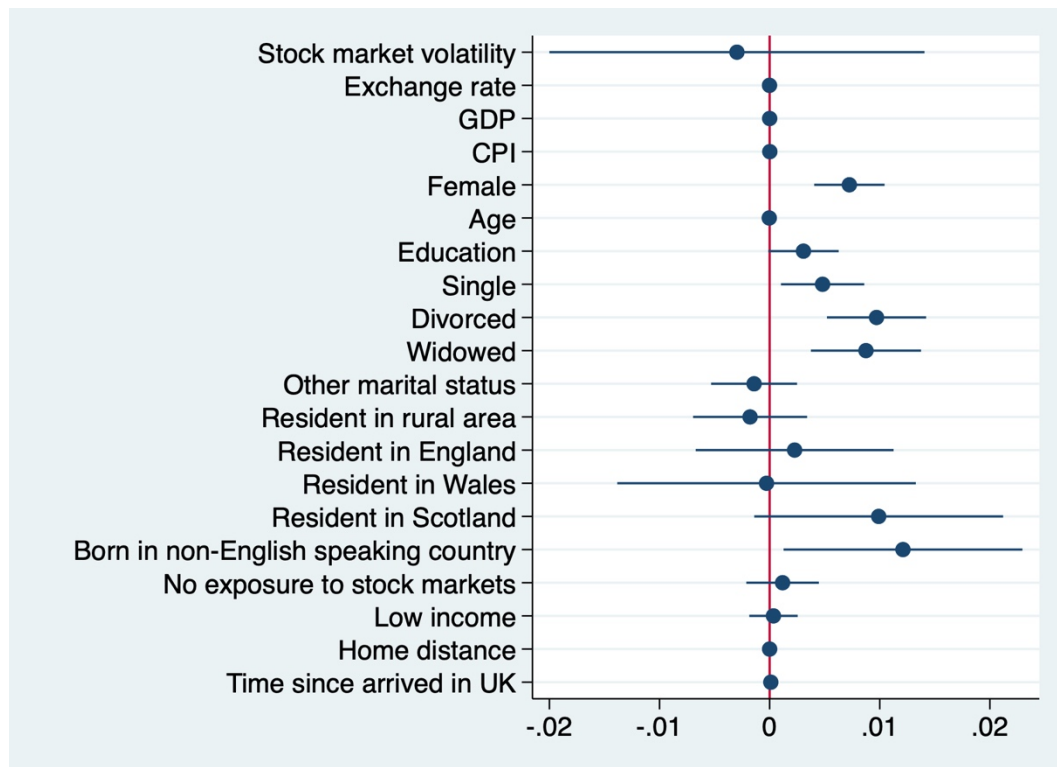


Figure 3.6 Marginal Effects on Diagnosed Clinical Depression

Note: The plot illustrates the marginal effects of the impact of each independent variable on diagnosed clinical depression using the random effects probit model with 95% confidence intervals.

3.5.3 Economic Control Variables

I note that a weakening currency in the home country is associated with better subjective mental health. This may be explained by the simultaneous appreciation in GBP relative to the home country's currency. This result runs counter to the findings provided by previous research (Akay et al., 2017; Nguyen & Connelly, 2018). An increasing GDP leads to a decrease in immigrants' subjective mental health. This supports the findings of Akay et al.

(2017) who suggest that improving macroeconomic conditions in the home country may question the immigrant's decision to migrate, but contradicts the findings provided by Nguyen and Connelly (2018), and Nguyen and Duncan (2020). Finally, I provide evidence that a higher CPI is associated with a decrease in the immigrants' SF-12 MCS as found in previous research (Nguyen & Connelly 2018; Nguyen & Duncan 2020).

3.5.4 Socio-Demographic Determinants of Mental Health

All models suggest that females and immigrants with lower levels of education report inferior subjective mental health and are more likely to be diagnosed with clinical depression. The findings are consistent with previous studies (Ratcliffe & Taylor, 2015; Nguyen & Connelly, 2018; Blanchflower & Bryson, 2024). Simon (2002) interprets the gender gap in mental health status as a product of gender-linked socialization of emotion, which means that females are more prone than men to express distress via internalising emotional issues, such as depression. They also state that biological predisposition may account for the gender gap. Awaworyi Churchill et al. (2020) suggest that gender differences in locus of control contribute to the gender gap in mental health, indicating that a person's perception of how much control they have over their life may determine their mental health status. An explanation for the impact of education on subjective mental health may be that education helps develop cognitive and social skills and promotes a healthier lifestyle. Furthermore, high levels of education are associated with a higher income, which positively influences people's mental health (Jiang et al., 2020).

Immigrants whose marital status is single, divorced, widowed or 'other' report a lower level of subjective mental health relative to married immigrants, supporting previous research (Ratcliffe & Taylor, 2015; Nguyen & Connelly, 2018). I also provide evidence that single, divorced or widowed immigrants are more likely to be diagnosed with clinical depression relative to married immigrants, implying that being married leads to a health advantage for immigrants in both their subjective and objective mental health. These results may be linked to the literature suggesting that being married is a cause as well as a consequence of good mental health, indicating that being married improves mental

health and mentally healthy persons are more likely to get married in the first place (Simon, 2002).

Immigrants living in a rural area have a better SF-12 MCS and the pooled OLS model also suggests an increase in the GHQ-12. This result may be explained by the slow-paced lifestyle in rural areas compared to cities and the greater supply of natural environments in rural areas which is associated with better health by helping people to recover from stress and stimulating physical activity (Verheij et al., 2008). Living in a rural area does not affect diagnosed clinical depression. The results from the pooled OLS model suggest that immigrants living in Scotland have a lower SF-12 MCS and are more likely to be diagnosed with clinical depression than immigrants living in Northern Ireland. These findings can be linked to suicide rates among the UK nations, with suicide rates being highest in Scotland (Zero Suicide Alliance, 2022).

Immigrants born in non-English speaking countries report inferior subjective mental health and are more likely to be diagnosed with clinical depression, suggesting that immigrating from English speaking countries, such as Australia, Canada, Ireland, Jamaica, New Zealand and US, leads to a health advantage. These findings are in line with previous research (Jatrana et al., 2018; Nguyen & Connelly, 2018). A possible explanation for my results may be that the above listed English-speaking countries, with the exception of Jamaica, are among the wealthiest countries in the world, measured using GDP per capita (The World Bank, 2023). Another explanation may be that the absence of a language barrier increases the likelihood of securing stable employment (Giuntella & Nicodemo, 2018). This may be explained by the advantage native English speakers have in securing a well-paid, communication-intensive professional occupation rather than a manual-intensive job (Bazzoli et al., 2024).

The distance from London to the capital of the immigrant's home country negatively affects their subjective mental health but not their objective mental health. In other words, the further the distance between UK and the immigrant's home country, the weaker their self-reported mental health. Figure 3.9 shows the distance between London and each home country. One explanation for these results may be that countries that are closer to the UK are more similar in terms of cultural aspects and it is geographically closer

to family members or friends in their home country. This can be linked to the salmon bias hypothesis which states that immigrants move closer to their country of origin as their mental health is deteriorating (Lu & Zhang, 2016). This may explain why immigrants who migrate a short distance show better subjective mental health than those migrating longer distances. Another explanation may be that the geographically close countries in Europe, such as Ireland, France and Germany are wealthy countries, measured by GDP per capita, and the less wealthy countries, such as Bangladesh, India, Kenya, Pakistan and Uganda are farther away from UK (The World Bank, 2023; Gleditsch & Ward, 2001).

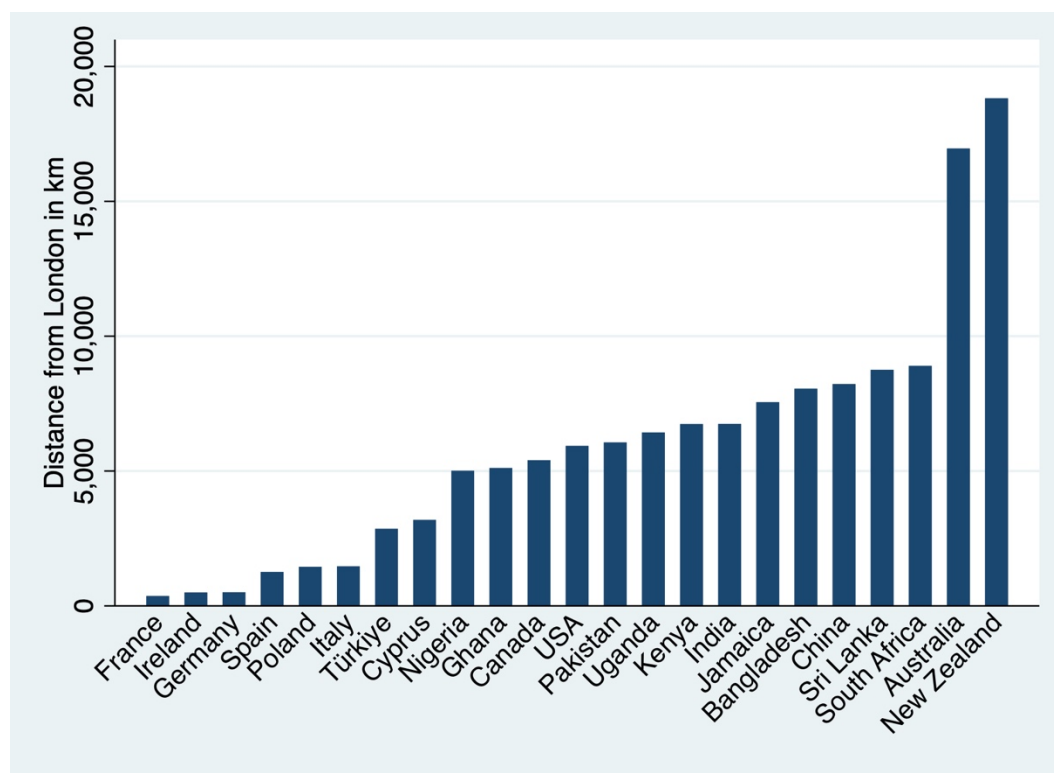


Figure 3.7 Distance from London to each Home Country

3.5.5 Testing Disintegration Theory from a Financial Market-Based Perspective

The time since the immigrant arrived in the UK has a negative effect on both their self-reported mental health and diagnosed clinical depression. In other words, the longer immigrants have been in the UK, the weaker their subjective mental health and the more likely they are to be diagnosed with clinical depression. This finding is in line with existing

theory. Stawarz et al. (2021) note that immigrants have better subjective mental health than comparable natives upon arrival in the host country, which is called the ‘healthy migrant paradox’. Furthermore, Constant et al. (2018) suggest that immigrants’ overall health becomes more similar to the health of comparable natives as the time spent in the host country increases, which can be seen as an alternative investigation of assimilation theory (Chiswick, 1978). Hence, in line with my findings, I conclude that people who immigrate to the UK may have better mental health than the native population upon arrival, but their mental health deteriorates until it approximates the mental health status of their native counterparts.

Expanding on this, the existing body of literature (Akay et al., 2017; Nguyen & Connelly, 2018; Nguyen & Duncan, 2020) tests disintegration theory from a macroeconomic perspective and suggests that the effect of economic conditions on subjective mental health varies according to the time since the immigrants’ arrival in the host country. Therefore, I divide the dataset into four sub-samples according to the time spent in the UK and model the impact of stock market volatility on the immigrants’ GHQ-12 for each sub-sample using a random effects model to test disintegration theory from a financial perspective. I use the random effects model and the GHQ-12, as this result is statistically significant as presented in the main regression results in Table 3.5. The coefficients presented in Table 3.6 and Figure 3.10 show that the impact of stock market volatility on subjective mental health weakens as the time spent in the UK increases. Immigrants who have spent 50 years or more in the UK tend to be the least affected by stock market volatility in their home country. This supports the disintegration theory (Nekoei, 2013) by using the impact of stock market volatility on mental health as an alternative measure of immigrants’ connectedness with their home country. My findings support research hypothesis *H2* and are in line with the evidence provided by previous literature (Akay et al., 2017; Nguyen & Connelly, 2018; Nguyen & Duncan, 2020).

Table 3.6 Effect of Stock Market Volatility on GHQ-12 by Time Since Arrived in UK

Time since arrived in UK	Coefficient	[95% Confidence Interval]	
0-15	0.877 (0.914)	-0.915	2.670
16-30	1.798 (1.060)	-0.279	3.876
31-50	1.442 (0.988)	-0.494	3.378
50+	0.692 (1.148)	-1.557	2.941

Note: I list the results from four random effects regressions to model the effect of stock market volatility on GHQ-12 by the time in years since the immigrant arrived in the UK. Coefficients and 95% confidence intervals are reported. Standard errors are in parentheses.

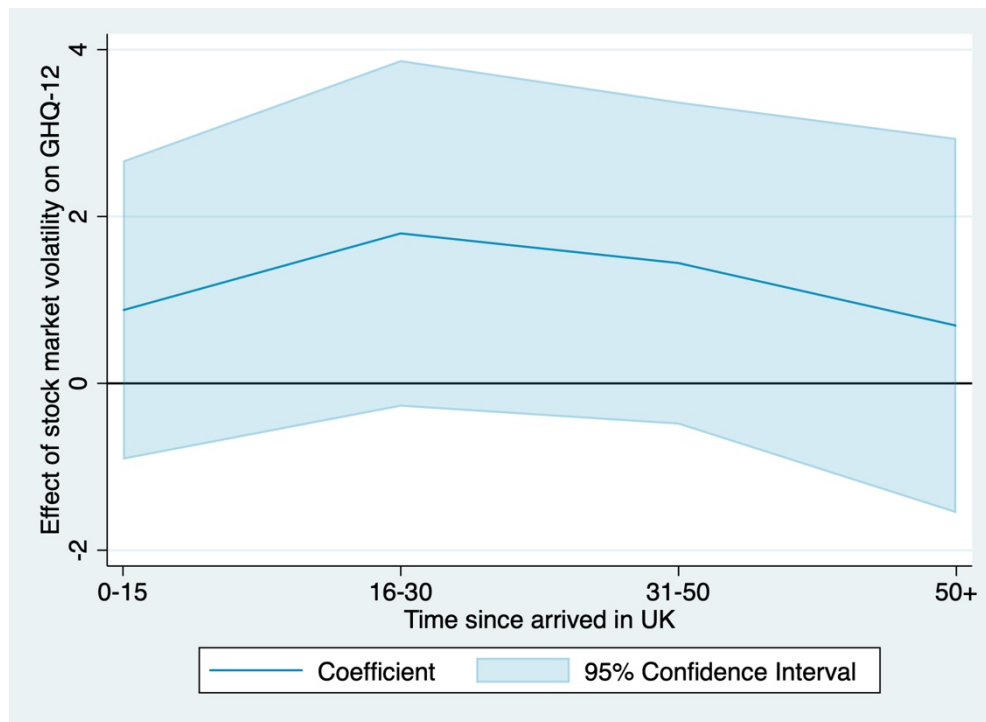


Figure 3.8 Effect of Stock Market Volatility on GHQ-12 by Time Since Arrived in UK

Note: I divide the dataset into four sub-samples according to the time since the immigrant arrived in the UK. This figure shows the coefficients of the impact of home country stock market volatility on the GHQ-12 with 95% confidence intervals.

3.5.6 Exposure to Stock Markets

Immigrants without exposure to stock markets report inferior subjective mental health than immigrants who are exposed to stock markets. This may be because immigrants

without exposure to stock markets may not invest as they have less money. This aligns with the result that immigrants with low-income report lower subjective mental health than immigrants with high income. Hidrobo et al. (2023) explain this by suggesting that an increase in income improves people's mental health through improved self-esteem and a reduction in stress and worrying. These findings correspond to Ratcliffe and Taylor's (2015) results who report that income from interest or dividends positively affects subjective mental health. Both the exposure to stock markets and the level of income do not affect diagnosed clinical depression.

3.5.7 Age as a Determinant of Mental Health

The immigrants' age at the time of the interview affects both their GHQ-12 and SF-12 MCS. The older the immigrant, the lower their GHQ-12 and the better their SF-12 MCS. Diagnosed clinical depressions are not affected. These findings need further research as I find variation between the impact of age on the measures of subjective mental health, and Nguyen and Connelly (2018) provide evidence that age is not a determinant of immigrants' subjective mental health. One explanation for this could be the evidence provided by existing literature suggesting that subjective well-being is U-shaped, which may explain the variation in the results when using linear regression models (Graham & Ruiz Pozuelo, 2017; Blanchflower, 2020).

Next, I divide the dataset into four sub-samples according to the immigrants' age when they first arrived in the UK and model the effect of stock market volatility on subjective mental health measured by GHQ-12 for each sub-sample using a random effects regression. I use the random effects model and the GHQ-12, as this result is statistically significant as presented in the main regression results in Table 3.5. As shown in Table 3.7 and Figure 3.11 I find that immigrants who arrived as children (aged 0-15) are the least impacted by stock market volatility in their home countries. The effect increases significantly with the immigrants' age when they first arrived in the UK, with immigrants who were older than 50 at the time of arrival being most affected. Hence, the immigrants' age at the time of arrival in the UK does influence how much they are impacted by stock market volatility in their home country. These findings are in line with Akay et al. (2017),

who suggest that immigrants who arrive in the host country as children are less affected by macroeconomic conditions in their home country because they do not use their home country as a reference point.

I provide an alternative explanation for these results using the lifecycle hypothesis (Modigliani & Brumberg, 1954). The lifecycle hypothesis states that people below the age of 25 mostly spend more than they earn while still in full-time education, while people between the age of 25 and 65 earn more than they spend which means they can afford to save and invest (Frijters et al., 2015). Frijters et al. (2015) also propose that people above the age of 45 are actively planning for their retirement, meaning that investing becomes more important to them. This may explain my findings that immigrants who are older than 50 at the time of arrival in the UK are significantly more affected by stock market volatility in their home country than any other group because they may have invested in their home country for their retirement before immigrating to the UK. In conjunction with the home bias theory, this may explain why the mental health of immigrants aged 50 plus at the time of arrival in the UK is so strongly impacted by stock market volatility in their home countries where they may have invested their savings.

Table 3.7 Effect of Stock Market Volatility on GHQ-12 by Age when Arrived in UK

Age when arrived in UK	Coefficient	[95% Confidence Interval]	
0-15	0.663 (0.824)	−0.952	2.277
16-30	1.290 (0.726)	−0.132	2.712
31-50	1.343 (1.314)	−1.233	3.919
50+	3.885 (3.825)	−3.612	11.383

Note: I list the results from four random effects regressions to model the effect of stock market volatility on GHQ-12 by the age in years when the immigrant arrived in the UK. Coefficients and 95% confidence intervals are reported. Standard errors are in parentheses.

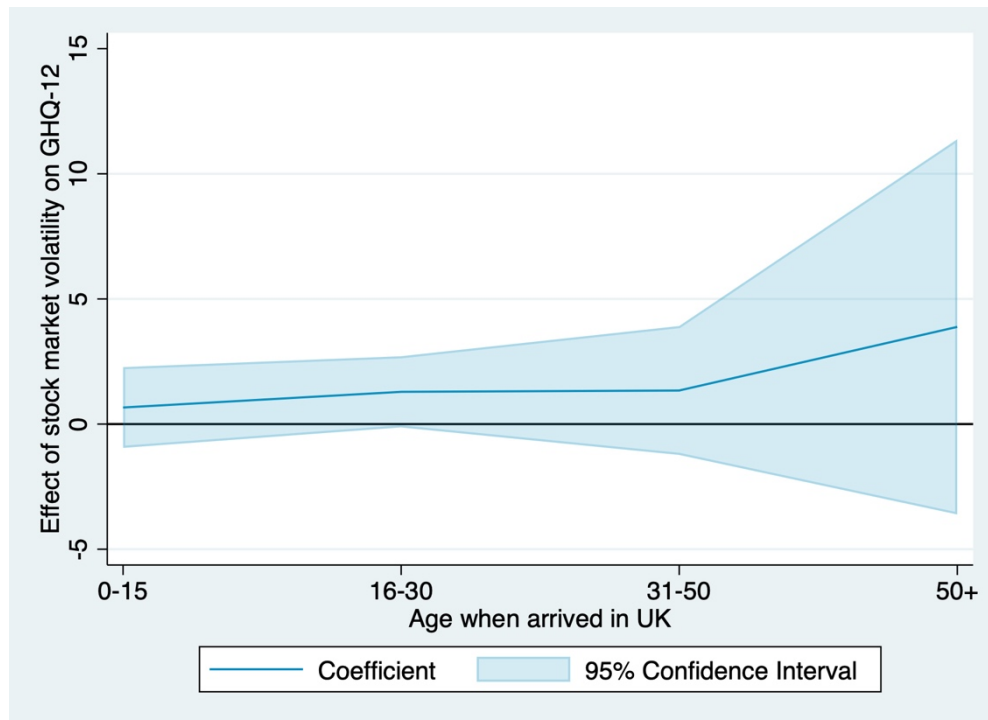


Figure 3.9 Effect of Stock Market Volatility on GHQ-12 by Age when Arrived in UK

Note: I divide the dataset into four sub-samples according to the immigrants' age when arrived in the UK. This figure shows the coefficients of the impact of home country stock market volatility on the GHQ-12 with 95% confidence intervals.

3.5.8 Robustness Analysis

To ensure my results are not influenced by multicollinearity between the independent variables, I calculate the variance inflation factors to detect any correlation between the independent variables in my random effects and pooled OLS regressions. Previous research suggests that a regression model has a multicollinearity problem if a variance inflation factor is greater than 5–10 (Baum, 2006; Kim, 2019b). Table 3.8 shows that the variation inflation factor for most independent variables is acceptable. However, the variables exchange rate, GDP, CPI, age, resident in England, born in non-English speaking country, and home distance seem to be strongly correlated with other independent variables in the model. Although Goldberger (1991) suggests that multicollinearity is frequently dramatised in econometrics textbooks and Johnston (1984) notes that multicollinearity between variables reflects the nature of the economic system, I re-run the regression models without the above-mentioned correlated variables to address the

issue of multicollinearity. The results presented in Table 3.9 show that my main regression results on the impact of stock market volatility on the GHQ-12 are robust and hold after excluding correlated independent variables. The SF-12 MCS and diagnosed clinical depressions remain unaffected.

Table 3.8 Results of Multicollinearity Test

	<i>GHQ-12</i>		<i>SF-12 MCS</i>	
	RE	POLS	RE	POLS
Stock market volatility	11.35	11.96	11.08	11.65
Exchange rate	113.67	114.04	115.46	115.87
GDP	14.13	63.42	14.09	62.40
CPI	37.72	38.20	37.02	37.50
Female	2.40	2.40	2.41	2.42
Age	28.44	29.11	28.51	29.20
Low level of education	2.98	2.99	2.92	2.93
Single	1.73	1.74	1.70	1.72
Divorced	1.17	1.17	1.18	1.18
Widowed	1.22	1.22	1.22	1.22
Other marital status	1.07	1.07	1.07	1.07
Resident in rural area	1.31	1.32	1.32	1.33
Resident in England	40.32	41.55	38.54	39.70
Resident in Wales	1.81	1.85	1.83	1.86
Resident in Scotland	2.24	2.28	2.25	2.29
Born in non-English speaking country	61.00	71.58	60.73	70.81
No exposure to stock markets	7.24	7.32	6.98	7.06
Low income	2.14	2.14	2.11	2.11
Home distance	86.34	309.85	85.70	301.91
Time since first arrived in UK	8.99	9.03	9.15	9.19

Note: I list the variance inflation factors for four models using two different regressions, random effects and pooled OLS regression, and two different dependent variables, GHQ-12 and SF-12 MCS.

I perform several other robustness tests in order to avoid the risk that my results are being driven by immigrants from countries with the highest number of observations, particularly young or old immigrants, or immigrants who have spent a very short or long time in the UK. I present the results of this analysis in Table 3.9. I first exclude observations from India and Pakistan from the dataset and find that my results from the main analysis remain largely the same. I then remove observations of individuals aged <25 and >75 as well as individuals who arrived in the UK <10 and >75 years ago in order to check the robustness

of my results. These findings allow me to conclude that the regression results in relation to the negative impact of stock market volatility in the immigrants' home countries on their subjective mental health are robust. Diagnosed clinical depressions remain unaffected.

Table 3.9 Robustness Tests on Impact of Stock Market Volatility

	Subjective mental health				Objective mental health
	<i>GHQ-12</i>		<i>SF-12 MCS</i>		<i>Diagnosed clinical depression</i>
	RE	POLS	RE	POLS	RE probit
Baseline	1.107** (0.497)	0.996 (0.635)	−0.747 (0.923)	−0.305 (1.164)	−0.003 (0.009)
Excluding correlated independent variables	0.988** (0.493)	0.898 (0.630)	−0.920 (0.917)	−0.576 (1.155)	−0.003 (0.008)
Excluding India	0.923 (0.564)	0.777 (0.724)	−0.203 (1.046)	0.443 (1.323)	−0.005 (0.012)
Excluding Pakistan	1.267** (0.501)	1.352** (0.645)	−1.690* (0.934)	−1.554 (1.186)	−0.005 (0.009)
Excluding immigrants aged <25	1.126** (0.511)	1.055 (0.658)	−0.720 (0.952)	−0.335 (1.201)	−0.002 (0.011)
Excluding immigrants aged >75	1.118** (0.517)	0.873 (0.659)	−0.262 (0.953)	0.359 (1.200)	−0.008 (0.014)
Excluding immigrants arrived in UK <10 years ago	1.471*** (0.541)	1.368* (0.697)	−1.126 (0.995)	−0.918 (1.260)	−0.005 (0.016)
Excluding immigrants arrived in UK >75 year ago	1.108** (0.499)	1.032 (0.637)	−0.717 (0.927)	−0.357 (1.167)	−0.003 (0.009)

Note: I list the results from five models using three different regressions, random effects, pooled OLS and random effects probit regression, and three different dependent variables, GHQ-12, SF-12 MCS and diagnosed clinical depression. For the pooled OLS and random effects models, coefficients are reported. For the random effects probit model, marginal effects are reported. Standard errors are in parentheses.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

I also determine the Pearson product-moment correlation coefficient between stock market volatility of each home country to test if my data are correlated across panel units. Table 3.10 shows the correlation coefficients between volatilities of each stock market. Although the global COVID stock market crash in 2020 is included, volatilities of the stock markets are not identical. The correlation coefficients between volatilities of some stock markets indicate no correlation or even negative correlation, for example for Cyprus and Jamaica. This means that the volatility of some stock market indices does not move in the same direction or that there is no statistical relationship at all between them. Therefore,

my results are driven by my choice of volatility in the immigrants' home countries, as there is no cross-sectional dependence in the dataset. Figure 3.12 visualises the correlation coefficients between each stock market in a heat plot (Jann, 2019).

Table 3.10 Correlations between Volatilities of Stock Markets

	Australia	Bangladesh	Canada	China	Cyprus	France	Germany	Ghana	India	Ireland	Italy	Jamaica
Australia	1.000											
Bangladesh	0.603*	1.000										
Canada	0.980***	0.607*	1.000									
China	0.361	0.159	0.256	1.000								
Cyprus	0.048	0.420	0.080	-0.030	1.000							
France	0.915***	0.506	0.879***	0.436	0.360	1.000						
Germany	0.935***	0.450	0.915***	0.441	0.222	0.960***	1.000					
Ghana	0.292	0.319	0.344	-0.262	-0.355	0.076	0.131	1.000				
India	0.951***	0.776**	0.950***	0.270	0.100	0.845***	0.864***	0.413	1.000			
Ireland	0.893***	0.408	0.853***	0.331	0.077	0.899***	0.845***	0.334	0.824***	1.000		
Italy	0.784***	0.324	0.771***	0.369	0.460	0.938***	0.901***	-0.135	0.711***	0.795***	1.000	
Jamaica	0.322	0.128	0.341	0.282	-0.663**	0.038	0.154	0.049	0.200	0.170	-0.026	1.000
Kenya	0.719***	0.412	0.670**	-0.040	-0.159	0.558*	0.528*	0.129	0.629**	0.622**	0.440	0.368
New Zealand	0.849***	0.603*	0.890***	0.093	-0.205	0.632**	0.697**	0.622**	0.891***	0.743***	0.501*	0.428
Nigeria	0.394	-0.093	0.312	0.477	-0.268	0.366	0.299	-0.340	0.169	0.497	0.326	0.588**
Pakistan	0.585**	0.531	0.590**	-0.141	-0.397	0.259	0.346	0.561*	0.585**	0.358	0.022	0.463
Poland	0.946***	0.625*	0.958***	0.134	0.059	0.845***	0.862***	0.458	0.937***	0.848***	0.726***	0.120
South Africa	0.935***	0.594*	0.928***	0.339	-0.126	0.802***	0.847***	0.462	0.915***	0.853***	0.672**	0.345
Spain	0.772***	0.470	0.757***	0.328	0.502*	0.927***	0.809***	-0.018	0.716***	0.853***	0.925***	-0.051
Sri Lanka	0.514*	0.580	0.554*	0.022	0.232	0.513*	0.445	0.716**	0.633**	0.596**	0.348	-0.177
Türkiye	0.466	0.852***	0.413	0.277	-0.010	0.389	0.378	0.344	0.622**	0.386	0.262	-0.140
Uganda	0.408	0.373	0.409	0.237	0.676**	0.634**	0.525*	-0.194	0.351	0.350	0.660**	-0.306
United States	0.944***	0.592*	0.947***	0.276	0.078	0.858***	0.887***	0.464	0.922***	0.854***	0.710***	0.206

(continued)

Table 3.10 Continued

	Kenya	New Zealand	Nigeria	Pakistan	Poland	South Africa	Spain	Sri Lanka	Türkiye	Uganda	United States
Australia											
Bangladesh											
Canada											
China											
Cyprus											
France											
Germany											
Ghana											
India											
Ireland											
Italy											
Jamaica											
Kenya	1.000										
New Zealand	0.621**	1.000									
Nigeria	0.505*	0.178	1.000								
Pakistan	0.736***	0.719***	0.142	1.000							
Poland	0.713***	0.891***	0.242	0.628**	1.000						
South Africa	0.626**	0.899***	0.368	0.594**	0.949***	1.000					
Spain	0.474	0.515*	0.372	0.049	0.724***	0.642**	1.000				
Sri Lanka	0.103	0.569*	-0.189	0.217	0.584**	0.522*	0.549*	1.000			
Türkiye	0.223	0.426	-0.039	0.262	0.508*	0.587**	0.253	0.443	1.000		
Uganda	0.215	0.118	0.038	-0.100	0.443	0.289	0.701**	0.297	0.072	1.000	
United States	0.619**	0.876***	0.269	0.620**	0.962***	0.953***	0.701**	0.575*	0.480	0.417	1.000

Note: I list the correlation coefficients between the volatility of each home country's stock market index. * if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

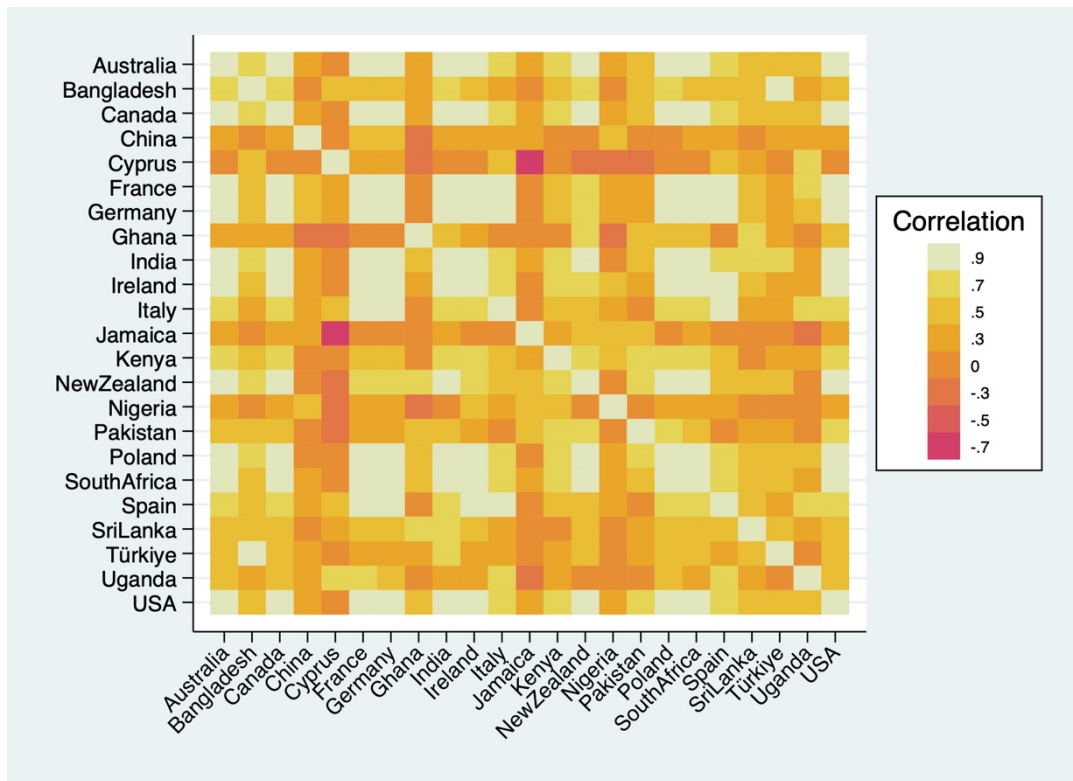


Figure 3.10 Correlations between Volatilities of Stock Markets

I also account for the fact that each home country has different capital controls designed to restrict capital inflows and outflows. To test whether the main regression results presented in Table 3.5 are affected by the level of capital controls in the respective home countries, I include this variable as an additional control in the regression models. To classify the level of capital controls, I use the dataset provided by Fernández et al. (2016), which has been employed in prior literature (Ha et al., 2023). This dataset categorises a country's capital control regime as open, gate, or wall. Open indicates no capital controls, gate refers to countries that impose capital controls occasionally, and wall indicates consistent, restrictive controls. To operationalise this variable, I create a variable coded as 1 for no capital controls, 2 for occasional controls, and 3 for consistent controls. Table 3.11 presents the regression results with this additional control variable. The results remain consistent with the main regression results.

Table 3.11 Regression Results with the Level of Capital Controls

	Subjective mental health				Objective mental health
	<i>GHQ-12</i>		<i>SF-12 MCS</i>		<i>Diagnosed clinical depression</i>
	RE	POLS	RE	POLS	RE probit
Stock market volatility	1.107** (0.497)	0.996 (0.635)	−0.747 (0.923)	−0.305 (1.164)	−0.003 (0.009)
Level of capital controls	17.766*** (5.970)	9.980 (7.063)	−20.701* (11.214)	−15.098 (13.200)	0.177* (0.102)
Control variables	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes

Note: I list the results from five models using three different regressions, pooled OLS, random effects regression and random effects probit regression, and three different dependent variables, GHQ-12, SF-12 MCS and diagnosed clinical depression. I control for sex, age, education, marital status, resident in urban or rural area, country of residence, born in a non-English speaking country, exposure to stock markets, level of income, home distance, time since first arrived in the UK, exchange rate, GDP, CPI, and year and country dummies. For the pooled OLS and random effects models, coefficients are reported. For the random effects probit model, marginal effects are reported. Standard errors are in parentheses.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

In Table 3.12, I include the level of capital controls as an interaction term in the regression model to examine how capital restrictions in the respective home countries influence the relationship between stock market volatility and immigrants' mental health. The results indicate that capital controls play a significant role in moderating this relationship, as stricter capital controls are associated with a weaker effect of stock market volatility on immigrants' subjective mental health, as measured by the GHQ-12 and SF-12 MCS. Diagnosed clinical depression remains unaffected. These findings suggest that immigrants from countries with strict capital controls are significantly less impacted by stock market volatility in their home country. One possible explanation is that these immigrants may be less financially exposed to stock markets in their home country, as capital restrictions limit their ability to repatriate gains to their host country.

Table 3.12 Interactions with the Level of Capital Controls

	Subjective mental health				Objective mental health
	<i>GHQ-12</i>		<i>SF-12 MCS</i>		<i>Diagnosed clinical depression</i>
	RE	POLS	RE	POLS	RE probit
Stock market volatility (S)	3.703** (1.462)	4.061** (1.885)	−6.423** (2.695)	−6.103* (3.422)	−2.009 (1.825)
Level of capital controls (C)	17.683*** (5.970)	9.916 (7.063)	−20.499* (11.213)	−14.935 (13.199)	11.828* (6.746)
S × C	−1.181* (0.625)	−1.392* (0.806)	2.595** (1.157)	2.646* (1.468)	0.850 (0.812)
Control variables	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes

Note: introduce two-way interaction terms and list the results from five models using three different regressions, pooled OLS, random effects regression and random effects probit regression, and three different dependent variables, GHQ-12, SF-12 MCS and diagnosed clinical depression. I control for sex, age, education, marital status, resident in urban or rural area, country of residence, born in a non-English speaking country, exposure to stock markets, level of income, home distance, time since first arrived in the UK, exchange rate, GDP, CPI, and year and country dummies. The baseline results for stock market volatility are included in Table 3.11. Coefficients are reported. Standard errors are in parentheses.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

Finally, I test the robustness of my main results using an alternative measure of stock market volatility. In the main regressions, I use annualised stock market volatility in the year of the interview with the respondent. To ensure that these results are robust, I replace this variable with 52-week stock market volatility, which captures volatility in the 52 weeks preceding the interview. The results of this robustness test, presented in Table 3.13, confirm that the main regression results hold. Notably, when using 52-week volatility instead of annualised volatility, the result of the pooled OLS regression now shows a statistically significant effect of stock market volatility on the GHQ-12.

Table 3.13 Regression Results with 52-week Volatility

	Subjective mental health				Objective mental health
	<i>GHQ-12</i>		<i>SF-12 MCS</i>		<i>Diagnosed clinical depression</i>
	RE	POLS	RE	POLS	RE probit
Stock market volatility	1.078** (0.492)	1.340** (0.623)	−0.599 (0.922)	−0.816 (1.153)	−0.006 (0.009)
Control variables	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes

Note: I list the results from five models using three different regressions, pooled OLS, random effects regression and random effects probit regression, and three different dependent variables, GHQ-12, SF-12 MCS and diagnosed clinical depression. I control for sex, age, education, marital status, resident in urban or rural area, country of residence, born in a non-English speaking country, exposure to stock markets, level of income, home distance, time since first arrived in the UK, exchange rate, GDP, CPI, and year and country dummies. For the pooled OLS and random effects models, coefficients are reported. For the random effects probit model, marginal effects are reported. Standard errors are in parentheses.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

3.6 Conclusion

I provide the first study investigating the association between immigrants' mental health and stock markets in their home countries. Using panel data from the UK based Understanding Society dataset, I provide robust evidence that immigrants' subjective mental health is negatively associated with stock market volatility in their home countries. This effect reduces as immigrants integrate into the host country and increases with the immigrants' age when they first arrived in the UK. I also provide evidence that while stock market volatility in the immigrants' home countries does impact their self-reported mental health, diagnosed clinical depression as a measure of objective mental health is not affected. This variation highlights the importance of using measures of both subjective and objective mental health. Furthermore, I find that a low level of income and the distance between the UK and immigrants' home countries negatively impacts their subjective mental health, whereas males, married immigrants and immigrants with higher education show better subjective and objective mental health.

In my analysis, I add stock market volatility in immigrants' home countries as another determinant of immigrants' subjective mental health to the existing body of literature. Furthermore, I find empirical support for the disintegration theory by providing evidence from a novel, financial market-based perspective. Future research may analyse data from

countries other than the UK to expand on the evidence I provide as this is the first study using stock market volatility in immigrants' home countries as an independent variable to explain their mental health. Further research may also consider conducting studies of a qualitative nature, to provide further insights into why immigrants' self-reported mental health is affected by stock market volatility in their home countries. This may offer a broader basis for discussion and interpretation of my results.

Furthermore, I believe that the findings of my study have several important policy implications. Firstly, I recommend that immigrants be provided with the opportunity to undertake courses in psycho-education upon arrival in the host country. Psycho-education is often provided by community mental health teams (Getachew et al., 2009) and it involves informing people about mental illnesses and their treatment, and how to support patients to cope with the disorder (Bäumel et al., 2006). Such educational offerings will enable immigrants to mitigate the challenges they may face in accessing mental healthcare services in the host country, while also providing them with the tools to potentially offset the associated mental health issues.

Secondly, I suggest that psychologists and other mental health practitioners undertake continuing professional development that informs them of the impacts of foreign economies and markets on the mental health outcomes of some clients. Without doubt these professionals will be aware of the impact of the local economy on their clients' mental health, but perhaps have given little consideration to the role other economies play, where economic crises may be a daily reality. Such policy implementations will likely help reduce the cost of mental health issues to the economy, while simultaneously reducing the personal suffering of immigrants living away from home.

Chapter 4 Familiarity and the Link between Stock Markets and Mental Health

Abstract

Despite the existence of extensive literature on equity home bias, little attention is paid to the role familiarity plays in the impact stock markets have on people's mental health. Using the UK based Understanding Society panel dataset from 2010 to 2023, I investigate how the subjective mental health of immigrants is impacted by stock market returns in their home country, and the role familiarity plays in this relationship. I provide novel evidence that positive daily returns have a one-day lagged positive impact on the subjective mental health of immigrants, and an immediate positive impact if they either are retired or have income from interest or dividends. I also find that familiarity matters in this relationship, suggesting that immigrants from developed (developing) countries and countries that are geographically and economically close (distant) to the UK are positively (negatively) impacted by stock market returns in their home country.

4.1 Introduction

According to a recent study conducted across 29 countries, 50% of the world's population will develop a mental health disorder by the age of 75 (McGrath et al., 2023). The estimated economic impact of mental health disorders worldwide amounts to approximately USD 5 trillion per year (Arias et al., 2022). Broken down to a regional level, this suggests that the cost of mental illness in high-income North American countries, such as Canada, US and Panama, may account for 8% of their GDP (Arias et al., 2022). At the same time, global migration is at a record high, with the number of new permanent immigrants in OECD countries at more than 6 million in 2022. The United Kingdom alone has experienced an increase in permanent immigration in 2022 of 35.1% compared to 2021 and 37.9% compared to pre-pandemic levels in 2019 (OECD, 2023). According to existing literature, the determinants of mental health differ between immigrants and the native-born population. Nguyen and Connelly (2018) suggest that the mental health of immigrants is not only affected by economic conditions in their country of residence, but

also in their home country. These factors include the GDP and inflation rate in their home country (Akay et al., 2017; Nguyen & Connelly, 2018).

Research on the impact of stock market performance and economic conditions in people's home country on their mental health is limited. Akay et al. (2017) and Nguyen and Connelly (2018) represent two notable exceptions investigating how immigrants' mental health is affected by macroeconomic conditions in their home countries. I provide the first study to investigate how immigrants' mental health is affected by stock market returns in their home country and the role familiarity plays in this relationship.

The theory on which my study is based is the equity home bias puzzle. There is an extensive body of literature investigating equity home bias in portfolios of individual investors (Coval & Moskowitz, 2001; Ivkovic & Weisbenner, 2005; Chan et al., 2005; Solnik & Zuo, 2017). The majority of this literature investigates the phenomenon of local bias, also referred to as proximity bias, which claims that investors' portfolios are biased towards geographically close firms (Baltzer et al., 2013). The existing literature provides two explanations for this phenomenon, information asymmetry and familiarity. The information asymmetry hypothesis suggests that local investors have a time advantage over non-local investors in receiving value-relevant information on local firms (Coval & Moskowitz, 2001; Ivkovic & Weisbenner, 2005; Lindblom et al., 2018).

The familiarity hypothesis states that investors tend to invest more in firms and markets they have a connection with, be it emotionally (including a common language and place attachment), culturally or due to psychological factors (Grinblatt & Keloharju, 2001; Baltzer et al., 2015; Lindblom et al., 2018; Ardalan, 2019). My study is based on the familiarity hypothesis. Research suggests that immigrants may have a strong emotional and cultural connection with their home country (Siar, 2014; Lemish, 2022). However, unlike the majority of previous research, I do not limit the familiarity hypothesis to investments made geographically close to the investor. Instead, I hypothesise that investors may be affected by stock markets in their home country due to their emotional connection, such as a common language or feelings of belonging, with their home country.

I begin by measuring the subjective mental health of immigrants using the GHQ-12 and the SF-12 MCS obtained from the UK based Understanding Society household panel dataset from 2010 to 2023. I merge this dataset with daily logarithmic (log) returns including lagged returns based on the major stock market index in each home country. I employ the fixed effects model and the pooled OLS regression to provide a robust analysis of the relationship between immigrants' mental health and stock market returns in their home country. To address the issue of endogeneity, such as the impact of exogenous events on both stock markets and mental health, I include income from interest and dividends, retirement, and retirement income from savings or investments as interaction terms to capture the effect stock markets have on immigrants' wealth. I also include measures of familiarity as interaction terms to investigate if familiarity with the home country stock market influences the impact of stock markets on immigrants' mental health. I measure familiarity as the cultural distance (based on Hofstede scores), geographic distance (based on the distance between London and the home country's capital city in kilometres), and economic distance (based on bilateral trade) between the UK and the immigrant's home country, and whether the same language is spoken in the home country and the UK. I also investigate if economic development influences this relationship.

I find that one-day lagged returns in immigrants' home countries have a positive impact on their mental health, with the effect being stronger for immigrants who have retirement income from savings or investments. My initial investigation shows that there is no immediate impact of daily returns on the mental health of immigrants. However, upon further investigation I find that there is an immediate impact in two cases – if immigrants have income from interest or dividends, or if they are retired. The results indicate that income from interest or dividends, retirement, and retirement income from savings or investments are critical moderators of this relationship. Furthermore, I find that stock market returns have a positive impact on the mental health of immigrants from developed countries and countries that are geographically and economically close to the UK, and a negative impact on the mental health of immigrants from countries that are culturally, geographically and economically distant to the UK, from developing countries, and from countries where English is commonly spoken.

I make both theoretical and empirical contributions to the literature. I make an important contribution to the financial economics literature by providing novel evidence to support the familiarity hypothesis from a perspective based on familiarity between the host country and the home country. Furthermore, I extend the familiarity hypothesis, suggesting that it may not only apply to portfolio compositions, but also to the choice of stock market that is used as a benchmark to evaluate the overall stock market performance or a country's economic prospects. In terms of my empirical analysis, I build on the work presented in chapter 3 by analysing the relationship between home country stock market returns and immigrants' mental health. Furthermore, I expand the existing evidence on the impact of stock markets in people's country of residence on their mental health (Engelberg & Parsons, 2016; Schwandt, 2018), providing novel evidence on how mental health is impacted by stock market returns in people's home country. Finally, I add to theory the longevity of the mental health impairment due to stock market returns, as there is evidence of an immediate impact of daily stock market returns on immigrants' subjective mental health.

This chapter is structured as follows. I begin by presenting the research hypotheses, followed by an overview of the dataset and the econometric models used in the analysis. Next, I present the results accompanied by a discussion, followed by a robustness check of my findings. The chapter concludes with a summary of the key findings and directions for future research.

4.2 Research Hypotheses

Previous literature provides evidence of an existing relationship between domestic stock market returns and people's mental health (Cotti et al., 2015; Engelberg & Parsons, 2016; Schwandt, 2018), and the impact of macroeconomic conditions in immigrants' home countries on their mental health (Akay et al., 2017; Nguyen & Connelly, 2018). Furthermore, the familiarity hypothesis suggests that investors prefer to invest in markets and firms they have a connection with (Baltzer et al., 2015; Lindblom et al., 2018). Based on the existing literature, I develop the following research hypotheses:

H3. Immigrants' mental health is affected by stock market returns in their home country.

H4. The impact of stock market returns in immigrants' home countries on their mental health differs between immigrants who emigrate to a country they are familiar with (culturally, geographically and economically close, and where the same language is spoken), and those who emigrate to a country they are less familiar with (culturally, geographically and economically distant, and where the language spoken is different).

4.3 Data

4.3.1 Dependent Variables

I obtain my dependent variables from the Understanding Society dataset which includes UK based household panel data from 2010 to 2023 (University of Essex. Institute for Social and Economic Research, 2023). My dataset contains immigrants from the 23 most common home countries of immigrants in the UK, including Australia, Bangladesh, Canada, China, Cyprus, France, Germany, Ghana, India, Ireland, Italy, Jamaica, Kenya, New Zealand, Nigeria, Pakistan, Poland, South Africa, Spain, Sri Lanka, Türkiye, Uganda, and US. My sample includes a total of 48,614 observations with 9,598 immigrants who were surveyed repeatedly over several years. Table 4.1 includes a full description of all variables.

Table 4.1 Variable Descriptions

Variable	Definition
Dependent variables	
GHQ-12	12-Item General Health Questionnaire (GHQ-12) score. The lower the score the better the mental health. The score's range is 0 – 36.
SF-12 MCS	Mental Component Summary (MCS) of the 12-Item Short-Form Health Survey (SF-12). The higher the score the better the mental health. The score's range is 0 – 100.
Independent variables	
Daily log return	Daily logarithmic returns based on the major stock market index in each home country.
Female	Dummy variable: =1 if sex assigned at birth is female. Coefficients are relative to male.
Age	The research participant's age in years at the time of the interview.
Higher education	Dummy variable: =1 if level of education is a Higher Degree (Masters, PhD), First Degree (Bachelors) or Diploma in Higher Education. Coefficients are relative to a low level of education.
Marital status	Dummy variables: =1 if current marital status is single/divorced/widowed/other. Coefficients are relative to married.
Job status	Dummy variable: =1 if current job status is self-employed/unemployed/retired/student/other. Coefficients are relative to employed.
Resident in urban area	Dummy variable: =1 if research participant is an urban resident. Coefficients are relative to rural residents.
Country of residence	Dummy variable: =1 if research participant is a resident of Wales/Scotland/Northern Ireland. Coefficients are relative to residents of England.
Born in English speaking country	Dummy variable: =1 if research participant was born in Ireland, Australia, New Zealand, Canada, United States, or Jamaica. Coefficients are relative to residents born in non-English speaking countries.
Home distance	Distance from London to the capital city in the home country in kilometres.
Time since first arrived in UK	Time in years since research participant arrived in UK to live for a minimum of 3 months or with the intention to settle indefinitely.
Value of property	Value of property in £ if research participant is a home owner, including mortgaged and shared ownership.
Individual income	Research participant's total monthly personal gross income in £.
Household income	Total income in £ of the research participant's household in the month before the interview.
Income from interest or dividends	Dummy variable: =1 if research participant has income from interest or dividends. Coefficients are relative to research participants with no income from interest or dividends.
Retirement income from savings or investments	Dummy variable: =1 if research participant has retirement income from savings or investments. Coefficients are relative to research participants with no retirement income from savings or investments.
Daily UK log return	Daily logarithmic returns based on the Financial Times Stock Exchange (FTSE) 100 index.
Year dummies	Dummy variable: =1 based on year of interview. Coefficients are relative to research participants interviewed in 2010.
Month dummies	Dummy variable: =1 based on month of interview. Coefficients are relative to research participants interviewed in January.
Weekday dummies	Dummy variable: =1 based on weekday of interview. Coefficients are relative to research participants interviewed on a Sunday.
Season dummies	Dummy variable: =1 based on season of interview. Coefficients are relative to research participants interviewed in spring.
Home country dummies	Dummy variable: =1 based on research participant's home country. Coefficients are relative to research participants born in Ireland.

I use the GHQ-12 and the SF-12 MCS as measures of mental health. The GHQ-12 is based on the short form of the General Health Questionnaire which is designed to detect psychiatric illness, including depression and anxiety (Goldberg, 1972). The questionnaire includes 12 questions about mental health which are answered on a 4-point Likert scale. The answers to the 12 questions are then combined to provide a score between 0 and 36. The lower the GHQ-12 score, the better the individual's mental health and the less likely that person is to be currently suffering from a psychiatric disorder. The SF-12 MCS is a more general measure of mental health and is calculated using the 12-Item Short-Form Health Survey. The survey comprises 12 questions which can be answered on 3-point and 5-point Likert scales. To calculate the SF-12 MCS, each answer is weighted and then transformed into a score between 0 and 100. A high score indicates that the individual is in good general mental health (Ware et al., 1995). I use these two measures of mental health to capture the potential impact of my stock market variables on both the immigrants' general mental health and any psychiatric disorders.

4.3.2 Independent Variables

My independent variables include stock market data from each of the 23 home countries. I use the main stock market index of each country (see Table 4.2) to calculate the daily log returns. My dataset includes the date of each interview. I merge this dataset with daily stock market returns on that date. I also include one-day lagged returns in my models. The stock market data were obtained from Bloomberg. I control for additional variables that may have an impact on the results of my models. I include the control variables sex assigned at birth, age, education level, marital status, job status, resident in urban or rural area, country of residence within the UK, born in English speaking country, distance to home country which I obtain from the Gleditsch and Ward dataset (Gleditsch & Ward, 2001), time since first arrived in the UK, value of property, individual income, household income, income from interest or dividends, retirement income from savings or investments, daily logarithmic UK stock market returns based on the Financial Times Stock Exchange (FTSE) 100 index, the year, month, season, and weekday of the interview, and home country dummies in my models. While most of these control variables are based on

previous literature (Ratcliffe & Taylor, 2015; Nguyen & Connelly, 2018), retirement income from savings or investments is a novel variable in my models.

Table 4.2 Stock Market Indices by Home Country

Home Country	Stock Market Index
Australia	S&P/ASX 200
Bangladesh	Bangladesh Dhaka Stock Exchange Broad Index
Canada	S&P/TSX Composite Index
China	Shanghai Shenzhen CSI 300 Index
Cyprus	Cyprus Stock Exchange General Index
France	CAC 40 Index
Germany	Deutsche Boerse AG German Stock Index DAX
Ghana	Ghana Stock Exchange Composite Index
India	S&P BSE SENSEX Index
Ireland	ISEQ All-Share Index
Italy	FTSE MIB Index
Jamaica	Jamaica Stock Exchange Market Index
Kenya	Nairobi Securities Exchange Ltd 20 Index
New Zealand	S&P/NZX 50 Gross Index
Nigeria	NGX All Share Index
Pakistan	Karachi Stock Exchange KSE-100 Index
Poland	WIG20
South Africa	FTSE/JSE Africa Top 40 Index
Spain	IBEX 35 Index
Sri Lanka	Sri Lanka Colombo Stock Exchange All Share Index
Türkiye	Borsa Istanbul 100 Index
Uganda	Uganda Securities Exchange All Share Index
United States	S&P 500 Index

4.3.3 Interaction Terms

In line with literature investigating the pure wealth effect (McInerney et al., 2013; Ratcliffe & Taylor, 2015; Frijters et al., 2015), I hypothesise that income from interest or dividends, retirement, and retirement income from savings or investments may be important moderators of the relationship between stock market returns and mental health. Therefore, I include these three variables as interaction terms. This approach follows Frijters et al. (2015) and McInerney et al. (2013) who suggest that the impact of stock markets on people's mental health is stronger for individuals who invest in the stock market. It is also supported by Angel et al. (2003) and Lindeboom et al. (2002) who suggest that the mental health of retirees is more vulnerable to financial distress compared to non-retired individuals.

I also include the cultural, geographic, and economic distance between the UK and the immigrant's home country, the language spoken and the economic development as interaction terms in my models. To measure cultural distance, I use the survey-based Hofstede scores (Hofstede, 1980; Hofstede, 2001). I obtain the most recent data for 2015 from the Geert Hofstede website (www.geerthofstede.com) whereby scores for six dimensions of national culture are assigned to each home country listed in Table 4.2. The six dimensions include power distance, individualism, masculinity, uncertainty avoidance, long-term orientation, and indulgence. Following the approach by Kogut and Singh (1988), I first calculate the difference in the scores for each dimension between the UK and each home country. I then divide each difference score by the variance in each dimension and calculate the arithmetic average across the six dimensions for each country. I calculate the cultural distance CD_{ic} of immigrant i from home country c as follows:

$$CD_{ic} = \sum_{n=1}^N \left(\frac{|C_{n,c} - C_{n,u}|}{V_n} \right) / N \quad (4.1)$$

In the above equation, $C_{n,c}$ represents the score for the n th dimension of home country c , while $C_{n,u}$ denotes the score for the n th dimension of the UK. The variance in the scores of the n th dimension is represented by V_n . This approach is also utilised by other literature investigating cultural differences and home bias (Beugelsdijk & Frijns, 2010; Anderson et al., 2011; Kim, 2017). The countries I classify as culturally close are Ireland, Germany, Italy, Australia, New Zealand, Canada, US, India, South Africa, and Jamaica. The cultural distance for immigrants from Cyprus and Sri Lanka cannot be calculated due to the lack of data.

To measure the geographic distance between the UK and each home country, I use the data from the Gleditsch and Ward dataset (Gleditsch & Ward, 2001). Geographically close countries are Ireland, France, Germany, Italy, Spain, Poland, Cyprus, Türkiye, Canada, US, Ghana, and Nigeria. To calculate economic distance, I divide the sum of exports and imports between the UK and each home country by the GDP of both the UK and each home country. I then calculate the arithmetic average between the two scores to determine the economic distance score. The macroeconomic data are obtained from The World Bank WITS database (The World Bank, 2024b). This approach follows Chan et al. (2005) and is also used by previous literature (Anderson et al., 2011). Economically close

countries are Ireland, France, Germany, Italy, Spain, Poland, Türkiye, Canada, US, China, and India. To classify countries as culturally, geographically and economically close, I determine the mean of each variable and classify those countries with a score below the mean as culturally, geographically, or economically close. Countries where English is commonly spoken are Ireland, Australia, New Zealand, Canada, US, and Jamaica. To divide the home countries into developed and emerging economies, I use the United Nation's classification (United Nations. Department of Economic and Social Affairs, 2024). The countries classified as developed countries are Ireland, France, Germany, Italy, Spain, Poland, Cyprus, Australia, New Zealand, Canada, and US.

4.4 Econometric Models

To determine whether the random effects model or fixed effects model is more appropriate for this dataset, I run two Hausman tests. The first Hausman test is a multivariate model including all variables in the study. The second test is a univariate model with daily returns as the sole independent variable, as this is the main variable of interest for this study. The results of the Hausman test are presented in Table 4.3. The Hausman test for the multivariate model suggests that the fixed effects model is appropriate for this study, whereas the Hausman test for the univariate model suggests that the random effects model is more suitable for the dataset. I employ the fixed effects model to capture the individual-specific effects of daily returns on the mental health of immigrants. Furthermore, Wooldridge (2002) suggests that although the fixed effects model does not control for time-invariant variables, such as born in an English speaking country and home distance, it produces more robust results than the random effects model. Therefore, the methods employed in this study provide a counterpart to the analysis presented in chapter 3.

Table 4.3 Hausman Test Results

	<i>GHQ-12</i>	<i>SF-12 MCS</i>
Multivariate Model		
χ^2	68.13	100.31
p-value	0.037	0.000
Univariate Model		
χ^2	0.43	0.12
p-value	0.513	0.734

Note: I list the results for two Hausman tests using two different dependent variables, GHQ-12 and SF-12 MCS.

As a result, I employ a fixed effects model for each of my mental health variables, GHQ-12 and SF-12 MCS, thereby capturing individual-specific effects. Applying the fixed effects model, I estimate the mental health y of immigrant i from home country c at time t as follows:

$$y_{itc} = \alpha_i + x'_{itc}\beta + \varepsilon_{itc} \quad (4.2)$$

In the preceding equation, the dependent variables GHQ-12 and SF-12 MCS of each immigrant from home country c at time t are expressed as y_{itc} . α_i represents the individual-specific intercepts of immigrant i , x'_{itc} is the i^{th} independent variable and β represents the slope parameter for the respective independent variables. The error term is expressed as ε_{itc} .

To enhance the robustness of my results, I also employ a pooled OLS model for each of my mental health variables, GHQ-12 and SF-12 MCS. The pooled OLS model allows me to control for time-invariant variables, such as born in an English-speaking country and home distance. My pooled OLS model estimates the mental health y of immigrant i from home country c at time t as follows:

$$y_{itc} = \alpha + x'_{itc}\beta + \varepsilon_{itc} \quad (4.3)$$

In the above equation, y_{itc} represents the dependent variables GHQ-12 and SF-12 MCS of immigrant i from home country c at time t . α is the intercept, x'_{itc} is the i^{th} independent variable, β represents the slope parameter for each independent variable and ε_{itc} is the error term.

4.5 Results and Discussion

4.5.1 Descriptive Statistics

I present the descriptive statistics in Table 4.4. The table shows a mean of 11.096 for the GHQ-12 and 48.685 for the SF-12 MCS, indicating the average mental health scores for immigrants in the UK. The GHQ-12 has a standard deviation of 5.648 and the SF-12 MCS shows a standard deviation of 10.165, implying that there is a moderate variation in the scores reported. These statistics indicate that both the average and the majority of immigrants in the UK are in good mental health. The average daily log return is 0.0002 with a standard deviation of 0.012. The positive sign indicates that positive returns are more likely than negative ones. Figure 4.1 shows the daily log returns by home country. This figure provides evidence that stock markets in the countries included in this study experience very different returns. This is especially the case in Cyprus, China, and Uganda which have had periods of highly volatile returns.

Table 4.4 Descriptive Statistics

	Mean	Standard Deviation	Minimum	Maximum
GHQ-12 (N = 37,560)	11.096	5.648	0	36
SF-12 MCS (N = 35,481)	48.685	10.165	0	76.53
Daily log return	0.0002	0.012	−0.201	0.203
Female	0.542	0.498	0	1
Age	47.911	16.401	15	102
Higher education	0.408	0.491	0	1
Single	0.185	0.389	0	1
Divorced	0.062	0.241	0	1
Widowed	0.052	0.222	0	1
Other marital status	0.031	0.174	0	1
Self-employed	0.097	0.296	0	1
Unemployed	0.063	0.242	0	1
Retired	0.180	0.384	0	1
Student	0.042	0.201	0	1
Other job status	0.178	0.382	0	1
Resident in urban area	0.931	0.254	0	1
Resident in Wales	0.019	0.135	0	1
Resident in Scotland	0.026	0.159	0	1
Resident in Northern Ireland	0.025	0.157	0	1
Born in English speaking country	0.164	0.370	0	1
Home distance	5,809.627	3,140.389	365	18,817
Time since first arrived in UK	27.277	17.577	0	102
Value of property	324,136.855	492,355.925	1	27,000,000
Individual income	1,640.475	1,679.112	0	24,569.16
Household income	4,032.696	4,546.072	0	749,262.13
Income from interest or dividends	0.126	0.332	0	1
Retirement income from savings or investments	0.019	0.137	0	1
Daily UK log return	0.0002	0.010	−0.115	0.087
Year	2,015.428	3.362	2010	2023
Month	6.385	3.471	1	12
Weekday (Sunday=1)	3.995	1.876	1	7
Season (Spring=1)	2.500	1.119	1	4
Home country dummies (Ireland=1)	13.375	5.913	1	23

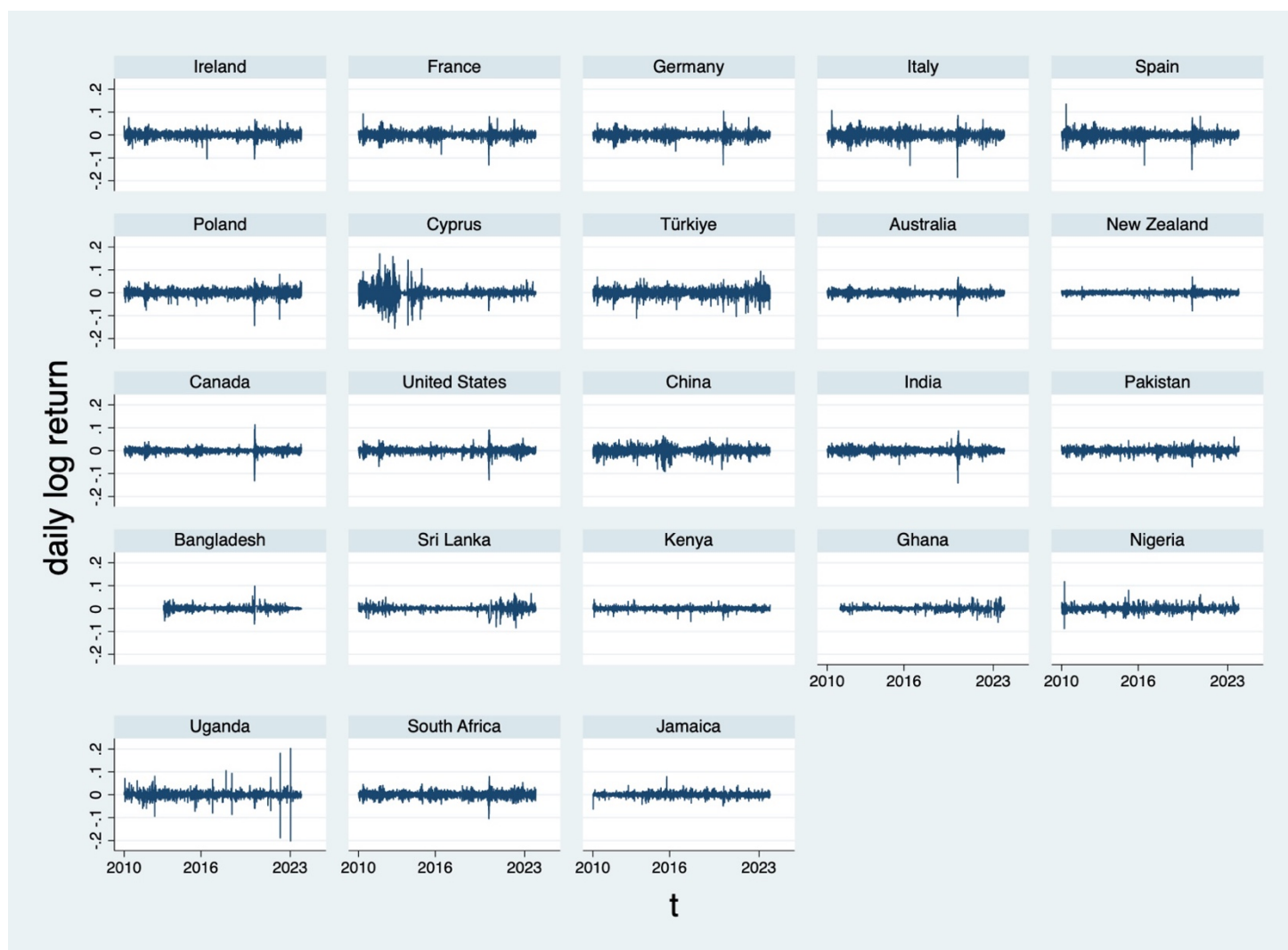


Figure 4.1 Daily Log Returns by Home Country

The descriptive statistics also show that 54.2% of all respondents are females and the average respondent is 47.911 years old at the time of the interview. 40.8% of the sample have higher education, 18.5% are single, 6.2% are divorced and 5.2% are widowed. 9.7% are self-employed, 6.3% are unemployed, 18% are retired and 4.2% are full-time students. 93.1% of all respondents live in an urban area, 1.9% are residents of Wales, 2.6% are residents of Scotland, and 2.5% are residents of Northern Ireland. 16.4% are born in an English-speaking country. The average distance from London to the capital city in each home country is 5,809.627 kilometres and the average respondent arrived in the UK 27.277 years before the interview. The mean value of property is £324,136.855 with a standard deviation of £492,355.925, indicating a strong fluctuation in the property values reported. The mean monthly income is £1,640.475 for individuals and £4,032.696 per household. On average, 12.6% of my sample have income from interest or dividends and 1.9% receive retirement income from savings or investments. Similar to log returns of stock markets in immigrants' home countries, the average daily UK log return is 0.0002 with a standard deviation of 0.010.

4.5.2 Stock Market Returns in Immigrants' Home Countries

The main regression results are presented in Table 4.5. I also provide coefficient plots (Jann, 2014) in Figures 4.2 and 4.3 to visualise the coefficients and 95% confidence intervals for the GHQ-12 and the SF-12 MCS for both regression models. Coefficients for the GHQ-12 must be interpreted inversely because the GHQ-12 uses an inverse scale to measure mental health with 0 indicating good mental health. Both the fixed effects and the pooled OLS models suggest that immigrants' mental health is not affected by daily stock market returns in their home country. However, I find that one-day lagged positive returns have a positive impact on the mental health of immigrants. My fixed effects model provides evidence that, for every one-unit increase in one-day lagged log returns, immigrants experience a 5.660 better GHQ-12, which corresponds to an increase in their mental health of 15.7%. These findings support research hypothesis *H3* under the condition that their mental health is only affected by one-day lagged returns in their home country. The channels through which the immigrants are affected may be the pure wealth

effect but also the fact that stock markets may act as a barometer of economic prospects and social moods in their home country (Ratcliffe & Taylor, 2015). The latter is particularly relevant for immigrants having family or friends in their home country.

Table 4.5 Main Regression Results

	<i>GHQ-12</i>		<i>SF-12 MCS</i>	
	FE	POLS	FE	POLS
Daily log return	−1.452 (3.903)	−3.756 (4.607)	−6.383 (7.193)	5.290 (8.457)
Lag 1	−5.660* (3.393)	−0.317 (3.985)	−0.512 (6.250)	0.396 (7.295)
Female	−1.714 (1.846)	0.239** (0.101)	3.782 (3.323)	−0.450** (0.185)
Age	0.073 (0.191)	0.020*** (0.006)	−0.155 (0.355)	0.043*** (0.011)
Higher education	0.753 (0.508)	−0.099 (0.104)	−0.338 (0.937)	0.643*** (0.191)
Single	0.223 (0.345)	1.047*** (0.156)	0.066 (0.633)	−2.052*** (0.285)
Divorced	−0.428 (0.415)	0.534*** (0.204)	−0.110 (0.761)	−1.612*** (0.374)
Widowed	0.868* (0.499)	0.419* (0.231)	−3.140*** (0.903)	−0.780* (0.426)
Other marital status	0.288 (0.503)	0.974*** (0.322)	0.300 (0.914)	−2.086*** (0.590)
Self-employed	−0.122 (0.221)	−0.500*** (0.156)	0.373 (0.406)	0.865*** (0.285)
Unemployed	1.220*** (0.257)	1.841*** (0.244)	−0.467 (0.469)	−2.217*** (0.445)
Retired	−0.120 (0.233)	−0.709*** (0.176)	0.779* (0.431)	1.350*** (0.324)
Student	0.263 (0.431)	0.625** (0.315)	0.572 (0.801)	−0.218 (0.579)
Other job status	0.948*** (0.212)	1.474*** (0.162)	−0.518 (0.391)	−2.398*** (0.297)
Resident in urban area	0.517 (0.444)	0.458*** (0.159)	−1.390* (0.811)	−0.780*** (0.290)
Resident in Wales	−1.294 (1.760)	−0.510 (0.317)	3.541 (3.387)	1.147** (0.581)
Resident in Scotland	1.327 (2.578)	−0.176 (0.279)	−2.501 (4.694)	−0.198 (0.509)
Resident in Northern Ireland	−3.645 (2.528)	−0.703** (0.305)	5.736 (4.459)	1.209** (0.559)
Born in English-speaking country		−1.357*** (0.354)		2.016*** (0.649)
Home distance		−0.000*** (0.000)		0.000*** (0.000)
Time since first arrived in UK	−0.056 (0.202)	0.016*** (0.004)	0.055 (0.374)	−0.030*** (0.008)
Value of property	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Individual income	0.000 (0.000)	−0.000 (0.000)	−0.000 (0.000)	0.000 (0.000)
Household income	−0.000** (0.000)	−0.000*** (0.000)	0.000** (0.000)	0.000*** (0.000)
Income from interest or dividends	−0.190 (0.119)	−0.612*** (0.119)	0.274 (0.219)	0.844*** (0.218)
Retirement income from savings or investments	−0.208 (0.221)	−0.488* (0.265)	0.255 (0.403)	0.511 (0.481)
Daily UK log return	−10.058** (4.189)	−7.978 (4.848)	25.011*** (7.734)	21.090** (8.927)

(continued)

Table 4.5 Continued

	<i>GHQ-12</i>		<i>SF-12 MCS</i>	
	FE	POLS	FE	POLS
Year dummies	YES	YES	YES	YES
Month dummies	YES	YES	YES	YES
Weekday dummies	YES	YES	YES	YES
Season dummies	YES	YES	YES	YES
Home country dummies	YES	YES	YES	YES

Note: I list the results from four models using two different dependent variables, GHQ-12 and SF-12 MCS, and two different regressions, fixed effects and pooled OLS regression. In the fixed effects model, time-invariant control variables such as born in English-speaking country and home distance are omitted. Coefficients are reported. Standard errors are in parentheses. * if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

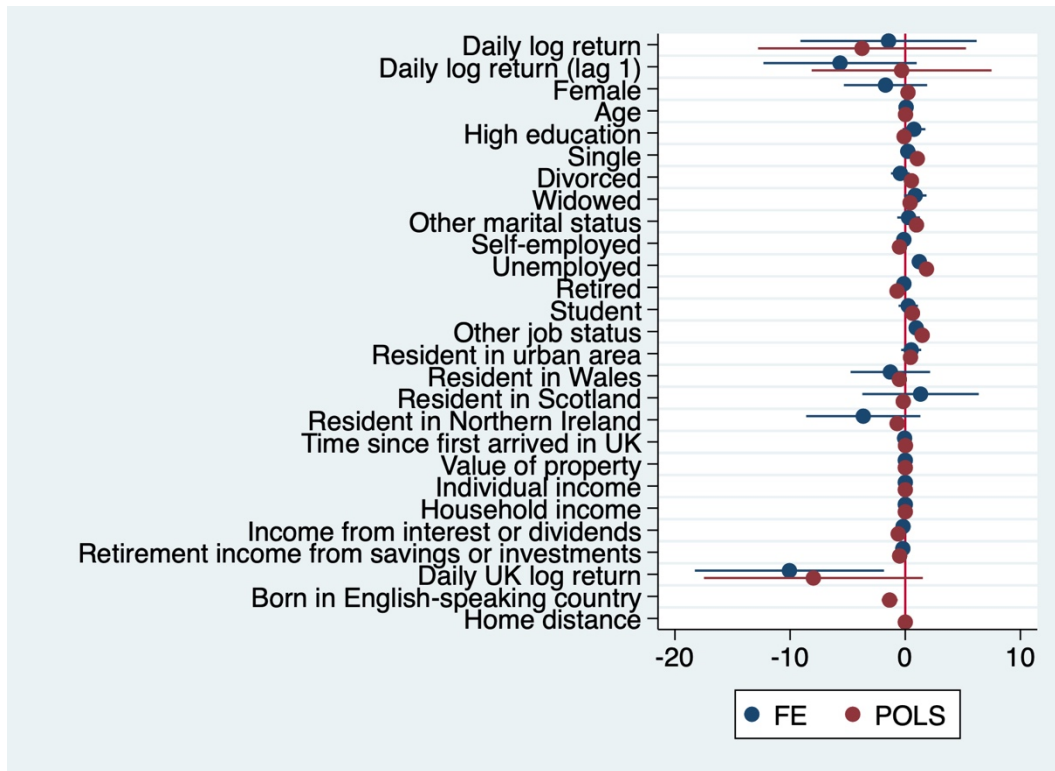


Figure 4.2 Coefficients of GHQ-12

Note: The coefficient plot illustrates the coefficients of the impact of each independent variable on the GHQ-12 using two models, the fixed effects and pooled OLS regression, with 95% confidence intervals.

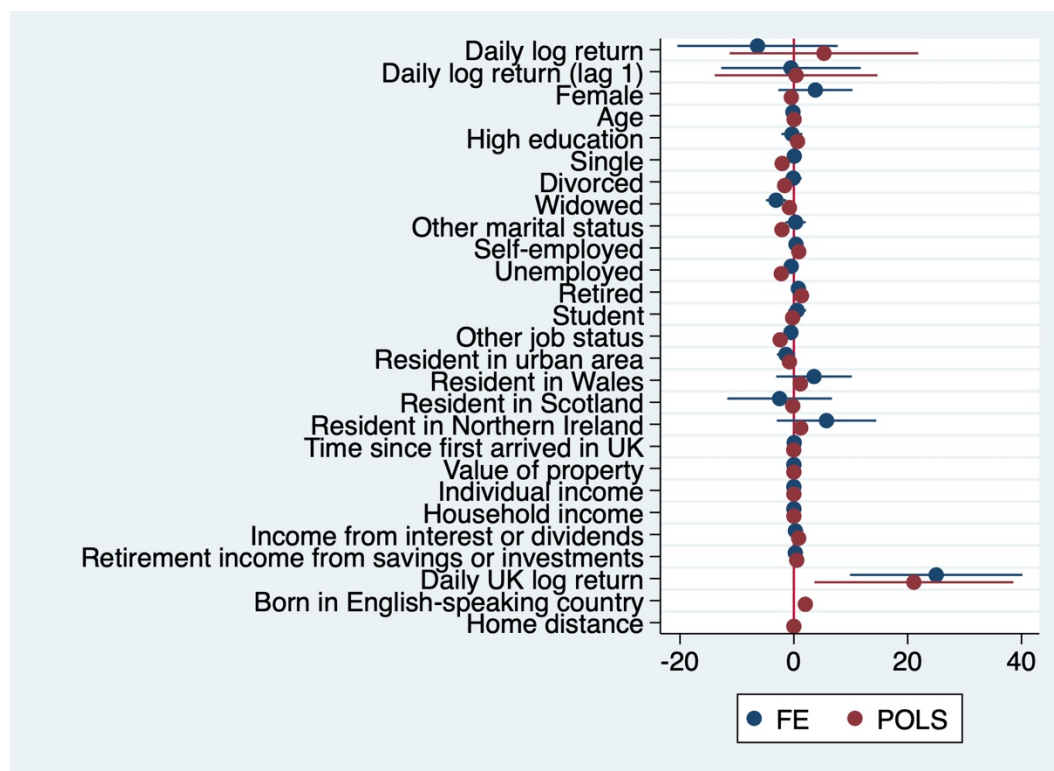


Figure 4.3 Coefficients of SF-12 MCS

Note: The coefficient plot illustrates the coefficients of the impact of each independent variable on the SF-12 MCS using two models, the fixed effects and pooled OLS regression, with 95% confidence intervals.

To investigate the pure wealth effect, I hypothesise that daily stock market returns may have an immediate impact on immigrants' mental health if they have income from interest or dividends, are retired, or report to have retirement income from savings or investments. Therefore, I study how the impact of daily and one-day lagged returns on mental health is influenced by these interactions. The results from this analysis are presented in Table 4.6. This approach is supported by previous literature which suggests that stock market returns are associated with an immediate response in mental health (McInerney et al., 2013; Frijters et al., 2015; Engelberg & Parsons, 2016). Furthermore, Frijters et al. (2015), McInerney et al. (2013), Schwandt (2018), and Sargent-Cox et al. (2011) all suggest that income from dividends and retirement are moderators of the relationship between stock market returns and mental health.

Table 4.6 Interactions with Return, Income from Interest or Dividends, and Retirement

	(1)				(2)			
	GHQ-12		SF-12 MCS		GHQ-12		SF-12 MCS	
	FE	POLS	FE	POLS	FE	POLS	FE	POLS
Daily log return (D)	2.135 (4.397)	−0.053 (5.134)	−6.184 (8.111)	6.344 (9.434)	3.325 (4.396)	−1.361 (5.165)	−11.352 (8.113)	6.330 (9.484)
Income from interest or dividends (I)	−0.189 (0.119)	−0.610*** (0.119)	0.274 (0.219)	0.845*** (0.218)	−0.193 (0.119)	−0.613*** (0.119)	0.277 (0.219)	0.844*** (0.218)
Retired (R)	−0.122 (0.233)	−0.714*** (0.176)	0.779* (0.431)	1.349*** (0.324)	−0.119 (0.233)	−0.707*** (0.176)	0.778* (0.431)	1.351*** (0.324)
D × I	−14.609* (8.247)	−16.936* (10.071)	−0.805 (15.150)	−4.644 (18.419)				
D × R					−19.632** (8.313)	−10.299 (10.039)	20.192 (15.251)	−4.460 (18.409)
Daily log return (lag 1) (D1)	−1.956 (4.113)	2.432 (4.788)	−2.383 (7.592)	0.457 (8.782)	−3.100 (4.042)	1.621 (4.695)	−3.902 (7.455)	−2.682 (8.609)
Income from interest or dividends (I)	−0.188 (0.119)	−0.611*** (0.119)	0.274 (0.219)	0.847*** (0.218)	−0.192 (0.119)	−0.613*** (0.119)	0.277 (0.219)	0.849*** (0.218)
Retired (R)	−0.112 (0.233)	−0.705*** (0.176)	0.754* (0.431)	1.339*** (0.324)	−0.107 (0.233)	−0.702*** (0.176)	0.749* (0.431)	1.329*** (0.324)
D1 × I	−8.488 (7.815)	−8.117 (9.337)	2.399 (14.356)	2.620 (17.058)				
D1 × R					−4.288 (8.304)	−5.393 (9.927)	10.238 (15.288)	19.400 (18.154)

Note: I introduce two-way interaction terms and list the results from 16 models using two different dependent variables, GHQ-12 and SF-12 MCS, and two different regressions, fixed effects and pooled OLS regression. In my models I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence within the UK, born in English speaking country, home distance, time since first arrived in UK, value of property, individual income, household income, income from interest or dividends, retirement income from savings or investments, UK log returns, year, month, weekday, season, and home country dummies. The baseline results for daily log return and daily log return (lag 1) are included in Table 4.5. Coefficients are reported. Standard errors are in parentheses.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

The results presented in Table 4.6 suggest that income from interest or dividends and retirement are critical moderators of the relationship between daily returns and immigrants' mental health. I present a graph of each two-way interaction in Figure 4.4, Graph A and B. I find that daily returns have an immediate positive impact on immigrants who have income from interest or dividends, whereas those who do not have income from interest or dividends are not affected. For every one-unit increase in the daily log return, immigrants who have income from interest or dividends tend to experience a 12.474 better GHQ-12 using the fixed effects model and a 16.989 better GHQ-12 using the pooled OLS regression. These findings also support research hypothesis *H3*.

I explain these results by suggestion that immigrants who have income from interest or dividends may have invested in companies in their home country, and the increase in value of their investment may explain the improvement in their mental health. Assuming that immigrants who have income from interest or dividends invested in their home country, the immediate increase in their GHQ-12 may be explained by the immediate increase in the immigrants' wealth that comes with an increase in daily stock market returns, and there is a consensus in the literature that wealth is one determinant of mental health (Allen et al., 2014; Ratcliffe & Taylor, 2015).

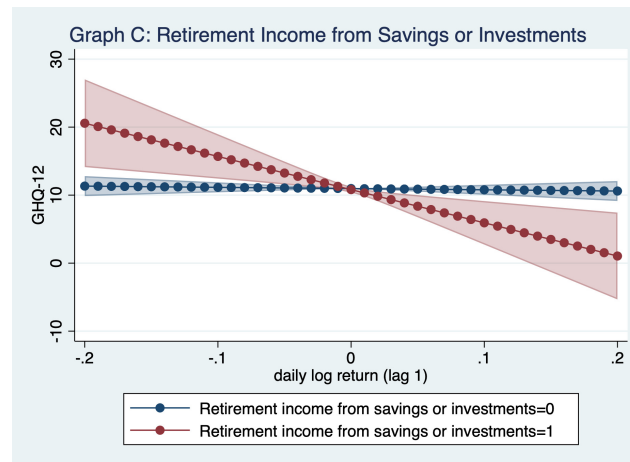
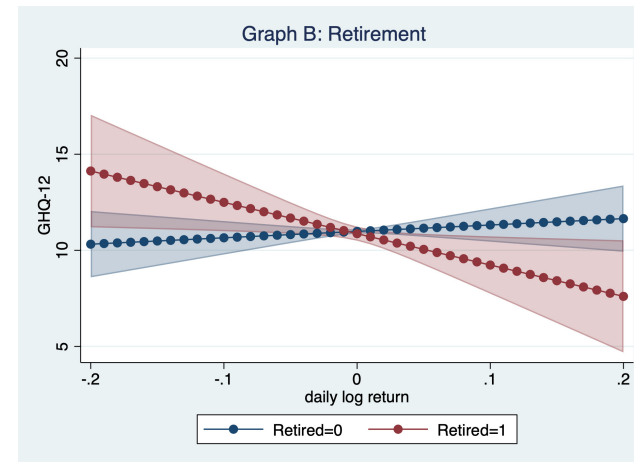
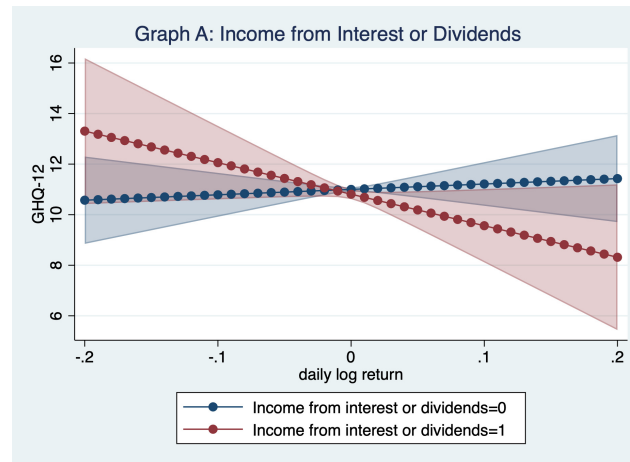


Figure 4.4 Predicted Mean of GHQ-12 by Daily Return with Interactions with 95% CIs

I also find that retirement is a critical moderator of the relationship between daily stock market returns and the mental health of immigrants, as the impact of daily returns on the GHQ-12 differs between retired and non-retired immigrants. While immigrants who are not retired are not affected by daily returns, they do have an impact on the mental health of retired immigrants, whereby a one-unit increase in the daily log return is associated with a 16.307 better GHQ-12. The additional effect of being retired is therefore 1.3 times stronger than the additional effect of income from interest or dividends. These results support the findings presented in chapter 3, suggesting that immigrants may have invested in their home country for their retirement. In chapter 3, I explain this finding using the life cycle hypothesis (Modigliani & Brumberg, 1954) which states that people's wealth peaks immediately before retirement and retirees spend their accumulated wealth during their retirement. Considering that one of the most common sources of accumulated wealth are financial assets, including stocks (Poterba et al., 2011; Gornick & Sierminska, 2021), this may explain why retired immigrants are more affected by daily returns than those who are not retired.

However, I also consider an alternative explanation for this finding. Following the life cycle hypothesis, retirees generally have less disposable income than non-retired individuals. Therefore, I suggest that retirees may depend on their investments more than non-retired immigrants who may have income from other sources to mitigate losses from investments. Immigrants who are not retired may worry less about daily stock market returns because they may not depend on them as much as retired immigrants. Furthermore, retired immigrants may not have as much time to recover from losses compared to non-retired immigrants because retired immigrants may need their savings immediately to pay their bills. Non-retired immigrants may have more time until they reach retirement so their investments can recover from negative returns. This may be a reason why the impact of daily returns is stronger for retired immigrants. I also note that income from interest or dividends and retirement are not moderators of the relationship between one-day lagged returns and the GHQ-12. The SF-12 MCS remains unaffected by both daily and one-day lagged returns.

While the impact of daily returns on immigrants' mental health does not differ between immigrants with and without retirement income from savings or investments, there is a

significant difference in the effect of one-day lagged returns. The results are presented in Table 4.7. For immigrants with retirement income from savings or investments, a one-unit increase in one-day lagged returns is associated with a 48.818 better GHQ-12 using the fixed effects model and a 69.183 improved GHQ-12 using the POLS regression. The POLS model also suggests that immigrants with retirement income from savings or investments tend to have a 97.299 higher SF-12 MCS if one-day lagged returns increase by one unit. I illustrate this interaction in Figure 4.4, Graph C. This allows the conclusion that the interaction effect of retirement income from savings or investments is 3 times stronger than the additional effect of retirement, and 3.9 times stronger than the additional effect of income from interest or dividends. Hence, the impact of daily stock market returns on mental health is strongest for immigrants with retirement income from savings or investments. This finding can be linked to previous research which suggests that the impact of stock markets on people's mental health is strongest for stockholders and retirees (Sargent-Cox et al., 2011; McInerney et al., 2013; Frijters et al., 2015; Schwandt, 2018).

Table 4.7 Interactions with Return and Retirement Income from Savings or Investments

	GHQ-12		SF-12 MCS	
	FE	POLS	FE	POLS
Daily log return (D)	−1.198 (3.963)	−4.229 (4.675)	−6.146 (7.305)	6.910 (8.585)
Retirement income from savings or investments (S)	−0.206 (0.221)	−0.491* (0.265)	0.257 (0.403)	0.520 (0.481)
D × S	−6.935 (18.731)	13.681 (22.923)	−6.342 (34.105)	−45.665 (41.572)
Daily log return (lag 1) (D1)	−1.808 (3.747)	3.497 (4.366)	−3.743 (6.918)	−3.056 (8.010)
Retirement income from savings or investments (S)	−0.155 (0.221)	−0.411 (0.266)	0.192 (0.405)	0.397 (0.483)
D1 × S	−47.010*** (16.697)	−72.680*** (20.466)	41.038 (30.456)	100.355*** (37.119)

Note: I introduce two-way interaction terms and list the results from eight models using two different dependent variables, GHQ-12 and SF-12 MCS, and two different regressions, fixed effects and pooled OLS regression. In my models I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence within the UK, born in English speaking country, home distance, time since first arrived in UK, value of property, individual income, household income, income from interest or dividends, retirement income from savings or investments, UK log returns, year, month, weekday, season, and home country dummies. The baseline results for daily log return and daily log return (lag 1) are included in Table 4.5. Coefficients are reported. Standard errors are in parentheses. * if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

4.5.3 Testing the Familiarity Hypothesis

To test the familiarity hypothesis, I include cultural, geographic, and economic distance, the language spoken in the home country and economic development as interaction terms in my models. The results presented in Table 4.8 suggest that the mental health of immigrants from countries that are both geographically and economically close, and immigrants from developed countries are positively affected by an increase in daily stock market returns in their home country. The impact is strongest for immigrants from developed countries.

The explanation I propose for this finding is threefold. Firstly, these results may represent the immigrants' financial ties they still have with their home country. The impact of stock markets on immigrants' mental health may be due to investments held in their home country, which can be linked to the home bias theory and supports the familiarity hypothesis. Secondly, I also suggest that immigrants may potentially hold portfolios that are internationally diversified as theory suggests (Levy & Sarnat, 1970), but their ties to their home country may be so strong that they use the stock market in their home country as the benchmark to evaluate the overall stock market performance or economic prospects. This both supports and extends the familiarity hypothesis. I propose that the familiarity hypothesis may not only apply to investment decisions, but also to the choice of the stock market that is used as a benchmark. This means that people's mental health may be affected by returns of stock markets to which they have an emotional connection, despite not necessarily holding investments there. Finally, I suggest that immigrants from countries that are developed and geographically or economically close may benefit from improving stock market performance in their home country due to the strong ties between the UK and their home country.

Table 4.8 Interaction Terms

	<i>GHQ-12</i>		<i>SF-12 MCS</i>	
	FE	POLS	FE	POLS
Daily log return (D)	6.875 (6.194)	6.475 (7.153)	−21.709* (11.585)	−11.797 (13.332)
D × Culturally close	−8.848 (7.864)	−13.770 (9.191)	23.370 (14.650)	26.544 (17.064)
Daily log return (lag 1) (D1)	−2.407 (5.816)	5.182 (6.738)	−8.273 (10.849)	−4.037 (12.488)
D1 × Culturally close	2.450 (7.379)	−5.716 (8.634)	5.962 (13.738)	1.523 (15.959)
Daily log return (D)	4.024 (5.160)	−0.638 (5.980)	−20.334** (9.551)	−3.448 (11.029)
D × Geographically close	−11.667 (7.190)	−6.967 (8.518)	29.337** (13.218)	19.280 (15.621)
Daily log return (lag 1) (D1)	2.364 (4.653)	3.189 (5.404)	−18.388** (8.585)	−4.121 (9.906)
D1 × Geographically close	−15.164** (6.849)	−6.396 (8.069)	39.545*** (12.610)	12.700 (14.768)
Daily log return (D)	1.876 (5.425)	−3.381 (6.230)	−17.143* (10.049)	1.335 (11.494)
D × Economically close	−6.393 (7.237)	−0.762 (8.534)	20.422 (13.321)	7.962 (15.669)
Daily log return (lag 1) (D1)	0.631 (4.957)	2.711 (5.741)	−18.113** (9.166)	−5.636 (10.537)
D1 × Economically close	−9.430 (6.827)	−4.470 (8.020)	33.148*** (12.573)	14.015 (14.681)
Daily log return (D)	−4.573 (4.262)	−5.365 (5.017)	−3.373 (7.858)	6.414 (9.216)
D × English speaking home country	16.084* (8.818)	8.613 (10.619)	−15.390 (16.178)	−5.962 (19.425)
Daily log return (lag 1) (D1)	−3.300 (3.941)	1.236 (4.597)	−4.070 (7.266)	2.551 (8.426)
D1 × English speaking home country	−4.168 (8.891)	−4.194 (10.619)	14.038 (16.405)	−9.626 (19.443)
Daily log return (D)	2.649 (5.045)	−0.029 (5.822)	−19.646** (9.334)	−5.254 (10.730)
D × Developed home country	−9.269 (7.223)	−8.995 (8.591)	29.570** (13.266)	25.132 (15.742)
Daily log return (lag 1) (D1)	2.615 (4.600)	3.527 (5.334)	−17.470** (8.493)	−3.873 (9.785)
D1 × Developed home country	−16.338** (6.884)	−7.540 (8.122)	38.644*** (12.671)	12.589 (14.860)

Note: I list the results from 40 models using two different dependent variables, GHQ-12 and SF-12 MCS, and two different regressions, fixed effects and pooled OLS regression. I run separate regressions for daily log returns and daily log returns (lag 1). In my models I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence within the UK, born in English speaking country, home distance, time since first arrived in UK, value of property, individual income, household income, income from interest or dividends, retirement income from savings or investments, UK log returns, year, month, weekday, season, and home country dummies. The baseline results for daily log return and daily log return (lag 1) are included in Table 4.5. Coefficients are reported. Standard errors are in parentheses.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

In stark contrast to the previous results, I also find that the mental health of immigrants from countries that are culturally, geographically, and economically distant, where English is commonly spoken, and from emerging economies are negatively impacted by an increase in daily stock market returns in their home country. While these results are surprising, I explain this by suggesting that immigrants from these countries may use their home country as a reference point which is why improving stock market performance in their home country may cause them to question their decision to migrate. This suggestion is in line with previous research (Akay et al., 2017). This explanation can be linked to the hypothesis that stock markets may provide a barometer for economic prospects in the respective country (Ratcliffe and Taylor, 2015). With economic conditions in the home country being one of the push factors of migration (Simpson, 2017), I suggest that questioning their decision to migrate is particularly relevant for immigrants from developing countries. In conclusion, my findings support research hypothesis *H4* in that familiarity plays a role in how the mental health of immigrants is impacted by stock markets in their home country.

4.5.4 Robustness Analysis

To test if my results from the main analysis are robust, I rerun the regressions presented in Table 4.5 using weekly, monthly, quarterly, and annual stock market returns. The results are presented in Table 4.9. I find that the mental health of immigrants is not affected by weekly, monthly, quarterly, and annual stock market returns in their home country. Therefore, I conclude that only daily returns have an immediate impact on immigrants' mental health. Building on the preceding findings, it is worth noting that both the fixed effects and pooled OLS model are symmetric regression models. This means that an increase in daily returns not only improves mental health outcomes, but a decrease in daily returns equally decreases mental health. As a result of the immediate impact of daily returns on subjective mental health and the absence of an impact of weekly, monthly, quarterly, and annual returns, I suggest that the longevity of the mental health impairment may be as short as one day.

Table 4.9 Robustness Analysis

	<i>GHQ-12</i>		<i>SF-12 MCS</i>	
	FE	POLS	FE	POLS
Weekly log return	1.514 (1.417)	0.849 (1.704)	−0.943 (2.626)	0.425 (3.150)
Lag 1	0.839 (1.334)	1.859 (1.595)	−0.206 (2.468)	−2.803 (2.947)
Monthly log return	−0.172 (0.698)	0.901 (0.834)	0.497 (1.294)	−1.172 (1.544)
Lag 1	−0.642 (0.619)	−0.949 (0.747)	1.140 (1.147)	1.578 (1.378)
Quarterly log return	−0.124 (0.422)	0.038 (0.508)	0.531 (0.781)	−0.141 (0.937)
Lag 1	−0.082 (0.365)	−0.299 (0.445)	0.134 (0.677)	0.956 (0.821)
Annual log return	−0.197 (0.210)	0.033 (0.257)	0.076 (0.390)	−0.159 (0.475)
Lag 1	−0.036 (0.208)	−0.102 (0.254)	0.543 (0.387)	0.445 (0.469)

Note: I list the results from 16 models using two different dependent variables, GHQ-12 and SF-12 MCS, and two different regressions, fixed effects and pooled OLS regression. In my models I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence within the UK, born in English speaking country, home distance, time since first arrived in UK, value of property, individual income, household income, income from interest or dividends, retirement income from savings or investments, UK log returns, year, month, weekday, season, and home country dummies. Coefficients are reported. Standard errors are in parentheses. * if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

I also run the Wooldridge test (Wooldridge, 2002; Drukker, 2003) to detect serial correlation in my data, as my models rely on the absence of serial correlation in the dataset (Wooldridge, 2002). The Wooldridge test is an appropriate test for my setting because it can be used in fixed effects models with unbalanced panel data with gaps in the individual series (Drukker, 2003). The F-Test value is 1.354 with a p-value of 0.257. These results indicate that there is no serial correlation in the daily log returns, as I do not reject the null hypothesis of no serial correlation in the data. This allows me to conclude that the results from my main analysis are robust.

Furthermore, I calculate the variance inflation factors to detect multicollinearity between the independent variables in my regression models. Table 4.10 shows that the variation inflation factors for most independent variables are acceptable; however, the variable age shows multicollinearity with other independent variables. Due to the nature of this variable, this multicollinearity issue can be disregarded, as age is naturally correlated with variables such as marital status, job status, and time since first arrived in UK.

Table 4.10 Results of Multicollinearity Test

	<i>GHQ-12</i>		<i>SF-12 MCS</i>	
	FE	POLS	FE	POLS
Daily log return	1.20	1.20	1.20	1.20
Lag 1	1.02	1.03	1.02	1.03
Female	2.55	2.75	2.56	2.75
Age	34.85	48.54	34.99	48.30
Higher education	2.32	2.47	2.32	2.48
Single	1.50	1.67	1.50	1.66
Divorced	1.15	1.18	1.15	1.18
Widowed	1.23	1.25	1.23	1.25
Other marital status	1.05	1.05	1.05	1.05
Self-employed	1.28	1.30	1.28	1.30
Unemployed	1.15	1.17	1.16	1.17
Retired	2.95	3.13	2.97	3.15
Student	1.39	1.48	1.39	1.47
Other job status	1.48	1.60	1.49	1.61
Resident in urban area	8.63	10.84	8.55	10.66
Resident in Wales	1.04	1.07	1.04	1.07
Resident in Scotland	1.06	1.11	1.06	1.11
Resident in Northern Ireland	1.10	1.23	1.10	1.22
Born in English speaking country		13.34		13.36
Home distance		31.44		31.81
Time since first arrived in UK	11.04	12.40	10.99	12.34
Value of property	1.65	1.69	1.66	1.69
Individual income	4.01	4.09	4.39	4.11
Household income	4.87	4.99	4.89	5.01
Income from interest or dividends	1.41	1.45	1.42	1.45
Retirement income from savings or investments	1.08	1.09	1.09	1.09
Daily UK log return	1.20	1.20	1.20	1.20

Note: I list the variance inflation factors for four models using two different regressions, fixed effects and pooled OLS regression, and two different dependent variables, GHQ-12 and SF-12 MCS.

To ensure that my results are not driven by spillover effects among the stock markets in the immigrants' home countries and the UK stock market, I determine the Pearson product-moment correlation coefficients between the UK stock market index FTSE 100 and the daily stock market returns in each home country to detect cross-sectional dependence between my independent variables. I present the correlation coefficients in Table 4.11 along with the relative frequency of immigrants from each country in my dataset.

I find that daily UK returns based on the FTSE 100 Index have a correlation coefficient of greater than 0.7 with 5 countries, a correlation coefficient between 0.3 and 0.7 with 7 countries, a correlation coefficient between 0 and 0.3 with 8 countries and no correlation at all with 3 countries. To evaluate the impact of spillover effects on my dataset, I also list the relative frequency of individuals from each country in Table 4.11. I note that 14.31% of all immigrants were born in countries with a correlation coefficient of greater than 0.7, 32.02% are from countries with a correlation coefficient between 0.3 and 0.7, 42.2% immigrated from countries with a correlation coefficient between 0 and 0.3, and 11.47% from countries with stock markets that have no correlation with the UK stock market. This implies that the majority of immigrants are from countries that have no correlation or a correlation coefficient of less than 0.3 with the UK stock market. Therefore, I conclude that spillover effects do not account for my results and that they are driven by the choice of stock market returns in immigrants' home countries as my independent variables.

Table 4.11 Correlation Analysis

	FTSE 100 Coefficient	Relative Frequency of Individuals
Australia	0.427***	1.23
Bangladesh	0.093***	11.11
Canada	0.645***	0.83
China	0.219***	2.68
Cyprus	0.170***	1.04
France	0.876***	1.39
Germany	0.846***	4.73
Ghana	0.022	2.84
India	0.454***	18.07
Ireland	0.752***	5.77
Italy	0.774***	1.56
Jamaica	0.025	5.12
Kenya	0.021	3.51
New Zealand	0.242***	0.94
Nigeria	0.063***	4.47
Pakistan	0.090***	16.85
Poland	0.616***	5.56
South Africa	0.691***	2.66
Spain	0.768***	0.86
Sri Lanka	0.045**	3.45
Türkiye	0.432***	1.19
Uganda	-0.047***	1.66
United States	0.622***	2.48

Note: I list the correlation coefficients between the FTSE 100 Index and each stock market of the immigrants' home countries. * if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$. I also list the relative frequency of individuals from each country in my dataset.

4.6 Conclusion

To my knowledge, I provide the first study to investigate if the mental health of immigrants is impacted by stock market returns in their home country, and the role familiarity plays in this relationship. I provide robust evidence that immigrants' subjective mental health is positively impacted by one-day lagged returns in their home country, with the effect being stronger for individuals with retirement income from savings or investments. Daily returns have an immediate positive impact on the mental health of immigrants if they either have income from interest or dividends or are retired. Therefore, I conclude that income from interest or dividends, retirement, and retirement income from savings or investments are important moderators of this relationship.

Furthermore, I provide novel evidence to support the role familiarity plays in the relationship between immigrants' mental health and stock markets in their home country.

I also extend the familiarity hypothesis in that familiarity may also play a role in choosing a benchmark index to evaluate the performance of the stock market or economic prospects, as I find that the mental health of immigrants from culturally, geographically and economically distant countries, and developing countries are negatively impacted by daily stock market returns in their home country. In addition to making a theoretical contribution to the familiarity hypothesis, I also add stock market returns in immigrants' home country as a determinant of their mental health to the existing body of literature.

Moreover, I extend previous literature investigating the impact of stock markets on people's mental health and I add to the theory the longevity of the mental health impairment due to daily stock market returns, as I find that there is an immediate impact of daily returns on the mental health of immigrants. While I address the issue of endogeneity, such as the impact of exogenous events on both immigrants' mental health and stock markets in their home country, by introducing interaction terms in my models, I encourage future research to further investigate the channels through which the mental health of immigrants is affected by stock markets in their home country.

Chapter 5 Stock Markets and Mental Health – Asymmetry and Spillover Effects

Abstract

Despite the arguments made by prospect theory, there is a lack of studies investigating asymmetric effects in the relationship between stock markets and mental health. I use the UK based Understanding Society panel dataset between 2010 and 2023 to investigate if stock market fluctuations have an asymmetric impact on mental health, and if there are mental health spillover effects on investors' household members, providing the first study to investigate this relationship using an asymmetric fixed effects model for panel data. I find that a decreasing stock market index has a stronger impact on mental health than an increasing one, supporting prospect theory. I also suggest that prospect theory does not hold for males in explaining the relationship between stock market fluctuations and mental health. Finally, I provide novel evidence for a mental health spillover effect of negative 52-week returns on investors' household members.

5.1 Introduction

Stock market fluctuations as one of the financial factors influencing mental health have been studied by an extensive body of literature (Ratcliffe & Taylor, 2015; Frijters et al., 2015; Engelberg & Parsons, 2016; Liu & Fan, 2024). Despite the increasing importance of Kahneman and Tversky's (1979) prospect theory, stating that losses have a greater impact than gains when making decisions under risk, and its growing application in behavioural finance and in models of economic behaviour (Ricciardi & Simon, 2000; Barberis, 2013), the vast majority of studies employ symmetric models to investigate the impact of stock market fluctuations on various measures of mental health (Ratcliffe & Taylor, 2015; Frijters et al., 2015; Engelberg & Parsons, 2016; Cotti & Simon, 2018). There is a lack of studies investigating asymmetry in the effect of stock market returns on people's mental health. Exceptions include Schwandt (2018), Cotti et al. (2015), and McInerney et al. (2013) who investigate the effects of wealth shocks, such as stock market booms and crashes, on mental health. Liu and Fan (2024) attempt to capture asymmetric effects of stock market

returns on the use of antidepressant drugs by using dummy variables as a proxy for positive and negative returns in a linear regression model.

However, I am unaware of any study to date investigating the impact of stock markets on mental health using an asymmetric fixed effects model. This model was originally introduced by York and Light (2017) and subsequently revised by Allison (2019) to provide a general method for investigating asymmetric relationships in panel data analysis. The novelty of this model is that the individual-specific effects of both positive and negative changes in independent variables can be estimated separately and quantified in a panel data setting using first differences. I provide the first study to investigate the asymmetric effect of stock market fluctuations on mental health using an asymmetric fixed effects model for panel data to overcome the challenges experienced by previous research (Cotti et al., 2015; Liu & Fan, 2024).

In line with prospect theory, I investigate if negative stock market returns have a greater impact on people's mental health than equivalent positive returns. Furthermore, Modigliani and Brumberg's (1954) lifecycle theory of consumption states that people accumulate wealth until retirement and consume their wealth during retirement. Therefore, I test if the impact of stock market fluctuations on mental health differs between age groups. Finally, I test if there are spillover effects of mental health impairments on other household members. This is grounded in the Jacobson model (Jacobson, 2000) which states that people are not only producers of their own health, but also that of other family members, suggesting an interconnectedness of health among family members. Cotti and Simon (2018) provide the only study I am aware of investigating mental health spillover effects of stock market performance on children. To my knowledge, I provide the first study to investigate spillover effects of both symmetric and asymmetric effects of stock market fluctuations on the mental health of other household members aged 15 and over.

I use panel data covering the period from 2010 to 2023 which I obtain from the UK based Understanding Society dataset to conduct a longitudinal study investigating asymmetry and spillover effects in the relationship between stock market fluctuations and mental health. I use the GHQ-12 and SF-12 MCS as measures of self-reported mental health. To

measure stock market performance, I use the FTSE 100 stock market index to calculate the 52-week logarithmic return prior to the interview, the level of stock market index on the day of the interview, and 52-week volatility prior to the interview which I calculate as the annualised standard deviation based on weekly logarithmic returns. I employ a standard fixed effects (SFE) model and a pooled ordinary least squares regression to analyse the symmetric impact of stock market fluctuations on mental health, and an asymmetric fixed effects (AFE) model to capture asymmetric effects in this relationship. To investigate mental health spillover effects on other household members, I divide my dataset into three sub-samples, individuals with investment income, individuals with household investment income but no individual investment income, and individuals who have neither individual nor household investment income, and estimate the impact of stock market fluctuations on mental health separately for each sub-sample.

I find that 52-week returns have a symmetric positive impact on the GHQ-12 score, while 52-week volatility has a symmetric negative impact on mental health. I also provide evidence for an asymmetric effect of both positive and negative changes in the level of stock market index on the GHQ-12, with the effect of a decreasing index being 1.7 times stronger than the effect of increases, supporting prospect theory. In contradiction to the lifecycle theory of consumption, I suggest that the impact of 52-week returns, the level of stock market index and 52-week volatility on mental health is weakest for middle-aged individuals and strongest for older cohorts. Finally, I provide evidence for a mental health spillover effect of negative 52-week returns on investors' household members.

Besides making a methodological contribution to the literature by using an asymmetric fixed effects model for panel data, I also provide the first study analysing mental health spillover effects due to fluctuations in the stock market on other adult household members. In terms of my empirical analysis, I expand on the existing literature investigating the impact of stock markets on mental health by providing novel evidence for asymmetry and spillover effects in this relationship. I also suggest that reliance on investment income is a crucial moderator of the relationship between stock market fluctuations and mental health. Finally, I find that prospect theory does not hold for males in explaining the relationship between stock market fluctuations and mental health.

The remainder of this chapter is organised as follows. First, I present the research hypotheses, followed by a description of the dataset and the econometric models used to conduct this study. Next, I present the results along with a discussion, including an examination of the robustness of my findings. The chapter concludes with a summary of the study's key findings, their implications for policymakers, and directions for future research.

5.2 Research Hypotheses

According to prospect theory, losses have a greater impact on people than equivalent gains (Kahneman & Tversky, 1979). Furthermore, the lifecycle theory of consumption states that young and middle-aged individuals accumulate wealth up until retirement, while older cohorts consume their wealth during retirement (Modigliani & Brumberg, 1954). Finally, the Jacobson model suggests that mental health among family members is interconnected and mental health impairments can spill over on other family members (Jacobson, 2000; Jung et al., 2024). In line with theory provided by previous literature, I develop the following research hypotheses:

H5. Negative stock market returns have a stronger impact on mental health than positive ones.

H6. The impact of stock market returns is strongest for young and middle-aged individuals.

H7. There is a spillover effect on the mental health of other household members due to stock market fluctuations.

5.3 Data

5.3.1 Dependent Variables

I use data from the Understanding Society dataset, a UK based household longitudinal study. My dataset includes information from 2010 to 2023 at both the individual and household level (University of Essex. Institute for Social and Economic Research, 2023). A

full description of all variables is presented in Table 5.1. My total sample encompasses 452,064 observations with 78,893 individuals who were interviewed annually over several years. I use the GHQ-12 and SF-12 MCS as my dependent variables to measure subjective mental health. Both measures have been frequently used in previous literature (Makowska et al., 2002; Cygan-Rehm et al., 2017; Anjara et al., 2020; Arulsamy & Delaney, 2022).

The GHQ-12 is based on the short-form of the General Health Questionnaire which aims to detect psychiatric illness such as depression and anxiety (Goldberg, 1972). The 12 questions contained in the questionnaire are answered on a 4-point Likert scale with the aim of measuring the respondent's subjective mental health and the likelihood of having a psychiatric disorder. The GHQ-12 score is calculated by combining the 12 answers into a score ranging from 0 to 36, with a low score indicating that the respondent is in good mental health. The SF-12 MCS is the Mental Component Summary of the 12-Item Short-Form Health Survey which is designed to measure an individual's general mental health. The 12 questions included in the SF-12 are answered on 3-point and 5-point Likert scales. The responses are weighted and transformed into the SF-12 MCS which represents a score between 0 and 100, with a high score indicating that the respondent is in good general mental health (Ware et al., 1995). These two measures of self-reported mental health are used in this study to analyse both the individuals' general mental health and the likelihood of the respondent suffering from a psychiatric disorder. Figures 5.1 and 5.2 show the frequency distribution of the GHQ-12 and SF-12 MCS respectively.

Table 5.1 Variable Descriptions

Variable	Definition
Dependent variables	
GHQ-12	12-Item General Health Questionnaire (GHQ-12) score. The lower the score the better the mental health. The score's range is 0 – 36.
SF-12 MCS	Mental Component Summary (MCS) of the 12-Item Short-Form Health Survey (SF-12). The higher the score the better the mental health. The score's range is 0 – 100.
Independent variables	
52-week return	52-week logarithmic return of 52 weeks before the interview based on the FTSE 100 index.
Level of stock market index	Level of the FTSE 100 index on the day of the interview.
52-week volatility	Annualised FTSE 100 volatility based on the standard deviation of weekly logarithmic returns 52 weeks before the interview.
Female	Dummy variable: =1 if sex assigned at birth is female. Coefficients are relative to male.
Age	The research participant's age in years at the time of the interview.
Higher education	Dummy variable: =1 if level of education is a Higher Degree (Masters, PhD), First Degree (Bachelors) or Diploma in Higher Education. Coefficients are relative to a low level of education.
Marital status	Dummy variables: =1 if current marital status is single/divorced/widowed/other. Coefficients are relative to married.
Job status	Dummy variable: =1 if current job status is self-employed/unemployed/retired/student/other. Coefficients are relative to employed.
Resident in urban area	Dummy variable: =1 if research participant is an urban resident. Coefficients are relative to rural residents.
Country of residence	Dummy variable: =1 if research participant is a resident of Wales/Scotland/Northern Ireland. Coefficients are relative to residents of England.
Total individual income	Research participant's total monthly personal gross income in £.
Total household income	Total gross income in £ of the research participant's household in the month before the interview.
Individual investment income	Research participant's income from interest and dividends in £ in the year before the interview.
Household investment	Total investment income in £ of the research participant's household in the month before the interview.
GDP	Annual growth rate of UK GDP per capita in % based on constant £.
Inflation	Annual inflation in % based on UK consumer price index.
Year	Dummy variable: =1 based on year of interview. Coefficients are relative to research participants interviewed in 2010.
Month	Dummy variable: =1 based on month of interview. Coefficients are relative to research participants interviewed in January.
Week	Dummy variable: =1 based on week of interview. Coefficients are relative to research participants interviewed in week 1.

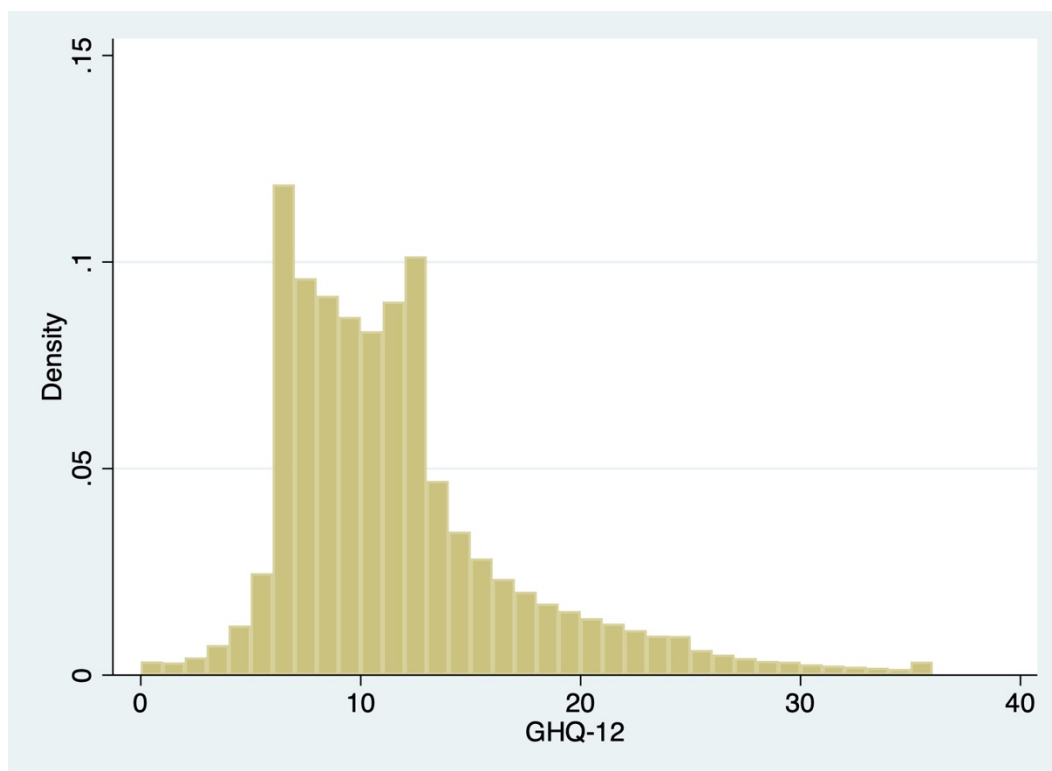


Figure 5.1 Frequency Distribution of GHQ-12

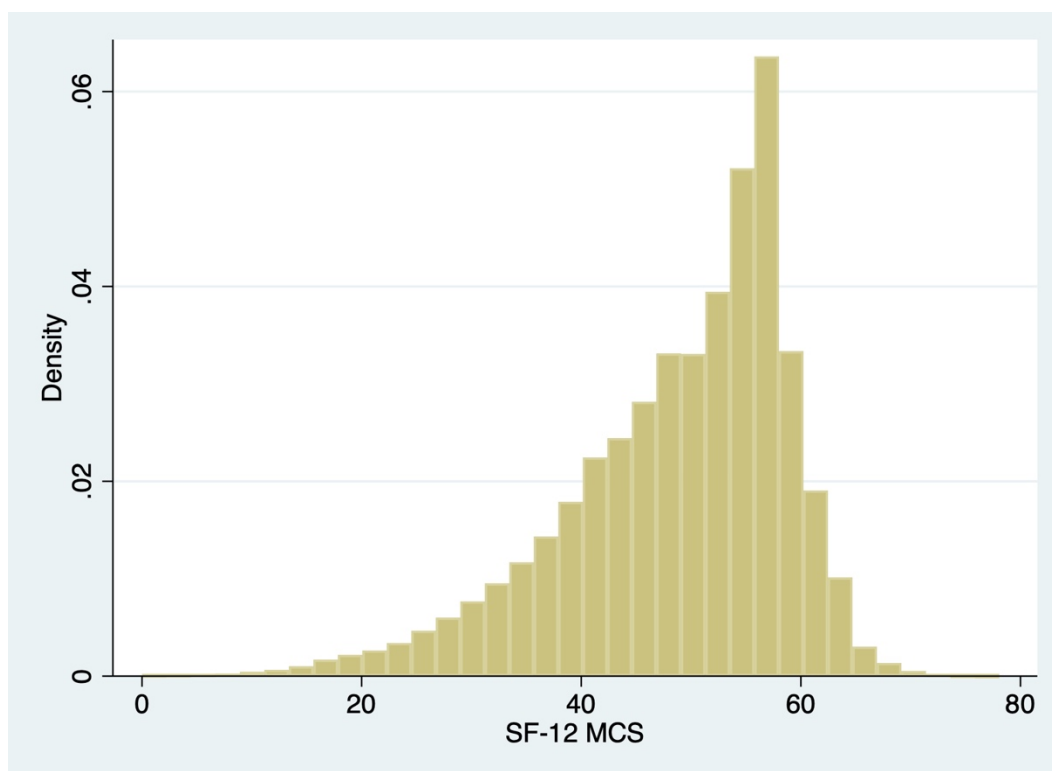


Figure 5.2 Frequency Distribution of SF-12 MCS

5.3.2 Independent Variables

My independent variables, 52-week return, level of stock market index, and 52-week volatility, are based on the FTSE 100 index which is the major stock market index in the UK. To measure 52-week returns, I calculate logarithmic returns over a period of 52 weeks prior to the interview. The level of stock market index is the value of the FTSE 100 index on the day of the interview. Finally, I measure 52-week volatility as the annualised standard deviation of the FTSE 100 index based on weekly logarithmic returns over a period of 52 weeks prior to the interview. The data were obtained from Bloomberg.

5.3.3 Control Variables

In my regression models, I control for the variables sex assigned at birth, age, education level, marital status, job status, resident in urban or rural area, country of residence within the UK, total individual income, total household income, individual investment income, household investment income, year, month, and week dummies. In my robustness analysis, I additionally control for macroeconomic variables, including GDP and inflation, which I obtain from the World Bank's World Development Indicators database (The World Bank, 2024a). The choice of control variables is guided by previous literature investigating the relationship between stock markets and mental health (Cotti et al., 2015; Ratcliffe & Taylor, 2015; Schwandt, 2018).

5.4 Econometric Models

I employ a pooled OLS, standard fixed effects, and asymmetric fixed effects model for each of my measures of subjective mental health, GHQ-12 and SF-12 MCS. Using the pooled OLS model, I estimate the subjective mental health y of individual i at time t as follows:

$$y_{it} = \mu_t + x_{it}\beta + \varepsilon_{it} \quad (5.1)$$

In the preceding equation, y_{it} represents the subjective mental health y , measured by GHQ-12 and SF-12 MCS, of individual i at time t . μ_t represents the intercept, x_{it} is the i^{th}

independent variable, β is the slope parameter for each independent variable and ε_{it} represents the error term.

The standard fixed effects model is employed to capture the individual-specific effects. I estimate the subjective mental health y of individual i at time t as follows:

$$y_{it} = \mu_t + x_{it}\beta + \alpha_i + \varepsilon_{it} \quad (5.2)$$

In this model, the individual-specific effects α_i are added to the equation. The remaining model specification remains unchanged to the pooled OLS model. As one of the assumptions of the standard fixed effects model is a linear, symmetric impact of the i^{th} independent variable on the dependent variable, I also employ an asymmetric fixed effects model to investigate asymmetry in the relationship between stock market performance and subjective mental health. Following the approach proposed by Allison (2019), I first determine the first differences of my independent variables and subsequently decompose them into positive and negative components:

$$x_{it}^+ = x_{it} - x_{it-1} \text{ if } (x_{it} - x_{it-1}) > 0, \text{ otherwise } 0 \quad (5.3)$$

$$x_{it}^- = -(x_{it} - x_{it-1}) \text{ if } (x_{it} - x_{it-1}) < 0, \text{ otherwise } 0 \quad (5.4)$$

In equation (5.3), x_{it}^+ represents a positive change in the first difference of each independent variable. A negative change in the first difference of my independent variables is represented by x_{it}^- in equation (5.4). If time $t = 1$, x_{it}^+ and x_{it}^- are set to 0 because x_{it-1} is not observed (Allison, 2019). I then accumulate both positive and negative changes in the first differences of each independent variable up to time t as follows:

$$z_{it}^+ = \sum_{s=1}^t x_{is}^+ \quad (5.5)$$

$$z_{it}^- = \sum_{s=1}^t x_{is}^- \quad (5.6)$$

In the above two equations, z_{it}^+ represents the accumulation of all positive changes while z_{it}^- represents the accumulation of all negative changes up to time t . Finally, I can estimate the following asymmetric first difference model (Allison, 2019; Park & Kim, 2024):

$$\Delta y_{it} = \Delta \mu_t + \beta^+ \Delta z_{it}^+ + \beta^- \Delta z_{it}^- + \Delta \varepsilon_{it} \quad (5.7)$$

To test whether the impact of stock market performance on subjective mental health is asymmetric, I perform a Wald test that determines whether the difference between the magnitude of positive and negative changes in the independent variables is statistically significant ($\beta^+ = -\beta^-$). This approach is in line with previous literature (Allison, 2019; Park et al., 2024; Park & Kim, 2024).

5.5 Results and Discussion

5.5.1 Descriptive Statistics

Figure 5.3 shows a line graph of my independent variables, 52-week return, level of stock market index, and 52-week volatility, during the period 2010 to 2023. The graphs show a positive trend in the FTSE 100 index and illustrate that 52-week volatility increases equally with both sharply increasing and sharply decreasing returns in the FTSE 100 index. This highlights the importance of using not only stock market returns and the level of stock market index to measure stock market performance, but also a measure of stock market volatility to capture changes in the standard deviation of weekly returns.

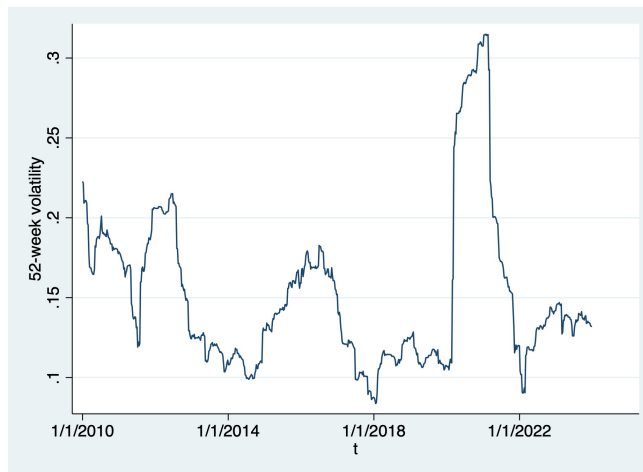
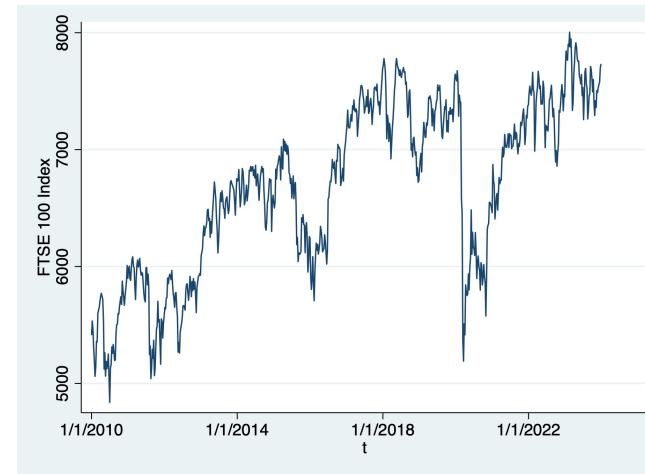
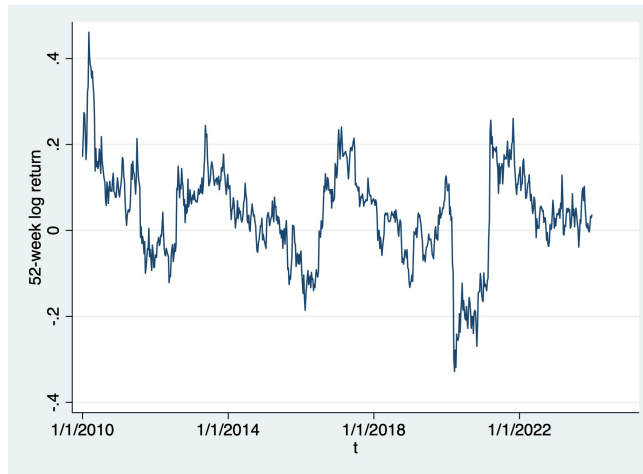


Figure 5.3 52-Week Return, Level of Stock Market Index and 52-Week Volatility

The descriptive statistics are presented in Table 5.2. The average GHQ-12 score is 11.225 with a standard deviation of 5.590. This indicates that the average respondent is in good mental health. The mean SF-12 MCS is 48.823 with a standard deviation of 10.285. The mean 52-week return is 0.036, indicating that positive 52-week returns are more likely than negative ones. The average level of the FTSE 100 stock market index is 6,495.504 and the average 52-week volatility is 0.153 standard deviations based on weekly logarithmic returns.

54.3% of my sample are female and the average respondent is 48.586 years old at the time of the interview. 32.1% of the respondents have higher education. 29.8% of my sample are single, 8.9% are divorced, and 6.5% are widowed. 7.7% of all respondents are self-employed, 4.6% are unemployed, 24.4% are retired, and 6.4% are students. The majority of respondents, 75%, live in an urban area. 7% are residents of Wales, 8.6% are residents of Scotland, and 6.6% are residents of Northern Ireland. The average total monthly income of each individual is £1,736.102, while the average total monthly household income is £3,924.224. The average respondent has an individual investment income of £399.146 per year. The mean of monthly household investment income is £212.238. The average annual GDP growth rate is 0.994%, with average inflation being 2.202%.

Table 5.2 Descriptive Statistics

	Mean	Standard Deviation	Minimum	Maximum
GHQ-12	11.225	5.590	0	36
SF-12 MCS	48.823	10.285	0	78.08
52-week return	0.036	0.112	−0.328	0.461
Level of stock market index	6,495.504	699.716	4,838.09	8,004.36
52-week volatility	0.153	0.049	0.084	0.315
Female	0.543	0.498	0	1
Age	48.586	18.757	15	104
Higher education	0.321	0.467	0	1
Single	0.298	0.457	0	1
Divorced	0.089	0.284	0	1
Widowed	0.065	0.246	0	1
Other marital status	0.024	0.154	0	1
Self-employed	0.077	0.266	0	1
Unemployed	0.046	0.210	0	1
Retired	0.244	0.430	0	1
Student	0.064	0.245	0	1
Other job status	0.100	0.299	0	1
Resident in urban area	0.756	0.430	0	1
Resident in Wales	0.070	0.255	0	1
Resident in Scotland	0.086	0.280	0	1
Resident in Northern Ireland	0.066	0.249	0	1
Total individual income	1,736.102	1,604.62	0	29,224
Total household income	3,924.224	3,709.104	0	1,344,970
Individual investment income	399.146	8,700	0	4,200,000
Household investment income	212.238	1,303.044	0	350,679.9
GDP	0.994	3.594	−10.687	8.764
Inflation	2.202	1.300	0.368	7.922
Year	2015.228	3.456	2010	2023
Month	6.329	3.338	1	12
Week	25.660	14.493	1	52

5.5.2 Main Regression Results

Prior to running the regressions, I test my dataset for multicollinearity between the variables. The results are presented in Table 5.3. As I detect multicollinearity between my main independent variables, 52-week return, level of stock market index and 52-week volatility, I run separate regressions for these variables. This applies to all regression results presented in Tables 5.4 to 5.8. The variance inflation factors for the level of stock market index are exceptionally high, as this variable is naturally correlated with both 52-week returns and year dummies. The variable age is also naturally correlated with year dummies.

Table 5.3 Results of Multicollinearity Test

	<i>GHQ-12</i>			<i>SF-12 MCS</i>		
	POLS	SFE	AFE	POLS	SFE	AFE
52-week return	5.66	5.09		5.70	5.10	
(positive)			11.87			11.93
(negative)			14.40			14.47
Level of stock market index	1,165.96	276.84		1,183.64	279.61	
(positive)			27.39			27.39
(negative)			17.46			17.52
52-week volatility	53.16	39.19		52.78	39.06	
(positive)			14.40			14.45
(negative)			21.49			21.48
Female	2.44	2.44	2.41	2.44	2.44	2.41
Age	25.98	25.46	22.83	25.97	25.46	22.88
Higher education	1.75	1.75	1.74	1.75	1.75	1.74
Single	2.61	2.59	2.46	2.62	2.60	2.46
Divorced	1.23	1.23	1.23	1.22	1.22	1.23
Widowed	1.26	1.26	1.26	1.26	1.26	1.26
Other marital status	1.06	1.06	1.06	1.06	1.06	1.06
Self-employed	1.18	1.18	1.18	1.18	1.18	1.18
Unemployed	1.20	1.20	1.19	1.20	1.19	1.19
Retired	3.13	3.12	3.08	3.12	3.11	3.06
Student	1.58	1.57	1.56	1.58	1.57	1.56
Other job status	1.30	1.30	1.30	1.30	1.30	1.30
Resident in urban area	4.65	4.63	4.49	4.62	4.59	4.46
Resident in Wales	1.08	1.08	1.08	1.08	1.08	1.08
Resident in Scotland	1.11	1.11	1.11	1.11	1.11	1.11
Resident in Northern Ireland	1.10	1.10	1.11	1.10	1.10	1.11
Total individual income	3.77	3.77	3.76	3.77	3.77	3.76
Total household income	2.78	2.77	2.76	2.77	2.77	2.75
Individual investment income	1.28	1.28	1.28	1.28	1.28	1.28
Household investment income	1.35	1.35	1.35	1.35	1.35	1.35

Note: I list the variance inflation factors for six models using three different regressions, pooled OLS, standard fixed effects and asymmetric fixed effects regression, and two different dependent variables, GHQ-12 and SF-12 MCS.

The main regression results for the total sample are presented in Table 5.4. Coefficients for the GHQ-12 score are interpreted inversely, as the GHQ-12 uses an inverse scale with 0 indicating good mental health. Table 5.4 shows that while 52-week returns do not affect the SF-12 MCS, they do have a symmetric impact on the GHQ-12, with a one-unit increase in 52-week returns leading to a 0.552 better GHQ-12 according to the standard fixed

effects model and a 0.472 better GHQ-12 according to the pooled OLS model. The asymmetric fixed effects model confirms the existence of a symmetric relationship.

An increasing stock market index also leads to an improved GHQ-12 score. The asymmetric fixed effects model provides evidence for an asymmetric effect of both positive and negative changes in the level of stock market index on the GHQ-12, with the effect of a decreasing index being 1.7 times stronger than the effect of increases, supporting prospect theory. This finding supports research hypothesis *H5* and is in line with previous literature investigating asymmetry in the relationship between stock markets and mental health (Cotti et al., 2015; Liu & Fan, 2024) and with research testing prospect theory (Boyce et al., 2013; Watson & Osberg, 2019). The difference in the effect of positive and negative changes in the level of stock market index on the SF-12 MCS is not statistically significant. Finally, 52-week volatility has a symmetric impact on mental health measured by GHQ-12 and SF-12 MCS, with increasing volatility leading to deteriorating mental health outcomes.

Table 5.4 Regression Results for Total Sample and Gender Groups

		All		Male		Female	
		GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS
52-week return	POLS	−0.472*** (0.133)	0.233 (0.243)	−0.341* (0.183)	0.073 (0.340)	−0.549*** (0.189)	0.290 (0.341)
52-week return	SFE	−0.552*** (0.107)	0.233 (0.191)	−0.372** (0.149)	−0.064 (0.270)	−0.685*** (0.152)	0.454* (0.268)
52-week return (positive)	AFE	−0.325** (0.162)	0.386 (0.288)	−0.096 (0.225)	0.304 (0.410)	−0.477** (0.228)	0.407 (0.402)
52-week return (negative)	AFE	0.504*** (0.179)	−0.176 (0.318)	0.085 (0.249)	0.095 (0.451)	0.827*** (0.253)	−0.352 (0.445)
p-value for $\beta^+ = -\beta^-$	Wald test	0.461	0.625	0.973	0.515	0.305	0.927
Level of stock market index	POLS	−0.099*** (0.035)	0.032 (0.064)	0.051 (0.048)	0.034 (0.089)	−0.130*** (0.050)	0.070 (0.090)
Level of stock market index	SFE	−0.145*** (0.028)	0.066 (0.050)	−0.100** (0.039)	−0.012 (0.071)	−0.179*** (0.040)	0.123* (0.071)
Level of stock market index (positive)	AFE	−0.094*** (0.025)	0.119*** (0.044)	−0.072** (0.035)	0.038 (0.063)	−0.110*** (0.035)	0.182*** (0.062)
Level of stock market index (negative)	AFE	0.159*** (0.030)	−0.104** (0.053)	0.091** (0.041)	−0.012 (0.074)	0.214*** (0.042)	−0.178** (0.074)
p-value for $\beta^+ = -\beta^-$	Wald test	0.027	0.775	0.646	0.727	0.012	0.962
52-week volatility	POLS	2.028*** (0.355)	−0.851 (0.645)	1.212** (0.488)	0.105 (0.903)	2.556*** (0.505)	−1.370 (0.906)
52-week volatility	SFE	2.711*** (0.280)	−1.629*** (0.497)	1.930*** (0.387)	−0.515 (0.702)	3.275*** (0.398)	−2.418*** (0.697)
52-week volatility (positive)	AFE	2.378*** (0.267)	−1.537*** (0.475)	1.756*** (0.372)	−0.809 (0.675)	2.862*** (0.378)	−2.083*** (0.664)
52-week volatility (negative)	AFE	−1.819*** (0.315)	1.709*** (0.561)	−1.006** (0.439)	0.485 (0.798)	−2.420*** (0.446)	2.604*** (0.783)
p-value for $\beta^+ = -\beta^-$	Wald test	0.103	0.778	0.118	0.710	0.362	0.541
N(Observations)		291,461	286,859	131,397	129,457	160,064	157,402

Note: I list the results from 54 models using three different samples, all, males and females, two different dependent variables, GHQ-12 and SF-12 MCS, and three different regressions, pooled OLS, standard fixed effects and asymmetric fixed effects regression. I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence, total individual income, total household income, individual investment income, household investment income, and year, month and week

dummies. Coefficients are reported. Standard errors are in parentheses. Coefficients and standard errors for level of stock market index are multiplied by 1,000.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

These results may be explained by the two mechanisms provided by previous literature, (1) the pure wealth effect and (2) stock markets as a barometer of economic prospects, social movements and social mood (Ratcliffe & Taylor, 2015). To investigate the pure wealth effect further, I restrict my sample to individuals with investment income. The results are presented in section 5.5.4. Furthermore, I provide an explanation for the negative impact of 52-week volatility on mental health. According to Cascaldi-Garcia et al. (2023), stock market volatility is commonly used in the literature as an indicator of uncertainty in both financial and economic terms. The increasing uncertainty may cause people to worry more about the value of their financial assets, but also about their future employment due to an increasingly uncertain economic environment, which may lead to a deterioration in their mental health.

Next, I divide the total sample into males and females to analyse gender differences in the effect of stock markets on mental health. All regression models suggest that women's mental health is significantly more impacted by stock market fluctuations than that of men. According to the standard fixed effects models, women's GHQ-12 score is 1.8 times more impacted by 52-week returns and the level of stock market index, and 1.7 times more by 52-week volatility, compared to men's GHQ-12. I also find an asymmetric effect of changes in the level of the stock market index on women's GHQ-12 score, with the effect of negative changes being 1.9 times stronger than the effect of positive ones, which demonstrates that women's reaction to losses is stronger than men's.

This finding has implications for prospect theory. While prospect theory is supported by the results for female respondents, my results suggest that it does not hold for male respondents in explaining the relationship between stock market fluctuations and mental health. I also note a symmetric impact of the level of stock market index and 52-week volatility on women's SF-12 MCS, while that of males is not affected. I explain these results with literature suggesting that female investors have less confidence in the performance of their investments and react more emotionally to risky situations than male investors (Rahman & Rashidi, 2021). Another explanation is that females are more inclined than men to express distress because they are more likely to internalise emotional issues than men (Simon, 2002).

5.5.3 Testing the Lifecycle Theory of Consumption

To test the lifecycle hypothesis, I divide my total sample into young (aged 15–44), middle-aged (45–60) and older cohorts (aged 60+). This approach is in line with previous literature (Frijters et al., 2015). My regression results are presented in Table 5.5. My results show that while 52-week returns have a symmetric impact on the GHQ-12 score of young individuals, there is an asymmetric impact of changes in the level of stock market index and 52-week volatility on their mental health. The impact of negative changes in the level of stock market index is 2.8 times stronger than the impact of positive ones, and the impact of an increase in 52-week volatility is 1.9 times stronger than the effect of decreasing volatility. The asymmetric fixed effects model also suggests that the SF-12 MCS of young cohorts is only affected by increases in 52-week volatility, while it is not affected by 52-week returns and the level of stock market index.

Table 5.5 Regression Results for Age Groups

		Age 15–44		Age 45–60		Age 60+	
		GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS
52-week return	POLS	−0.487** (0.203)	0.481 (0.371)	−0.241 (0.255)	−0.416 (0.444)	−0.719*** (0.233)	0.502 (0.449)
52-week return	SFE	−0.588*** (0.175)	0.358 (0.306)	−0.385* (0.204)	0.022 (0.348)	−0.766*** (0.173)	0.493 (0.348)
52-week return (positive)	AFE	−0.490* (0.266)	0.533 (0.466)	−0.455 (0.335)	−0.001 (0.569)	0.159 (0.290)	−0.425 (0.583)
52-week return (negative)	AFE	0.889*** (0.301)	−0.561 (0.526)	−0.214 (0.363)	0.949 (0.616)	1.406*** (0.310)	−1.918*** (0.621)
p-value for $\beta^+ = -\beta^-$	Wald test	0.328	0.969	0.186	0.270	0.000	0.007
Level of stock market index	POLS	−0.087 (0.053)	0.085 (0.098)	−0.076 (0.066)	−0.093 (0.116)	−0.167*** (0.061)	0.101 (0.118)
Level of stock market index	SFE	−0.160*** (0.046)	0.042 (0.081)	−0.122** (0.053)	0.029 (0.091)	−0.166*** (0.046)	0.163* (0.091)
Level of stock market index (positive)	AFE	−0.072* (0.040)	0.032 (0.071)	−0.151*** (0.050)	0.156* (0.086)	−0.042 (0.045)	−0.002 (0.091)
Level of stock market index (negative)	AFE	0.204*** (0.048)	−0.103 (0.085)	0.086 (0.059)	−0.021 (0.100)	0.237*** (0.052)	−0.364*** (0.104)
p-value for $\beta^+ = -\beta^-$	Wald test	0.007	0.413	0.293	0.203	0.000	0.001
52-week volatility	POLS	2.177*** (0.563)	−1.506 (1.025)	1.569** (0.666)	0.358 (1.158)	2.151*** (0.594)	−0.717 (1.136)
52-week volatility	SFE	2.868*** (0.474)	−2.076** (0.826)	2.521*** (0.523)	−1.224 (0.887)	2.905*** (0.432)	−1.474* (0.864)
52-week volatility (positive)	AFE	3.096*** (0.442)	−2.891*** (0.770)	2.047*** (0.534)	−1.445 (0.906)	2.725*** (0.468)	−1.445 (0.937)
52-week volatility (negative)	AFE	−1.660*** (0.525)	0.987 (0.916)	−1.839*** (0.628)	1.647 (1.065)	−1.873*** (0.537)	1.253 (1.077)
p-value for $\beta^+ = -\beta^-$	Wald test	0.012	0.056	0.772	0.869	0.178	0.880
N(Observations)		136,308	134,149	82,714	81,650	72,439	71,060

Note: I list the results from 54 models using three different samples, age 15–44, age 45–60 and age 60+, two different dependent variables, GHQ-12 and SF-12 MCS, and three different regressions, pooled OLS, standard fixed effects and asymmetric fixed effects regression. I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence, total individual income, total household income, individual investment income, household investment income, and year, month

and week dummies. Coefficients are reported. Standard errors are in parentheses. Coefficients and standard errors for level of stock market index are multiplied by 1,000.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

The regression models do not provide any evidence of asymmetry in the impact of stock market fluctuations on the mental health of middle-aged individuals. However, the standard fixed effects models suggest that there is a symmetric impact of 52-week returns, the level of stock market index and 52-week volatility on their GHQ-12 score. The results for individuals aged 60+ suggest that there is an asymmetric effect of 52-week returns and the level of stock market index on both their GHQ-12 and SF-12 MCS, with only negative returns and negative changes in the level of stock market index negatively impacting their mental health. 52-week volatility appears to have a symmetric impact on their mental health measured by GHQ-12 and SF-12 MCS. It is striking that the impact of these variables on middle-aged individuals is considerably weaker compared to the young and older cohorts, with the impact being strongest for the older cohort. These results do not support research hypothesis *H6* and are in stark contrast to the findings provided by Frijters et al. (2015) who find that the impact of stock markets is strongest for young and middle-aged individuals.

To visualise the discrepancy between the age groups, I present graphs in Figure 5.4 of the coefficients of 52-week returns, the level of stock market index and 52-week volatility illustrating their impact on the GHQ-12 score by age group using the standard fixed effects model. According to the lifecycle theory of consumption, I expect middle-aged individuals to be impacted the most by stock market fluctuations, as they are wealthier and may have invested more in the stock market than young and older cohorts. However, the graphs in Figure 5.4 show that the opposite is the case. The curves are inverted, indicating that young and old individuals are considerably more affected than middle-aged ones. In line with the lifecycle theory, I explain this finding by suggestion that middle-aged individuals have higher income compared to younger and older cohorts which can be used to absorb losses from investments. Therefore, I suggest that middle-aged individuals may rely less on their investment income. To further investigate this hypothesis, I test if reliance on investment income is a moderator of the relationship between stock market fluctuations and mental health (see section 5.5.5).

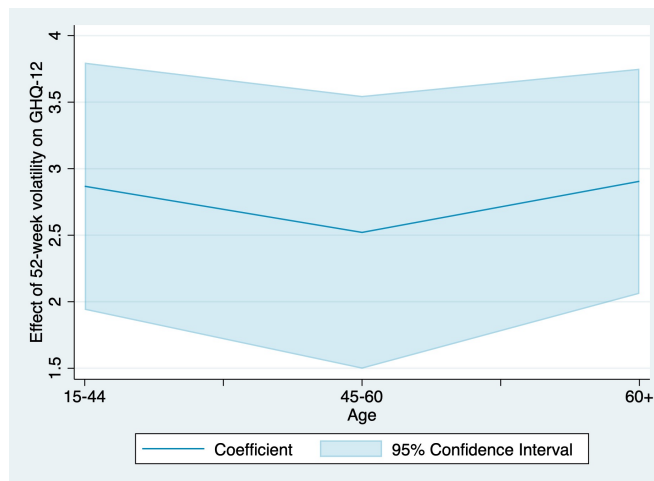
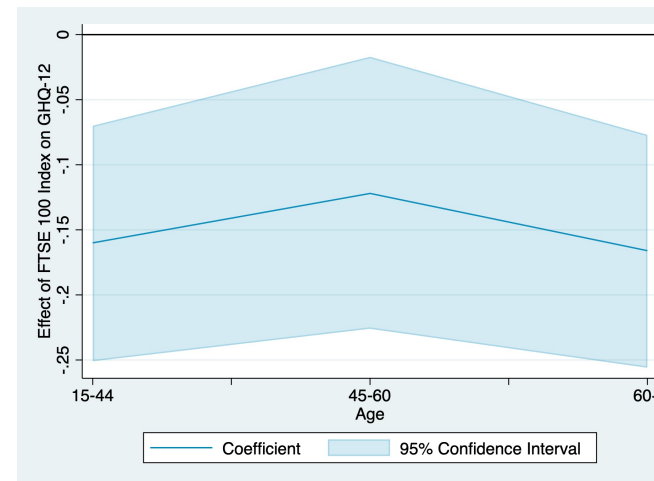
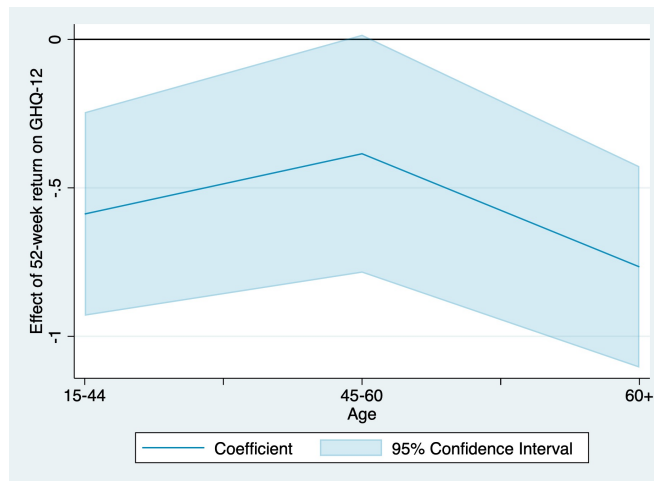


Figure 5.4 Effect of Return, Stock Market Index and Volatility on GHQ-12 by Age Group

5.5.4 Spillover Effects on other Household Members

To investigate mental health spillover effects due to stock market fluctuations on other household members, I divide my dataset into three sub-samples, (1) individuals with investment income, (2) individuals with household investment income but no individual investment income, and (3) individuals who have neither individual nor household investment income. The third sub-sample serves as the control group. The regression results are presented in Table 5.6. The pooled OLS, symmetric fixed effects and asymmetric fixed effects model provide evidence for the existence of a symmetric effect of 52-week returns on the GHQ-12 score of individuals with investment income, suggesting that both positive and negative 52-week returns equally affect their mental health. This result may primarily be explained by the pure wealth effect, as the respondents included in this sub-sample have income from investments, the amount of which may be affected by fluctuations in the stock market.

Table 5.6 Spillover Effects Regression Results

		(1)		(2)		(3)	
		GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS
52-week return	POLS	−0.638*** (0.221)	0.443 (0.408)	−0.658** (0.272)	0.266 (0.497)	−0.307 (0.201)	0.143 (0.365)
52-week return	SFE	−0.981*** (0.188)	0.766** (0.332)	−1.073*** (0.255)	1.050** (0.453)	−0.163 (0.173)	−0.245 (0.310)
52-week return (positive)	AFE	−0.707** (0.300)	1.126** (0.532)	−0.076 (0.406)	−0.026 (0.721)	−0.263 (0.264)	0.105 (0.472)
52-week return (negative)	AFE	0.761** (0.325)	−0.088 (0.576)	1.433*** (0.437)	−0.595 (0.772)	−0.014 (0.293)	0.046 (0.524)
p-value for $\beta^+ = -\beta^-$	Wald test	0.904	0.192	0.026	0.564	0.486	0.831
Level of stock market index	POLS	−0.136** (0.058)	−0.011 (0.106)	−0.067 (0.071)	−0.051 (0.129)	−0.099* (0.053)	0.114 (0.097)
Level of stock market index	SFE	−0.283*** (0.049)	0.206** (0.087)	−0.198*** (0.067)	0.146 (0.118)	−0.085* (0.046)	0.016 (0.082)
Level of stock market index (positive)	AFE	−0.212*** (0.047)	0.205** (0.083)	−0.051 (0.062)	0.068 (0.110)	−0.081** (0.040)	0.159** (0.072)
Level of stock market index (negative)	AFE	0.261*** (0.055)	−0.110 (0.097)	0.195*** (0.071)	−0.096 (0.125)	0.133*** (0.048)	−0.212** (0.085)
p-value for $\beta^+ = -\beta^-$	Wald test	0.382	0.343	0.054	0.834	0.282	0.541
52-week volatility	POLS	3.532*** (0.596)	−2.495** (1.098)	1.353* (0.705)	0.766 (1.283)	1.652*** (0.541)	−0.891 (0.976)
52-week volatility	SFE	4.600*** (0.493)	−4.039*** (0.873)	2.932*** (0.642)	−1.181 (1.134)	1.637*** (0.455)	−0.582 (0.809)
52-week volatility (positive)	AFE	3.642*** (0.511)	−1.878** (0.903)	2.556*** (0.641)	−1.030 (1.132)	1.685*** (0.430)	−2.016*** (0.767)
52-week volatility (negative)	AFE	−3.329*** (0.602)	3.696*** (1.066)	−1.174 (0.761)	−0.473 (1.346)	−1.731*** (0.506)	2.024** (0.902)
p-value for $\beta^+ = -\beta^-$	Wald test	0.648	0.134	0.107	0.321	0.934	0.993
N(Observations)		79,087	78,407	67,374	66,497	145,000	141,955

Note: I list the results from 54 models using three different samples, (1) individuals with investment income, (2) individuals with household investment income but no individual investment income and (3) individuals without any individual or household investment income, two different dependent variables, GHQ-12 and SF-12 MCS, and three different regressions, pooled OLS, standard fixed effects and asymmetric fixed effects regression. I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence, total individual income, total household income, individual investment income, household investment income, and year, month

and week dummies. Coefficients are reported. Standard errors are in parentheses. Coefficients and standard errors for level of stock market index are multiplied by 1,000.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

The asymmetric fixed effects model suggests that only negative 52-week returns have a negative impact on the GHQ-12 score of individuals with household investment income but no individual investment income. This finding cannot be explained by the pure wealth effect, as individuals included in this sub-sample do not have any individual investment income. Instead, they may either be affected by the mental health impairment of other household members or because stock markets act as a barometer of economic prospects. The control group is not affected by 52-week returns. This eliminates the possibility of sub-sample (2) being affected because stock markets are a barometer of economic prospects, and provides strong support for the existence of a mental health spillover effect of negative 52-week returns on investors' household members, as individuals who have neither individual nor household investment income are not affected by 52-week returns. In conclusion, the results show that there is a symmetric effect of 52-week returns on the mental health of individuals with investment income, but only the mental health impairment due to negative 52-week returns spills over on other household members, whereas these are not affected by positive 52-week returns. This finding supports research hypothesis *H7* and builds on the findings provided by Cotti and Simon (2018) who suggest that a stock market crash has adverse effects on the mental health of children.

The results for the models including the level of stock market index are similar to the results using 52-week returns, with the level of stock market index having a symmetric effect on the mental health of individuals with investment income, and there is an asymmetric effect of negative changes in the level of stock market index on individuals with household investment income but no individual investment income. However, the results using sub-sample (3) are different, as there appears to be a symmetric impact of the level of stock market index on the mental health of individuals included in the control group. These results suggest that individuals included in sub-sample (2) may either be affected due to stock market indices being a barometer of economic prospects, or mental health spillover effects from other household members, or a combination of the two. Individuals included in sub-sample (3), however, should not be affected due to mental health spillover effects, as their household members also do not have any investment income.

The pooled OLS and standard fixed effects model suggest that 52-week volatility also has a symmetric impact on the mental health of individuals included in sub-sample (1) and (3), with increasing volatility leading to inferior mental health. The asymmetric fixed effects model suggests that only increases in 52-week volatility have an adverse effect on the mental health of individuals with household investment income but no individual investment income. These findings are similar to the results using the level of stock market index as an independent variable.

5.5.5 Reliance on Investment Income

I introduce interaction terms to test if the effect of stock market fluctuations on mental health differs across alternative levels of a person's reliance on investment income. This is motivated by my findings in section 5.5.3 that middle-aged individuals are the least affected by stock markets, which is in contradiction to the lifecycle theory of consumption. I measure reliance on investment income as the percentage of individual investment income in relation to total individual income. To calculate this new variable, I divide the annual investment income by 12 to calculate the monthly investment income which is then divided by the total monthly individual income to calculate the reliance on investment income. The higher the ratio, the more the individual is reliant on investment income. I introduce interaction terms between my stock market variables and reliance on investment income for two samples, the total sample and individuals with investment income. I present the results using the pooled OLS model and standard fixed effects regression in Table 5.7. The results using the asymmetric fixed effects model are presented in Table 5.8.

Table 5.7 Interactions between Symmetric Effects and Reliance on Investment Income

	All				Individuals with investment income			
	GHQ-12		SF-12 MCS		GHQ-12		SF-12 MCS	
	POLS	SFE	POLS	SFE	POLS	SFE	POLS	SFE
52-week return (R)	−0.472*** (0.134)	−0.524*** (0.108)	0.181 (0.244)	0.183 (0.193)	−0.632*** (0.228)	−0.867*** (0.194)	0.185 (0.420)	0.594* (0.343)
Reliance on investment income (I)	−1.312*** (0.095)	−0.271*** (0.089)	2.442*** (0.172)	0.443*** (0.159)	−0.614*** (0.093)	−0.218** (0.102)	1.272*** (0.171)	0.450** (0.181)
$R \times I$	−0.256 (0.743)	−1.346** (0.625)	2.870** (1.349)	2.337** (1.110)	−0.170 (0.667)	−1.500** (0.631)	3.367*** (1.228)	2.286** (1.119)
Level of stock market index (X)	−0.108*** (0.035)	−0.144*** (0.028)	0.039 (0.064)	0.060 (0.050)	−0.167*** (0.058)	−0.283*** (0.050)	0.024 (0.108)	0.192** (0.088)
Reliance on investment income (I)	−3.798*** (0.809)	−0.049 (0.701)	4.297*** (1.472)	−1.386 (1.248)	−3.046*** (0.728)	−0.267 (0.720)	3.952*** (1.345)	−0.629 (1.278)
$X \times I$	0.378*** (0.122)	−0.039 (0.106)	−0.271 (0.223)	0.286 (0.188)	0.370*** (0.110)	0.002 (0.108)	−0.395* (0.203)	0.172 (0.192)
52-week volatility (V)	1.986*** (0.357)	2.621*** (0.281)	−0.735 (0.648)	−1.508*** (0.500)	3.464*** (0.610)	4.365*** (0.505)	−2.183* (1.123)	−3.703*** (0.894)
Reliance on investment income (I)	−1.626*** (0.262)	−0.902*** (0.222)	3.343*** (0.475)	1.311*** (0.394)	−0.734*** (0.239)	−0.674*** (0.227)	1.895*** (0.439)	1.110*** (0.402)
$V \times I$	1.997 (1.591)	3.899*** (1.325)	−5.364* (2.883)	−5.277** (2.351)	0.757 (1.431)	2.759** (1.320)	−3.493 (2.631)	−3.950* (2.338)
N(Observations)	291,461	291,461	286,859	286,859	79,087	79,087	78,407	78,407

Note: I list the results from 24 models using two different samples, all and respondents with individual investment income, two different dependent variables, GHQ-12 and SF-12 MCS, and two different regressions, pooled OLS and standard fixed effects regression. I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence, total individual income, total household income, individual investment income, household investment income, and year, month and week dummies. Coefficients are reported. Standard errors are in parentheses. Coefficients and standard errors for level of stock market index are multiplied by 1,000.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

The pooled OLS and standard fixed effects regression results in Table 5.7 for both the total sample and individuals with investment income show that the positive effect of 52-week returns on people's mental health increases with increasing reliance on investment income. The standard fixed effects model using the total sample shows that the additional effect of 52-week returns on the GHQ-12 score is 2.6 times stronger as the reliance on investment income ratio increases by one unit. In essence, this is a comparison between a person who is not reliant on investment income and a person who lives solely on investment income.

The results from the pooled OLS model using the level of stock market index are surprising. They show that an increasing index has a negative impact on the GHQ-12 score of individuals with strong reliance on investment income. However, the standard fixed effects model does not confirm these findings, suggesting that only individuals with low reliance on investment income are positively impacted by an increasing stock market index, while individuals who heavily rely on investment income are not affected. It should be noted that the pooled OLS model does not capture the individual-specific effects and is more restrictive than the standard fixed effects model (Cameron & Trivedi, 2005). These results are further examined using the asymmetric fixed effects model, the results of which are shown in Table 5.8.

Finally, 52-week volatility has a negative impact on individuals without any reliance on investment income, with the effect being much stronger for individuals who heavily rely on investment income. According to the standard fixed effects model using the total sample, the additional negative effect of 52-week volatility on the SF-12 MCS is 3.5 times stronger as the reliance on investment income ratio increases by one unit.

The results from the asymmetric fixed effects model presented in Table 5.8 show that there is no asymmetric interaction effect using 52-week returns, supporting the findings presented in Table 5.7 which suggest a symmetric positive interaction effect between 52-week returns and reliance on investment income. However, I find that there is an asymmetric interaction effect between negative changes in the level of stock market index and reliance on investment income. In other words, the more a person is dependent on individual investment income, the stronger the negative effect of a decreasing stock

market index on their GHQ-12 score. This weakens the validity of the surprising result presented in Table 5.7 which suggested that an increasing stock market index has a stronger negative impact on the mental health of individuals who are heavily reliant on investment income. I do not find evidence for asymmetry in the interaction effect between 52-week volatility and reliance on investment income which confirms the existence of a symmetric interaction effect.

In conclusion, I find a symmetric interaction effect for 52-week returns and 52-week volatility, and an asymmetric interaction effect between negative changes in the level of stock market index and reliance on investment income. These findings support the results presented in section 5.5.3 and explain why middle-aged individuals are less affected by stock market fluctuations than younger and older cohorts by suggesting that reliance on investment income does play a role in explaining the relationship between stock market fluctuations and mental health. The rationale behind this explanation is that middle-aged individuals belong to the working-age population and can rely on both employment and investment income.

Table 5.8 Interactions between Asymmetric Effects and Reliance on Investment Income

	All		Individuals with investment income	
	GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS
52-week return (positive) (R^+)	-0.325** (0.162)	0.360 (0.289)	-0.720** (0.302)	1.094** (0.535)
52-week return (negative) (R^-)	0.476*** (0.179)	-0.151 (0.319)	0.676** (0.330)	0.056 (0.585)
Reliance on investment income (I)	-0.377*** (0.143)	0.182 (0.255)	-0.448*** (0.164)	0.546* (0.292)
$R^+ \times I$	-0.154 (0.399)	1.322* (0.707)	0.208 (0.422)	0.458 (0.747)
$R^- \times I$	1.046 (0.657)	-0.988 (1.164)	0.952 (0.663)	-1.627 (1.174)
p-value for $\beta^+ = -\beta^-$	0.116	0.740	0.042	0.247
Level of stock market index (positive) (X^+)	-0.091*** (0.025)	0.112** (0.044)	-0.213*** (0.047)	0.187** (0.084)
Level of stock market index (negative) (X^-)	0.152*** (0.030)	-0.098* (0.053)	0.246*** (0.056)	-0.078 (0.099)
Reliance on investment income (I)	-0.323*** (0.121)	0.196 (0.215)	-0.390*** (0.138)	0.423* (0.245)
$X^+ \times I$	-0.116 (0.094)	0.355** (0.167)	0.008 (0.097)	0.241 (0.173)
$X^- \times I$	0.279** (0.139)	-0.252 (0.246)	0.185 (0.141)	-0.390 (0.250)
p-value for $\beta^+ = -\beta^-$	0.086	0.538	0.042	0.373
52-week volatility (positive) (V^+)	2.289*** (0.269)	-1.467*** (0.478)	3.363*** (0.520)	-1.690* (0.921)
52-week volatility (negative) (V^-)	-1.740*** (0.317)	1.582*** (0.563)	-3.166*** (0.612)	3.530*** (1.084)
Reliance on investment income (I)	-0.271** (0.117)	0.224 (0.208)	-0.333** (0.133)	0.499** (0.236)
$V^+ \times I$	3.939*** (1.227)	-3.053 (2.178)	3.340*** (1.243)	-2.197 (2.202)
$V^- \times I$	-3.636*** (1.321)	5.730** (2.351)	-1.902 (1.340)	1.857 (2.377)
p-value for $\beta^+ = -\beta^-$	0.745	0.106	0.124	0.838
N(Observations)	291,461	286,859	79,087	78,407

Note: I list the results from 12 asymmetric fixed effects models using two different samples, all and respondents with individual investment income, and two different dependent variables, GHQ-12 and SF-12 MCS. I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence, total individual income, total household income, individual investment income, household investment income, and year, month and week dummies. Coefficients are reported. Standard errors are in parentheses. Coefficients and standard errors for level of stock market index are multiplied by 1,000.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

5.5.6 Robustness Analysis

To ensure my results are robust, I additionally control for the UK's GDP growth rate and inflation to isolate the effect of stock market fluctuations from macroeconomic conditions. I include these control variables in all regression models and run the regressions again.

This approach is in line with previous literature (Ratcliffe & Taylor, 2015) and is motivated by the potential correlation between stock market performance and macroeconomic conditions. The results are presented in Tables A.2 – A.6 in Appendix A.2.

I find that my results largely remain the same and hold after controlling for GDP and inflation. Exceptions include the impact of the level of stock market index on the GHQ-12 of individuals aged 15–44 using the pooled OLS regression (see Table A.3) and the interaction term between the level of stock market index and reliance on investment income on the SF-12 MCS using the total sample and the standard fixed effects regression (see Table A.5). Both results become statistically significant after controlling for macroeconomic conditions. Conversely, the impact of an increase in 52-week volatility on the SF-12 MCS of individuals with investment income is no longer statistically significant after controlling for GDP and inflation (see Table A.6). Overall, the robustness analysis indicates that my results on the impact of 52-week returns, the level of stock market index and 52-week volatility on mental health are robust and hold even after controlling for macroeconomic conditions.

5.6 Conclusion

I provide the first study to investigate the asymmetric impact of stock market fluctuations on mental health using an asymmetric fixed effects model for panel data. I provide novel evidence for an asymmetric impact of changes in the level of stock market index on mental health, with the impact of negative changes being 1.7 times stronger than the impact of positive ones, supporting prospect theory. I also find that there is a symmetric positive impact of 52-week returns and a symmetric negative impact of 52-week volatility on people's mental health. Furthermore, I find that the effect of stock market fluctuations is weakest for middle-aged individuals and strongest for older cohorts, which contradicts the lifecycle theory of consumption. To explain this finding, I suggest reliance on investment income as a moderator of the relationship between stock market fluctuations and mental health. Moreover, I provide novel evidence of a mental health spillover effect of negative 52-week returns on household members of investors.

I make several contributions to the literature. I make a methodological contribution by providing the first study to use an asymmetric fixed effects model for panel data to test prospect theory from a perspective based on the link between stock market fluctuations and mental health. Furthermore, I find that prospect theory does not hold in explaining the relationship between stock market fluctuations and mental health for males. Finally, I expand on previous literature investigating the relationship between stock markets and mental health, providing the first study to investigate mental health spillover effects of stock market fluctuations on investors' household members aged 15 and over.

Future research may further investigate reliance on investment income as a moderator of the relationship between stock markets and mental health, as I provide varying results in this analysis. Furthermore, I encourage future research to further develop methodologies to measure mental health spillover effects, as there is a lack of studies proposing such approaches. I also recommend this area be expanded to investigate not only the impact of stock market fluctuations on investors but also on their household members, as the impact may be wider than initial studies suggest.

My findings also have important policy implications. I find that there is a spillover effect of the asymmetric negative impact of negative 52-week returns on the GHQ-12 score of investors' household members. Considering that the GHQ-12 is designed to detect psychiatric illness, including depression and anxiety, I recommend psychologists and other mental health practitioners be aware of the potential impact stock market fluctuations can have not only on investors but also on other household members. They may well be aware of the direct link between stock markets and people's mental health, but may have neglected the spillover effects on the mental health of other household members.

Chapter 6 Conclusion

6.1 Summary of Key Findings

The research aim in this thesis is to deepen our understanding of the relationship between stock market fluctuations and mental health by investigating the link between immigrants' mental health and stock market fluctuations in their home countries, and exploring asymmetry and spillover effects in the relationship between people's mental health and stock market fluctuations in their country of residence.

In chapter 3, I investigate if the mental health of immigrants is influenced by stock market volatility in their home country and if the impact reduces as the time spent in the host country increases. Utilising panel data from the UK based Understanding Society dataset, I present evidence that stock market volatility in immigrants' home countries is inversely associated with their subjective mental health. The effect diminishes as immigrants disintegrate financially from their home country, supporting disintegration theory, and intensifies with the age at which the immigrant first arrived in the UK. I also provide evidence that while the self-reported mental health of immigrants is negatively associated with stock market volatility in their home countries, diagnosed clinical depression as a measure of objective mental health is not affected. This variation in results highlights the importance of combining measures of both subjective and objective mental health in one study. Furthermore, I find that males, married immigrants and immigrants with higher education show better subjective and objective mental health, whereas a low level of income and the distance between the UK and immigrants' home countries is negatively associated with their self-reported mental health.

The study presented in chapter 3 represents the first analysis to investigate the link between immigrants' mental health and stock market fluctuations in their home countries. I add stock market volatility in immigrants' home countries as another financial factor influencing subjective mental health to the existing literature. Furthermore, I provide evidence from a novel, financial market-based perspective to support disintegration theory, suggesting that the impact of home country stock market volatility on the mental health of immigrants reduces as they assimilate into the host country.

In chapter 4, I investigate if the mental health of immigrants is influenced by stock market returns in their home country and if familiarity plays a role in this relationship. I present robust evidence that one-day lagged returns in immigrants' home countries have a positive impact on their subjective mental health. This effect is stronger for individuals with retirement income from savings or investments. Moreover, I find that immigrants' subjective mental health is immediately impacted by daily returns if they either have income from interest or dividends or are retired. As a result, I conclude that retirement, income from interest or dividends, and retirement income from savings or investments are critical moderators of this relationship.

Furthermore, I find that the mental health of immigrants from culturally, geographically and economically distant countries, and developing countries are negatively impacted by daily stock market returns in their home country, whereas immigrants from geographically and economically close countries, and developed countries are positively impacted by daily stock market returns in their home country. These findings support the familiarity hypothesis and highlight that familiarity plays a role in how the relationship between stock market fluctuations and mental health should be analysed and interpreted.

To my knowledge, my study presented in chapter 4 represents the first analysis to investigate if the mental health of immigrants is impacted by stock market returns in their home country, and the role familiarity plays in this relationship. Furthermore, I extend the familiarity hypothesis in that familiarity may also play a role in choosing a benchmark index to evaluate the economic prospects or overall stock market performance. Moreover, I add to the theory the longevity of the mental health impairment due to daily stock market returns, as I provide evidence of an immediate impact of daily returns on immigrants' mental health. In addition to making a theoretical contribution, I also add stock market returns in immigrants' home countries as a financial determinant of their mental health to the existing literature.

In chapter 5, I investigate if there is an asymmetric relationship between people's mental health and stock market fluctuations in their country of residence, and if the mental health impairment due to stock market fluctuations spills over on other household members. I provide novel evidence of an asymmetric effect of changes in the level of the domestic

stock market index on mental health. This finding supports prospect theory, as the impact of negative changes is 1.7 times stronger than the impact of positive ones. I also find that there is a symmetric positive impact of 52-week returns and a symmetric negative impact of 52-week volatility on people's subjective mental health. Moreover, my results suggest that the impact of stock market fluctuations is strongest for older cohorts and weakest for middle-aged individuals, which contradicts the lifecycle theory of consumption. I propose reliance on investment income as a moderator of the relationship between stock market fluctuations and mental health to explain this finding. Furthermore, I provide novel evidence that the mental health impairment due to negative 52-week returns spills over onto the household members of investors.

With my study presented in chapter 5 I provide the first analysis to investigate the asymmetric effect of stock market fluctuations on mental health using an asymmetric fixed effects model for panel data. I make several contributions to the literature. I make a methodological contribution to the literature by using an asymmetric fixed effects model for panel data to investigate asymmetry in the relationship between stock market fluctuations and mental health. Furthermore, I test prospect theory from a perspective based on the link between people's mental health and stock market fluctuations in their country of residence. Moreover, my results suggest that prospect theory does not hold in explaining the link between stock market fluctuations and men's mental health. Finally, I provide novel evidence of a mental health spillover effect of stock market fluctuations on investors' household members aged 15 and over.

6.2 Policy Implications

The findings of my thesis have several important policy implications. Firstly, I suggest that immigrants be offered the chance to participate in courses on psycho-education upon their arrival in the host country. Psycho-education, which is typically offered by community mental health teams (Getachew et al., 2009), involves educating individuals about mental illnesses, their treatment, and ways to support patients in managing these disorders (Bäumli et al., 2006). Providing such education to immigrants can help them cope with any challenges they may face in accessing mental healthcare services in the host country, while

equipping them with strategies to mitigate the associated mental health issues. Ideally, such educational programs should be implemented on a population-wide scale, with a particular focus on immigrants.

Secondly, I recommend that psychologists and other mental health professionals engage in continuing professional development to understand how foreign economies and markets can potentially influence the mental health outcomes of their foreign-born clients. While these practitioners are undoubtedly aware of the effect of the local economy on their clients' mental health, they may not have fully considered the role of other economies, particularly where economic crises may be a daily reality. Implementing such policies is likely to decrease the financial burden of mental health issues to the economy, while also alleviating the personal suffering of immigrants living away from home.

Finally, I recommend psychologists and other mental health professionals be aware of the potential impact stock market fluctuations can have not only on the mental health of their clients but also on other members of the same household, as I provide evidence that the mental health impairment due to negative 52-week stock market returns spills over on the GHQ-12 score of investors' household members. This is particularly relevant to psychologists, as the GHQ-12 is a measure to capture psychiatric illness, such as depression and anxiety. Psychologists and other mental health professionals may be aware of the impact fluctuations in the stock market can have on their clients' mental health, but may have neglected that this effect can spill over on the mental health of other household members.

6.3 Limitations of the Research

One limitation of this thesis is of a philosophical nature. Subjective measures of mental health may be subject to bias due to the mental health stigma among immigrants (Saechao et al., 2012; Hatzenbuehler et al., 2013; Pederson et al., 2021) which may cause them to hide their actual feelings when being interviewed by a researcher. However, objective measures of mental health, such as diagnosed clinical depressions, can equally be subject to bias because immigrants may not seek help from a psychologist or other mental health

professional to be diagnosed with a psychiatric illness and receive treatment for same. In an effort to mitigate any adverse implications of this issue on my research, I adopt post-positivism as my research paradigm, while remaining aware that this issue may still lead to inaccuracies in measuring and interpreting my research results. Another limitation of my thesis is that this research project is based on a dataset from the UK. My findings reported in chapter 4 suggest that the home country's economic development matters in explaining the relationship between stock market fluctuations and mental health. Therefore, I suggest that research using datasets from developing countries may report different results.

Furthermore, the design of my study presented in chapter 3 limits my ability to draw causal conclusions from my research findings regarding the impact of home country stock market volatility on the mental health of immigrants. To mitigate this issue, I incorporate several measures in my analysis. Firstly, I run a robustness test to isolate the effect of stock market volatility from macroeconomic conditions on the mental health of immigrants. Secondly, I include lagged variables in my analysis presented in chapter 4 to investigate the lagged effect of stock market returns on immigrants' mental health. Thirdly, I take into consideration the different channels through which mental health is affected by stock market fluctuations, including the pure wealth effect, stock markets as a barometer of economic prospects, social movements, and social mood. Despite all the efforts made, I am aware that a definitive causal link between immigrants' mental health and stock market volatility in their home countries cannot be established based on my findings, which is partly due to the fact that there may be no clear cause-effect relationship or causality may be bi-directional.

6.4 Avenues for Future Work

Building on the literature gaps identified and the research findings presented in this thesis, I propose several potential directions for future research. I encourage future work to investigate the relationship between immigrants' mental health and home country stock market fluctuations using data from countries other than the UK, as the research presented in this thesis is based on the Understanding Society dataset which includes data

solely from the UK. Future research may also investigate if foreign stock markets or macroeconomic conditions in immigrants' home countries have an impact on suicide rates among immigrants, as too little attention is paid to the cross-border impact of financial and economic factors on suicide rates. In terms of the methodology, I encourage future research to focus on establishing a causal relationship between stock market fluctuations and mental health. Further research may also conduct more qualitative studies to provide a better understanding of the channels through which immigrants are affected by stock markets in their home countries. This may enrich the discussion of findings in future research papers.

I also encourage future research to study asymmetry and spillover effects in the relationship between immigrants' mental health and stock market fluctuations in their home country, as my study presented in chapter 5 focuses on stock markets in people's country of residence. Furthermore, I recommend future research to further investigate reliance on investment income as a moderator of the relationship between stock markets and mental health, as I provide varying results in my analysis. My research on mental health spillover effects also highlights the need to further develop methodologies to measure mental health spillover effects, as there is a lack of studies proposing such approaches. Finally, I recommend this area be expanded to investigate not only the impact of stock market fluctuations on investors but also on their household members, as the impact may be wider than initial studies suggest.

6.5 Concluding Remarks

As I conclude this investigation into the relationship between stock market fluctuations and mental health, it is essential to recognise that this intricate interconnectedness does not remain within national borders and is not limited to individuals who invest in the stock market. In light of my findings presented in this thesis, I call upon mental health professionals and policymakers to collaboratively develop comprehensive strategies that help not only safeguard the economy but also mitigate any adverse impacts on the mental health of individuals. If these professionals pool their resources and expertise, we can pave the way for a future in which no one suffers in silence during times of financial turbulence.

Bibliography

- Abdou, R., Cassells, D., Berrill, J., & Hanly, J. (2020). An empirical investigation of the relationship between business performance and suicide in the US. *Social Science & Medicine*, 264, Article 113256. <https://doi.org/10.1016/j.socscimed.2020.113256>
- Abdou, R., Cassells, D., Berrill, J., & Hanly, J. (2022). Revisiting the relationship between economic uncertainty and suicide: An alternative approach. *Social Science & Medicine*, 306, Article 115095. <https://doi.org/10.1016/j.socscimed.2022.115095>
- Akay, A., Bargain, O., & Zimmermann, K. F. (2017). Home Sweet Home? Macroeconomic Conditions in Home Countries and the Well-Being of Migrants. *Journal of Human Resources*, 52(2), 351–373. <https://doi.org/10.3368/jhr.52.2.0115-6900R1>
- Allen, J., Balfour, R., Bell, R., & Marmot, M. (2014). Social determinants of mental health. *International Review of Psychiatry*, 26(4), 392–407. <https://doi.org/10.3109/09540261.2014.928270>
- Allison, P. D. (2019). Asymmetric Fixed-effects Models for Panel Data. *Socius*, 5, 1–12. <https://doi.org/10.1177/2378023119826441>
- Amadi, A. A. (2004). *Does familiarity breed investment? An empirical analysis of foreign equity holdings*. University of California, Davis. <https://dx.doi.org/10.2139/ssrn.527842>
- Anderson, C. W., Fedenia, M., Hirschey, M., & Skiba, H. (2011). Cultural influences on home bias and international diversification by institutional investors. *Journal of Banking and Finance*, 35(4), 916–934. <https://doi.org/10.1016/j.jbankfin.2010.09.006>
- Ando, A., & Modigliani, F. (1957). Test of the Life Cycle Hypothesis of Savings: Comments and Suggestions. *Bulletin of the Oxford University Institute of Economics & Statistics*, 19(2), 99–124. <https://doi.org/10.1111/j.1468-0084.1957.mp19002002.x>
- Ando, A., & Modigliani, F. (1963). The 'Life Cycle' Hypothesis of Saving: Aggregate Implications and Tests. *American Economic Review*, 53(1), 55–84. <https://www.jstor.org/stable/1817129>
- Angel, R. J., Frisco, M., Angel, J. L., & Chiriboga, D. A. (2003). Financial strain and health among elderly Mexican-origin individuals. *Journal of Health and Social Behavior*, 44(4), 536–551. <https://doi.org/10.2307/1519798>
- Anjara, S. G., Bonetto, C., Van Bortel, T., & Brayne, C. (2020). Using the GHQ-12 to screen for mental health problems among primary care patients: psychometrics and practical considerations. *International Journal of Mental Health Systems*, 14(62), 1–13. <https://doi.org/10.1186/s13033-020-00397-0>
- Ardalan, K. (2019). *Equity home bias in international finance: A place-attachment perspective* (1st ed). Routledge. <https://doi.org/10.4324/9780429278181>

- Arias, D., Saxena, S., & Verguet, S. (2022). Quantifying the global burden of mental disorders and their economic value. *eClinicalMedicine*, 54, Article 101675. <https://doi.org/10.1016/j.eclinm.2022.101675>
- Arulsamy, K., & Delaney, L. (2022). The impact of automatic enrolment on the mental health gap in pension participation: Evidence from the UK. *Journal of Health Economics*, 86, Article 102673. <https://doi.org/10.1016/j.jhealeco.2022.102673>
- Asgharian, H., Christiansen, C., & Hou, A. J. (2023). The effect of uncertainty on stock market volatility and correlation. *Journal of Banking and Finance*, 154, Article 106929. <https://doi.org/10.1016/j.jbankfin.2023.106929>
- Awaworyi Churchill, S., Munyanyi, M. E., Prakash, K., & Smyth, R. (2020). Locus of control and the gender gap in mental health. *Journal of Economic Behavior and Organization*, 178, 740–758. <https://doi.org/10.1016/j.jebo.2020.08.013>
- Baltzer, M., Stolper, O., & Walter, A. (2013). Is local bias a cross-border phenomenon? Evidence from individual investors' international asset allocation. *Journal of Banking and Finance*, 37(8), 2823–2835. <https://doi.org/10.1016/j.jbankfin.2013.04.009>
- Baltzer, M., Stolper, O., & Walter, A. (2015). Home-field advantage or a matter of ambiguity aversion? Local bias among German individual investors. *The European Journal of Finance*, 21(9), 734–754. <https://doi.org/10.1080/1351847X.2013.877514>
- Bansal, N., Karlsen, S., Sashidharan, S. P., Cohen, R., Chew-Graham, C. A., & Malpass, A. (2022). Understanding ethnic inequalities in mental healthcare in the UK: A meta-ethnography. *PLoS Medicine*, 19(12), e1004139. <https://doi.org/10.1371/journal.pmed.1004139>
- Barberis, N. C. (2013). Thirty Years of Prospect Theory in Economics: A Review and Assessment. *Journal of Economic Perspectives*, 27(1), 173–196. <http://dx.doi.org/10.1257/jep.27.1.173>
- Bartram, D. (2019). The UK Citizenship Process: Political Integration or Marginalization? *Sociology*, 53(4), 671–688. <https://doi.org/10.1177/0038038518813842>
- Baum, C.F. (2006). *An Introduction to Modern Econometrics using Stata*. Stata Press.
- Bäuml, J., Froböse, T., Kraemer, S., Rentrop, M., & Pitschel-Walz, G. (2006). Psychoeducation: A Basic Psychotherapeutic Intervention for Patients With Schizophrenia and Their Families. *Schizophrenia Bulletin*, 32(1), 1–9. <https://doi.org/10.1093/schbul/sbl017>
- Bazzoli, M., Madia, J. E., Nicodemo, C., & Podestà, F. (2024). Immigration and health outcomes: A study on native health perception and limitations in Europe. *Economic Modelling*, 131, Article 106627. <https://doi.org/10.1016/j.econmod.2023.106627>

- Beja, E. L. (2017). The Asymmetric Effects of Macroeconomic Performance on Happiness: Evidence for the EU. *Intereconomics*, 52, 184–190. <https://doi.org/10.1007/s10272-017-0670-y>
- Beugelsdijk, S., & Frijns, B. (2010). A cultural explanation of the foreign bias in international asset allocation. *Journal of Banking and Finance*, 34(9), 2121–2131. <https://doi.org/10.1016/j.jbankfin.2010.01.020>
- Blanchflower, D. G. (2020). Is happiness U-shaped everywhere? Age and subjective well-being in 145 countries. *Journal of Population Economics*, 34, 575–624. <https://doi.org/10.1007/s00148-020-00797-z>
- Blanchflower, D. G., & Bryson, A. (2024). The female happiness paradox. *Journal of Population Economics*, 37(16), 1–27. <https://doi.org/10.1007/s00148-024-00981-5>
- Boyce, C. J., Wood, A. M., Banks, J., Clark, A. E., & Brown, G. D. A. (2013). Money, Well-Being, and Loss Aversion: Does Income Loss Have a Greater Effect on Well-Being Than an Equivalent Income Gain? *Psychological Science*, 24(12), 2557–2562. <https://doi.org/10.1177/0956797613496436>
- Breuer, C. (2015). Unemployment and Suicide Mortality: Evidence from Regional Panel Data in Europe. *Health Economics*, 24(8), 936–950. <https://doi.org/10.1002/hec.3073>
- Briones-Vozmediano, E., Agudelo-Suarez, A. A., Goicolea, I., Vives-Cases, C. (2014). Economic crisis, immigrant women and changing availability of intimate partner violence services: a qualitative study of professionals' perceptions in Spain. *International Journal for Equity in Health*, 13(79), 1–9. <https://doi.org/10.1186/s12939-014-0079-1>
- Bryan, D., & Rafferty, M. (2014). Financial Derivatives as Social Policy beyond Crisis. *Sociology*, 48(5), 887–903. <https://doi.org/10.1177/0038038514539061>
- Cameron, A. C., & Trivedi, P. K. (2005). *Microeconometrics: Methods and Applications*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511811241>
- Cascaldi-Garcia, D., Sarisoy, C., Londono, J. M., Sun, B., Datta, D. D., Ferreira, T., Grishchenko, O., Jahan-Parvar, M. R., Loria, F., Ma, S., Rodriguez, M., Zer, I., & Rogers, J. (2023). What is Certain about Uncertainty? *Journal of Economic Literature*, 61(2), 624–654. <https://doi.org/10.1257/jel.20211645>
- Chan, K., Covrig, V., & Ng, L. (2005). What Determines the Domestic Bias and Foreign Bias? Evidence from Mutual Fund Equity Allocations Worldwide. *The Journal of Finance*, 60(3), 1495–1534. https://doi.org/10.1111/j.1540-6261.2005.768_1.x
- Chen, C., Lin, Y., Liu, T., & Chen, C. (2016). Economic Stress and Mental Health: The Relationship Between the Stock Market and Neurotic Disorder Doctor Visits. *Stress and Health*, 32(5), 607–615. <https://doi.org/10.1002/smi.2677>

- Chiswick, B. R. (1978). The Effect of Americanization on the Earnings of Foreign-born Men. *Journal of Political Economy*, 86(5), 897–921. <https://doi.org/10.1086/260717>
- Chopde, N. R., & Nichat, M. K. (2013). Landmark Based Shortest Path Detection by Using A* and Haversine Formula. *International Journal of Innovative Research in Computer and Communication Engineering*, 1(2), 298–302.
- Close, C., Kouvonen, A., Bosqui, T., Patel, K., O'Reilly, D., & Donnelly, M. (2016). The mental health and wellbeing of first generation migrants: a systematic-narrative review of reviews. *Globalization and Health*, 12(47), 1–13. <https://doi.org/10.1186/s12992-016-0187-3>
- Constant, A. F., García-Muñoz, T., Neuman, S., & Neuman, T. (2018). A 'healthy immigrant effect' or a 'sick immigrant effect'? Selection and policies matter. *The European Journal of Health Economics*, 19(1), 103–121. <https://doi.org/10.1007/s10198-017-0870-1>
- Cornelißen, T., & Sonderhof, K. (2009). Partial effects in probit and logit models with a triple dummy-variable interaction term. *The Stata Journal*, 9(4), 571–583. <https://doi.org/10.1177/1536867X0900900404>
- Cotti, C., Dunn, R. A., & Tefft, N. (2015). The Dow is killing me: risky health behaviors and the stock market. *Health Economics*, 24(7), 803–821. <https://doi.org/10.1002/hec.3062>
- Cotti, C., & Simon, D. (2018). The impact of stock market fluctuation on the mental and physical well-being of children. *Economic Inquiry*, 56(2), 1007–1027. <https://doi.org/10.1111/ecin.12528>
- Coval, J. D., & Moskowitz, T. J. (2001). The Geography of Investment: Informed Trading and Asset Prices. *Journal of Political Economy*, 109(4), 811–841. <https://doi.org/10.1086/322088>
- Cygan-Rehm, K., Kuehnle, D., & Oberfichtner, M. (2017). Bounding the causal effect of unemployment on mental health: Nonparametric evidence from four countries. *Health Economics*, 26(12), 1844–1861. <https://doi.org/10.1002/hec.3510>
- Dowling, E., & Harvie, D. (2014). Harnessing the Social: State, Crisis and (Big) Society. *Sociology*, 48(5), 869–886. <https://doi.org/10.1177/0038038514539060>
- Drukker, D. M. (2003). Testing for serial correlation in linear panel-data models. *The Stata Journal*, 3(2), 168–177. <https://doi.org/10.1177/1536867X0300300206>
- Easterlin, R. A. (2023). Why does happiness respond differently to an increase vs. decrease in income? *Journal of Economic Behavior and Organization*, 209, 200–204. <https://doi.org/10.1016/j.jebo.2023.03.005>

- Engelberg, J., & Parsons, C. A. (2016). Worrying about the Stock Market: Evidence from Hospital Admissions. *The Journal of Finance*, 71(3), 1227–1250. <https://doi.org/10.1111/jofi.12386>
- Fernández, A., Klein, M. W., Rebucci, A., Schindler, M., & Uribe, M. (2016). Capital Control Measures: A New Dataset. *IMF Economic Review*, 64(3), 548–574. <https://www.jstor.org/stable/45212119>
- Ferreira, M. A., & Miguel, A. F. (2011). The determinants of domestic and foreign bond bias. *Journal of Multinational Financial Management*, 21(5), 279–300. <https://doi.org/10.1016/j.mulfin.2011.07.004>
- Foad, H. (2011). Immigration and equity home bias. *Journal of International Money and Finance*, 30(6), 982–998. <https://doi.org/10.1016/j.jimonfin.2011.06.005>
- Frijters, P., Johnston, D. W., Shields, M. A., & Sinha, K. (2015). A lifecycle perspective of stock market performance and wellbeing. *Journal of Economic Behavior and Organization*, 112, 237–250. <https://doi.org/10.1016/j.jebo.2015.02.004>
- Getachew, H., Dimic, S., & Priebe, S. (2009). Is psychoeducation routinely provided in the UK? Survey of community mental health teams. *Psychiatric Bulletin*, 33(3), 102–103. <https://doi.org/10.1192/pb.bp.107.018077>
- Giuntella, O., Lonsky, J., Mazzonna, F., & Stella, L. (2021). Immigration policy and immigrants' sleep. Evidence from DACA. *Journal of Economic Behavior and Organization*, 182, 1–12. <https://doi.org/10.1016/j.jebo.2020.11.037>
- Giuntella, O., & Nicodemo, C. (2018). Migration, Health, and Well-being: Models and Methods. In B. H. Baltagi, & F. Moscone (Eds.), *Health Econometrics. Contributions to Economic Analysis* (Vol. 294, pp. 101–118). Emerald Publishing. <https://doi.org/10.1108/S0573-855520180000294006>
- Gleditsch, K. S., & Ward, M. D. (2001). Measuring Space: A Minimum-Distance Database and Applications to International Studies. *Journal of Peace Research*, 38(6), 739–758. <https://doi.org/10.1177/0022343301038006006>
- Goldberg, D. P. (1972). *The detection of psychiatric illness by questionnaire: A technique for the identification and assessment of non-psychotic psychiatric illness*. Oxford University Press.
- Goldberger, A. S. (1991). *A Course in Econometrics*. Harvard University Press.
- Graham, C., & Ruiz Pozuelo, J. (2017). Happiness, stress, and age: how the U curve varies across people and places. *Journal of Population Economics*, 30, 225–264. <https://doi.org/10.1007/s00148-016-0611-2>
- Grinblatt, M., & Keloharju, M. (2001). How distance, language, and culture influence stockholdings and trades. *The Journal of Finance*, 56(3), 1053–1073. <https://doi.org/10.1111/0022-1082.00355>

- Grossman, M. (1972). On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy*, 80(2), 223–255. <https://www.jstor.org/stable/1830580>
- Gornick, J. C., & Sierminska, E. (2021). Wealth accumulation and retirement preparedness in cross-national perspective: A gendered analysis of outcomes among single adults. *Journal of European Social Policy*, 31(5), 549–564. <https://doi.org/10.1177/09589287211056174>
- Ha, J., Liu, H., & Rogers, J. (2023). *Capital Controls in Emerging and Developing Economies and the Transmission of U.S. Monetary Policy*. Policy Research Working Paper No. WPS 10582. <http://documents.worldbank.org/curated/en/099737510042356177>
- Hatzenbuehler, M. L., Phelan, J. C., & Link, B. G. (2013). Stigma as a Fundamental Cause of Population Health Inequalities. *American Journal of Public Health*, 103(5), 813–821. <https://doi.org/10.2105/AJPH.2012.301069>
- HelloSafe. (2024). *Which countries in the world have the highest household investment in the stock market?* Retrieved 11 July 2025, from <https://hellosafe.ca/en/investing/broker/stock-ownership>
- Hidrobo, M., Karachiwalla, N., & Roy, S. (2023). The impact of cash transfers on mental health and investments: Experimental evidence from Mali. *Journal of Economic Behavior and Organization*, 216, 608–630. <https://doi.org/10.1016/j.jebo.2023.10.016>
- Hofstede, G. (1980). *Culture's Consequences: International Differences in Work-Related Values* (1st ed.). Sage.
- Hofstede, G. (2001). *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Nations* (2nd ed.). Sage.
- Holzmann, R., Ayuso, M., Alaminos, E., & Bravo, J. (2019). *Life Cycle Saving and Dissaving Revisited across Three-Tiered Income Groups: Starting Hypotheses, Refinement through Literature Review, and Ideas for Empirical Testing*. IZA Discussion Paper No. 12655. <https://dx.doi.org/10.2139/ssrn.3468603>
- Huang, C., Mehta, N. K., Elo, I. T., Cunningham, S. A., Stephenson, R., Williamson, D. F., & Narayan, K. M. V. (2011). Region of Birth and Disability Among Recent U.S. Immigrants: Evidence from the 2000 Census. *Population Research and Policy Review*, 30(3), 399–418. <https://doi.org/10.1007/s11113-010-9194-x>
- Ivkovic, Z., & Weisbenner, S. (2005). Local Does as Local Is: Information Content of the Geography of Individual Investors' Common Stock Investments. *The Journal of Finance*, 60(1), 267–306. <https://doi.org/10.1111/j.1540-6261.2005.00730.x>
- Jacobson, L. (2000). The family as producer of health – an extended grossman model. *Journal of Health Economics*, 19(5), 611–637. [https://doi.org/10.1016/S0167-6296\(99\)00041-7](https://doi.org/10.1016/S0167-6296(99)00041-7)

- Jafari, S., Baharlou, S., & Mathias, R. (2010). Knowledge of Determinants of Mental Health Among Iranian Immigrants of BC, Canada. *Journal of Immigrant and Minority Health*, 12, 100–106. <https://doi.org/10.1007/s10903-008-9130-x>
- Janke, K., Lee, K., Propper, C., Shields, K., & Shields, M. A. (2023). Economic conditions and health: Local effects, national effect and local area heterogeneity. *Journal of Economic Behavior and Organization*, 214, 801–828. <https://doi.org/10.1016/j.jebo.2023.07.003>
- Jann, B. (2014). Plotting regression coefficients and other estimates. *The Stata Journal*, 14(4), 708–737. <https://doi.org/10.1177/1536867X1401400402>
- Jann, B. (2019). *HEATPLOT: Stata module to create heat plots and hexagon plots*. Boston College Department of Economics. <http://ideas.repec.org/c/boc/bocode/s458598.html>
- Jatrana, S., Richardson, K., & Pasupuleti, S. S. R. (2018). Investigating the Dynamics of Migration and Health in Australia: A Longitudinal Study. *European Journal of Population*, 34(4), 519–565. <https://doi.org/10.1007/s10680-017-9439-z>
- Jervis, R. (2004). The Implications of Prospect Theory for Human Nature and Values. *Political Psychology*, 25(2), 163–176. <https://doi.org/10.1111/j.1467-9221.2004.00367.x>
- Jiang, W., Lu, Y., & Xie, H. (2020). Education and mental health: Evidence and mechanisms. *Journal of Economic Behavior and Organization*, 180, 407–437. <https://doi.org/10.1016/j.jebo.2020.09.032>
- Johnston, J. (1984). *Econometric Methods* (3rd ed.). McGraw-Hill.
- Jung, D., Kwak, D. W., Tang, K. K., & Yazbeck, M. (2024). *Spousal Mental Health Spillover: Do You Feel What I Feel, or Do You Feel What You See?* <https://dx.doi.org/10.2139/ssrn.4723925>.
- Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47(2), 263–292. <https://doi.org/10.2307/1914185>
- Kalotychou, E., & Staikouras, S. K. (2009). An Overview of the Issues Surrounding Stock Market Volatility. In G. N. Gregoriou (Ed.), *Stock Market Volatility* (pp. 3–30). Chapman and Hall/CRC. <https://doi.org/10.1201/9781420099553>
- Karlsson, A., & Nordén, L. (2007). Home sweet home: Home bias and international diversification among individual investors. *Journal of Banking and Finance*, 31(2), 317–333. <https://doi.org/10.1016/j.jbankfin.2006.04.005>
- Kim, H. (2017). The Spatial Impact of Cultural Distances on Home Bias across Asian Emerging Markets. *Atlantic Economic Journal*, 45, 81–101.

- Kim, D. (2019a). Economic cycle, fertility, and seasonal pattern of suicide rates in South Korea from 1995 to 2015. *Journal of Public Health*, 27(3), 379–385. <https://doi.org/10.1007/s10389-018-0949-x>
- Kim, J.H. (2019b). Multicollinearity and misleading statistical results. *Korean Journal of Anesthesiology*, 72(6), 558–569. <https://doi.org/10.4097/kja.19087>
- Kogut, B., & Singh, H. (1988). The Effect of National Culture on the Choice of Entry Mode. *Journal of International Business Studies*, 19, 411–432. <https://doi.org/10.1057/palgrave.jibs.8490394>
- Kopasker, D., Montagna, C., & Bender, K. A. (2018). Economic insecurity: A socioeconomic determinant of mental health. *SSM – Population Health*, 6, 184–194. <https://doi.org/10.1016/j.ssmph.2018.09.006>
- Lee, D., Kim, Y., & Devine, B. (2021). Spillover Effects of Mental Health Disorders on Family Member's Health-Related Quality of Life: Evidence from a US Sample. *Medical Decision Making*, 42(1), 80–93. <https://doi.org/10.1177/0272989X211027146>
- Lemish, D. (2022). Home-no-home: Academic immigrants in the fields of communication. *International Journal of Communication*, 16, 4424–4436.
- Letourneau, N., & Allen, M. (2006). Post-Positivist Critical Multiplism: A Beginning Dialogue. In W. K. Cody (Ed.), *Philosophical and Theoretical Perspectives for Advanced Nursing Practice* (4th ed., pp. 221–232). Jones and Bartlett Publishers.
- Levy, H., & Sarnat, M. (1970). International diversification of investment portfolios. *The American Economic Review*, 60(4), 668–675. <https://www.jstor.org/stable/1818410>
- Li, J., Zhou, Y., Hu, J., & Guo, F. (2023). Local bias versus home bias: Evidence from debt-based crowdfunding. *Applied Economics*, 56(23), 1–15. <https://doi.org/10.1080/00036846.2023.2200230>
- Lin, C., Chen, C., & Liu, T. (2015). Do stock prices drive people crazy? *Health Policy and Planning*, 30(2), 206–214. <https://doi.org/10.1093/heapol/czu007>
- Lin, C., Liu, T., & Chen, C. (2017). The association between attempted suicide and stock price movements: Evidence from Taiwan. *Psychiatric Research*, 254, 323–331. <https://doi.org/10.1016/j.psychres.2017.05.004>
- Lindblom, T., Mavruk, T., & Sjögren, S. (2018). East or west, home is best: The birthplace bias of individual investors. *Journal of Banking and Finance*, 92, 323–339. <https://doi.org/10.1016/j.jbankfin.2016.10.002>
- Lindeboom, M., Portrait, F., & van den Berg, G. J. (2002). An econometric analysis of the mental-health effects of major events in the life of older individuals. *Health Economics*, 11(6), 505–520. <https://doi.org/10.1002/hec.746>

- Liu, C., & Fan, M. (2024). Stock market and the psychological health of investors. *Financial Review*, 59(3), 545–829. <https://doi.org/10.1111/fire.12385>
- Lu, Y. (2010). Rural-urban migration and health: Evidence from longitudinal data in Indonesia. *Social Science & Medicine*, 70(3), 412–419. <https://doi.org/10.1016/j.socscimed.2009.10.028>
- Lu, Y., & Zhang, A. T. (2016). The link between migration and health. In F. Thomas (Ed.), *Handbook of Migration and Health* (pp. 19–43). Edward Elgar Publishing. <https://doi.org/10.4337/9781784714789.00011>
- Makowska, Z., Merecz, D., Moscicka, A., & Kolasa, W. (2002). The validity of general health questionnaires, GHQ-12 and GHQ-28, in mental health studies of working people. *International Journal of Occupational Medicine and Environmental Health*, 15(4), 353–362.
- McDaid, D., Park, A. L., Davidson, G., John, A., Knifton, L., McDaid, S., Morton, A., Thorpe, L., & Wilson, N. (2022). *The economic case for investing in the prevention of mental health conditions in the UK*. Mental Health Foundation.
- McGrath, J. J., Al-Hamzawi, A., Alonso, J., Altwaijri, Y., Andrade, L. H., Bromet, E. J., Bruffaerts, R., Caldas de Almeida, J. M., Chardoul, S., Chiu, W. T., Degenhardt, L., Demler, O. V., Ferry, F., Gureje, O., Haro, J. M., Karam, E. G., Karam, G., Khaled, S. M., Kovess-Masfety, V., ... Kessler, R. C. (2023). Age of onset and cumulative risk of mental disorders: A cross-national analysis of population surveys from 29 countries. *The Lancet Psychiatry*, 10(9), 668–681. [https://doi.org/10.1016/S2215-0366\(23\)00193-1](https://doi.org/10.1016/S2215-0366(23)00193-1)
- McInerney, M., Mellor, J. M., & Nicholas, L. H. (2013). Recession depression: Mental health effects of the 2008 stock market crash. *Journal of Health Economics*, 32(6), 1090–1104. <https://doi.org/10.1016/j.jhealeco.2013.09.002>
- Mental Health Foundation. (2017). *Surviving or Thriving? The state of the UK's mental health*. Retrieved 24 July 2023, from <https://www.mentalhealth.org.uk/sites/default/files/2022-06/surviving-or-thriving-state-uk-mental-health-publication.pdf>
- Modigliani, F., & Brumberg, R. H. (1954). Utility analysis and the consumption function: an interpretation of cross-section data. In K. K. Kurihara (Ed.), *Post-Keynesian Economics* (pp. 388–436). Rutgers University Press.
- Modigliani, F. (1966). The Life Cycle Hypothesis of Saving, the Demand for Wealth and the Supply of Capital. *Social Research*, 33(2), 160–217. <https://www.jstor.org/stable/40969831>
- Monti, E. J., & Tingen, M. S. (2006). Multiple Paradigms of Nursing Science. In W. K. Cody (Ed.), *Philosophical and Theoretical Perspectives for Advanced Nursing Practice* (4th ed., pp. 27–42). Jones and Bartlett Publishers.

- Mwanri, L., Faulk, N. K., Ziersch, A., Gesesew, H. A., Asa, G. A., & Ward, P. R. (2022). Post-Migration Stressors and Mental Health for African Migrants in South Australia: A Qualitative Study. *International Journal of Environmental Research and Public Health*, 19(13), 7914. <https://doi.org/10.3390/ijerph19137914>
- Nandi, A., Prescott, M. R., Cerdá, M., Vlahov, D., Tardiff, K. J., & Galea, S. (2012). Economic Conditions and Suicide Rates in New York City. *American Journal of Epidemiology*, 175(6), 527–535. <https://doi.org/10.1093/aje/kwr355>
- Naruetharadhol, P., Wongsachia, S., Van Wouwe, M., & Ketkaew, C. (2021). Career status, retirement readiness, and age differences: Empirical evidence from skilled immigrants in Thailand. *Cogent Business & Management*, 8(1), Article 1885572. <https://doi.org/10.1080/23311975.2021.1885572>
- Nauman, E., Van Landingham, M., Anglewicz, P., Patthavanit, U., & Punpuing, S. (2015). Rural-to-Urban Migration and Changes in Health Among Young Adults in Thailand. *Demography*, 52, 233–257. <https://doi.org/10.1007/s13524-014-0365-y>
- Nekoei, A. (2013). Immigrants' labour supply and exchange rate volatility. *American Economic Journal: Applied Economics*, 5(4), 144–164. <https://dx.doi.org/10.1257/app.5.4.144>
- Nguyen, H. T., & Connelly, L. B. (2018). Out of sight but not out of mind: Home countries' macroeconomic volatilities and immigrants' mental health. *Health Economics*, 27(1), 189–208. <https://doi.org/10.1002/hec.3532>
- Nguyen, H. T., & Duncan, A. S. (2020). Macroeconomic Fluctuations in Home Countries and Immigrants' Well-Being: New Evidence from Down Under. *International Migration Review*, 54(1), 205–232. <https://doi.org/10.1177/0197918318813975>
- Nikolova, M., & Ayhan, S. H. (2019). Your spouse is fired! How much do you care? *Journal of Population Economics*, 32, 799–844. <https://doi.org/10.1007/s00148-018-0693-0>
- OECD. (2023). *International migration outlook 2023*. OECD Publishing. <https://doi.org/10.1787/b0f40584-en>
- Ojurongbe, S. (2023). The perceived effects of migration on the mental health of Afro-Caribbean immigrants: A narrative synthesis of qualitative studies. *Journal of Psychiatric and Mental Health Nursing*, 30(6), 1203–1215. <https://doi.org/10.1111/jpm.12944>
- Park, H., & Kim, J. (2024). Perceived social position, active engagement with life, and depressive symptoms among older adults. *Social Science & Medicine*, 345, Article 116716. <https://doi.org/10.1016/j.socscimed.2024.116716>
- Park, H., Park, G., & Kim, J. (2024). Transitioning into and out of precarious employment and life satisfaction: Evidence from asymmetric fixed effects models. *Social Science & Medicine*, 341, Article 116539. <https://doi.org/10.1016/j.socscimed.2023.116539>

- Patten, S. B., & Juby, H. (2008). *A Profile of Clinical Depression in Canada*. Research Data Centre Network.
- Pederson, A. B., Earnshaw, V., Clark, C. T., Zumpf, K., & Burnett-Ziegler, I. (2021). Mental Health Stigma Among Black Immigrant Women in An Urban Setting. *Journal of Mental Health & Clinical Psychology*, 5(2), 1–7. <https://pmc.ncbi.nlm.nih.gov/articles/PMC8341438/>
- Pereira dos Santos, J., Tavares, M., & Barros, P. P. (2016). More than just numbers: Suicide rates and the economic cycle in Portugal (1910–2013). *SSM – Population Health*, 2, 14–23. <https://doi.org/10.1016/j.ssmph.2015.11.004>
- Pierce, A. (1967). The Economic Cycle and the Social Suicide Rate. *American Sociological Review*, 32(3), 457–462. <https://doi.org/10.2307/2091092>
- Pinedo, M., Beltrán-Girón, J., Correa, Z., & Valdez, C. (2021). A Qualitative View of Migration-Related Stressors on the Mental Health of Latinx Americans in the Current Sociopolitical Climate of Hostility Towards Migrants. *Journal of Immigrant and Minority Health*, 23, 1053–1064. <https://doi.org/10.1007/s10903-021-01207-6>
- Poterba, J., Venti, S., & Wise, D. (2011). The composition and drawdown of wealth in retirement. *Journal of Economic Perspectives*, 25(4), 95–118. <https://doi.org/10.1257/jep.25.4.95>
- Prechter, R. R., & Parker, W. D. (2007). The Financial/Economic Dichotomy in Social Behavioral Dynamics: The Socionomic Perspective. *The Journal of Behavioral Finance*, 8(2), 84–108. <https://doi.org/10.1080/15427560701381028>
- Rahman, S., & Rashidi, Z. (2021). Impact of Gender Differences on Individual Investor Behavior. *Beytulhikme An International Journal of Philosophy*, 11(9), 1567–1593. <https://dx.doi.org/10.2139/ssrn.4052754>
- Ratcliffe, A., & Taylor, K. (2015). Who cares about stock market booms and busts? Evidence from data on mental health. *Oxford Economic Papers*, 67(3), 826–845. <https://doi.org/10.1093/oep/gpv030>
- Reichert, A. R., & Tauchmann, H. (2017). Workforce reduction, subjective job insecurity, and mental health. *Journal of Economic Behavior and Organization*, 133, 187–212. <https://doi.org/10.1016/j.jebo.2016.10.018>
- Ricciardi, V., & Simon, H. K. (2000). What is Behavioral Finance? *Business, Education & Technology Journal*, 2(2), 1–9. <https://ssrn.com/abstract=256754>
- Rienzo, C., & Vargas-Silva, C. (2022). *Migrants in the UK: An Overview*. Migration Observatory Briefing, COMPAS. University of Oxford.
- Rohde, N., Tang, K. K., Osberg, L., & Rao, P. (2016). The effect of economic insecurity on mental health: Recent evidence from Australian panel data. *Social Science &*

- Ronda, E., Briones-Vozmediano, E., Galon, T., García, A. M., Benavides, F. G., & Agudelo-Suárez, A. (2016). A qualitative exploration of the impact of the economic recession in Spain on working, living and health conditions: reflections based on immigrant workers' experiences. *Health Expectations*, 19(2), 416–426. <https://doi.org/10.1111/hex.12365>
- Saechao, F., Sharrock, S., Reicherter, D., Livingston, J. D., Aylward, A., Whisnant, J., Koopman, C., & Kohli, S. (2012). Stressors and Barriers to Using Mental Health Services Among Diverse Groups of First-Generation Immigrants to the United States. *Community Mental Health Journal*, 48, 98–106. <https://doi.org/10.1007/s10597-011-9419-4>
- Sargent-Cox, K., Butterworth, P., & Anstey, K. J. (2011). The global financial crisis and psychological health in a sample of Australian older adults: A longitudinal study. *Social Science & Medicine*, 73(7), 1105–1112. <https://doi.org/10.1016/j.socscimed.2011.06.063>
- Schwandt, H. (2018). Wealth Shocks and Health Outcomes: Evidence from Stock Market Fluctuations. *American Economic Journal: Applied Economics*, 10(4), 349–377. <https://doi.org/10.1257/app.20140499>
- Sellers, S. L., Ward, E. C., & Pate, D. (2006). Dimensions of Depression: A Qualitative Study of Wellbeing Among Black African Immigrant Women. *Qualitative Social Work*, 5(1), 45–66. <https://doi.org/10.1177/1473325006061538>
- Shankar, J., Chen, S.-P., Lai, D. W. L., Joseph, S., Narayanan, R., Suleman, Z., Ali, H. M. A., & Kharat, P. (2024). Mental health challenges of recent immigrants in precarious work environments – a qualitative study. *Frontiers in Psychiatry*, 15, 1428276. <https://doi.org/10.3389/fpsy.2024.1428276>
- Siar, S. (2014). Highly skilled migrants' strong ties with their home country: Evidence from Filipinos in New Zealand and Australia. *Journal of International Migration and Integration*, 15, 655–676. <https://doi.org/10.1007/s12134-013-0285-5>
- Silva, M., Resurrección, A., Antunes, A., Frasquilho, D., & Cardoso, G. (2020). Impact of economic crises on mental health care: a systematic review. *Epidemiology and Psychiatric Sciences*, 29(e7), 1–13. <https://doi.org/10.1017/S2045796018000641>
- Simich, L., Hamilton, H., & Baya, B. K. (2006). Mental Distress, Economic Hardship and Expectations of Life in Canada among Sudanese Newcomers. *Transcultural Psychiatry*, 43(3), 418–444. <https://doi.org/10.1177/1363461506066985>
- Simon, R. W. (2002). Revisiting the Relationships among Gender, Marital Status, and Mental Health. *American Journal of Sociology*, 107(4), 1065–1096. <https://doi.org/10.1086/339225>

- Simpson, N. B. (2017). *Demographic and economic determinants of migration*. IZA Working Paper No. 373. <http://dx.doi.org/10.15185/izawol.373.v2>
- Solnik, B., & Zuo, L. (2017). Relative optimism and the home bias puzzle. *Review of Finance*, 21(5), 2045–2074. <https://doi.org/10.1093/rof/rfw021>
- Stawarz, N., Ette, A., & Rüger, H. (2021). Healthy Migrants? Comparing Subjective Health of German Emigrants, Remigrants, and Non-Migrants. In M. Erlinghagen, A. Ette, N. F. Schneider, & N. Witte (Eds.), *The Global Lives of German Migrants: Consequences of International Migration Across the Life Course* (pp. 205–225). Springer Nature. https://doi.org/10.1007/978-3-030-67498-4_12
- Talamonti, D., Schneider, J., Gibson, B., & Forshaw, M. (2024). The impact of national and international financial crises on mental health and well-being: a systematic review. *Journal of Mental Health*, 33(4), 522–559. <https://doi.org/10.1080/09638237.2023.2278104>
- The World Bank. (2023). *World Development Indicators, GDP per capita*. The World Bank. Retrieved 5 September 2023, from <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>
- The World Bank. (2024a). *World Development Indicators*. Retrieved 4 June 2024, from <https://data.worldbank.org/indicator>
- The World Bank. (2024b). *World Integrated Trade Solution*. Retrieved 24 June 2024, from <https://wits.worldbank.org/CountryProfile/en/GBR>
- Tobin, J. (1967). Life Cycle Saving and Balanced Growth. In W. Fellner (Ed.), *Ten Economic Studies in the Tradition of Irving Fisher* (pp. 231–256). John Wiley & Sons.
- Torres-Reyna, O. (2007). *Panel Data Analysis Fixed and Random Effects using Stata (v. 6.0)*. Princeton University. Retrieved 24 October 2023, from <https://www.princeton.edu/~otorres/Panel101.pdf>
- Tversky, A., & Kahneman, D. (1991). Loss Aversion in Riskless Choice: A Reference-Dependent Model. *The Quarterly Journal of Economics*, 106(4), 1039–1061. <https://doi.org/10.2307/2937956>
- United Nations. Department of Economic and Social Affairs. (2023). *Sustainable Development Goals*. Retrieved 23 October 2024, from <https://sdgs.un.org/goals>
- United Nations. Department of Economic and Social Affairs. (2024). *World Economic Situation and Prospects*. United Nations.
- University of Essex. Institute for Social and Economic Research. (2022). *Understanding Society: Waves 1-12, 2009-2021* (17th ed.). UK Data Service. <http://doi.org/10.5255/UKDA-SN-6614-18>

- University of Essex. Institute for Social and Economic Research. (2023). *Understanding Society: Waves 1-13, 2009-2023* (18th ed.). UK Data Service. <http://doi.org/10.5255/UKDA-SN-6614-19>
- Vandoros, S., Avendano, M., & Kawachi, I. (2019). The association between economic uncertainty and suicide in the short-run. *Social Science & Medicine*, 220, 403–410. <https://doi.org/10.1016/j.socscimed.2018.11.035>
- Vandoros, S., & Kawachi, I. (2021). Economic uncertainty and suicide in the United States. *European Journal of Epidemiology*, 36(6), 641–647. <https://doi.org/10.1007/s10654-021-00770-4>
- Verheij, R. A., Maas, J., & Groenewegen, P. P. (2008). Urban-Rural Health Differences and the Availability of Green Space. *European Urban and Regional Studies*, 15(4), 307–316. <https://doi.org/10.1177/0969776408095107>
- Ware, J. E., Kosinski, M., & Keller, S. D. (1995). *How to score SF-12 Physical and Mental Health Summary Scales* (2nd ed.). The Health Institute, New England Medical Center.
- Watson, B., & Osberg, L. (2019). Can positive income anticipations reverse the mental health impacts of negative income anxieties? *Economics and Human Biology*, 35, 107–122. <https://doi.org/10.1016/j.ehb.2019.05.003>
- White, B. B. (1978). Empirical Tests of the Life Cycle Hypothesis. *American Economic Review*, 68(4), 547–560. <https://www.jstor.org/stable/1808925>
- Wisniewski, T. P., Lambe, B. J., & Shrestha, K. (2020). Do Stock Market Fluctuations Affect Suicide Rates? *The Journal of Financial Research*, 43(4), 737–765. <https://doi.org/10.1111/jfir.12224>
- Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. MIT Press.
- Yin, H., Xu, L., Shao, Y., Li, L., & Wan, C. (2016). Relationship between suicide rate and economic growth and stock market in the People's Republic of China: 2004–2013. *Neuropsychiatric Disease and Treatment*, 12, 3119–3128. <https://doi.org/10.2147/NDT.S116148>
- York, R., & Light, R. (2017). Directional Asymmetry in Sociological Analyses. *Socius*, 3, 1–13. <https://doi.org/10.1177/2378023117697180>
- Zero Suicide Alliance. (2022). *Suicide Incidence*. Retrieved 8 January 2023, from <https://www.zerosuicidealliance.com/ZSA-Resources/facts-for-action/suicide-incidence>
- Zhao, Y. (2023). Job displacement and the mental health of households: Burden sharing counteracts spillover. *Labour Economics*, 81, Article 102340. <https://doi.org/10.1016/j.labeco.2023.102340>

Appendices

Appendix A.1 Robustness Analysis for Chapter 3

Table A.1 Robustness Analysis using Fixed Effects

	<i>GHQ-12</i>	<i>SF-12 MCS</i>
	FE	FE
Stock market volatility	1.021** (0.519)	−1.301 (0.964)
Exchange rate	−0.002*** (0.000)	0.001 (0.001)
GDP	0.000 (0.000)	−0.000 (0.000)
CPI	−0.000 (0.002)	0.004 (0.004)
Female		
Age	0.060 (0.126)	−0.353 (0.242)
Low level of education	−0.803*** (0.306)	0.648 (0.575)
Single	−0.020 (0.196)	0.589 (0.369)
Divorced	0.080 (0.250)	−0.465 (0.466)
Widowed	1.053*** (0.318)	−1.847*** (0.595)
Other marital status	0.693*** (0.233)	−1.077** (0.444)
Resident in rural area	−0.106 (0.297)	0.024 (0.546)
Resident in England	1.880 (1.866)	−5.639* (3.309)
Resident in Wales	0.970 (1.845)	−2.812 (3.241)
Resident in Scotland	3.137 (1.945)	−6.524* (3.465)
Born in non-English speaking country		
No exposure to stock markets	0.068 (0.092)	−0.142 (0.171)
Low income	0.321*** (0.077)	−0.169 (0.146)
Home distance		
Time since first arrived in UK	−0.015 (0.127)	0.131 (0.244)
Year dummies	Yes	Yes
Home country dummies	No	No

Note: I list the results from two models and two different dependent variables, GHQ-12 and SF-12 MCS. In the fixed effects model, time-invariant control variables such as female, born in non-English speaking country, home distance and home country dummies are omitted. Coefficients are reported. Standard errors are in parentheses. * if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

Appendix A.2 Robustness Analysis for Chapter 5

Table A.2 Regression Results for Total Sample and Gender Groups

		All		Male		Female	
		GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS
52-week return	POLS	−0.473*** (0.133)	0.238 (0.243)	−0.341* (0.183)	0.077 (0.340)	−0.551*** (0.189)	0.294 (0.341)
52-week return	SFE	−0.550*** (0.107)	0.236 (0.191)	−0.368** (0.149)	−0.068 (0.270)	−0.684*** (0.152)	0.461* (0.268)
52-week return (positive)	AFE	−0.318** (0.162)	0.433 (0.289)	−0.087 (0.226)	0.310 (0.411)	−0.472** (0.229)	0.487 (0.403)
52-week return (negative)	AFE	0.498*** (0.179)	−0.129 (0.319)	0.068 (0.249)	0.165 (0.452)	0.831*** (0.253)	−0.328 (0.445)
p-value for $\beta^+ = -\beta^-$	Wald test	0.458	0.482	0.957	0.440	0.294	0.793
Level of stock market index	POLS	−0.099*** (0.035)	0.033 (0.064)	0.051 (0.048)	0.033 (0.089)	−0.131*** (0.050)	0.071 (0.090)
Level of stock market index	SFE	−0.145*** (0.028)	0.065 (0.050)	−0.100** (0.039)	−0.016 (0.071)	−0.179*** (0.040)	0.124* (0.071)
Level of stock market index (positive)	AFE	−0.092*** (0.025)	0.121*** (0.044)	−0.073** (0.035)	0.039 (0.063)	−0.107*** (0.035)	0.185*** (0.062)
Level of stock market index (negative)	AFE	0.156*** (0.030)	−0.096* (0.053)	0.090** (0.041)	−0.002 (0.074)	0.210*** (0.042)	−0.172** (0.074)
p-value for $\beta^+ = -\beta^-$	Wald test	0.031	0.637	0.684	0.626	0.013	0.862
52-week volatility	POLS	2.030*** (0.355)	−0.857 (0.645)	1.215** (0.488)	0.102 (0.903)	2.556*** (0.505)	−1.378 (0.906)
52-week volatility	SFE	2.704*** (0.280)	−1.621*** (0.497)	1.925*** (0.388)	−0.490 (0.702)	3.268*** (0.398)	−2.424*** (0.697)
52-week volatility (positive)	AFE	2.345*** (0.268)	−1.413*** (0.477)	1.730*** (0.374)	−0.651 (0.677)	2.824*** (0.380)	−1.992*** (0.666)
52-week volatility (negative)	AFE	−1.802*** (0.317)	1.783*** (0.564)	−1.038** (0.442)	0.567 (0.802)	−2.365*** (0.448)	2.675*** (0.787)
p-value for $\beta^+ = -\beta^-$	Wald test	0.116	0.549	0.152	0.923	0.347	0.427
N(Observations)		291,461	286,859	131,397	129,457	160,064	157,402

Note: I list the results from 54 models using three different samples, all, males and females, two different dependent variables, GHQ-12 and SF-12 MCS, and three different regressions, pooled OLS, standard fixed effects and asymmetric fixed effects regression. I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence, total individual income, total household income, individual investment income, household investment income, GDP, inflation, and year, month

and week dummies. Coefficients are reported. Standard errors are in parentheses. Coefficients and standard errors for level of stock market index are multiplied by 1,000.

* if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

Table A.3 Regression Results for Age Groups

		Age 15–44		Age 45–60		Age 60+	
		GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS
52-week return	POLS	−0.492** (0.203)	0.485 (0.371)	−0.240 (0.255)	−0.413 (0.444)	−0.717*** (0.233)	0.507 (0.449)
52-week return	SFE	−0.584*** (0.175)	0.344 (0.306)	−0.384* (0.204)	0.044 (0.348)	−0.764*** (0.173)	0.499 (0.348)
52-week return (positive)	AFE	−0.490* (0.267)	0.575 (0.467)	−0.434 (0.336)	−0.057 (0.571)	0.147 (0.291)	−0.363 (0.585)
52-week return (negative)	AFE	0.876*** (0.302)	−0.526 (0.527)	−0.177 (0.363)	0.962 (0.617)	1.385*** (0.311)	−1.855*** (0.622)
p-value for $\beta^+ = -\beta^-$	Wald test	0.346	0.946	0.228	0.237	0.000	0.011
Level of stock market index	POLS	−0.089* (0.053)	0.086 (0.098)	−0.075 (0.066)	−0.092 (0.116)	−0.167*** (0.061)	0.102 (0.118)
Level of stock market index	SFE	−0.160*** (0.046)	0.038 (0.081)	−0.123** (0.053)	0.031 (0.091)	−0.166*** (0.046)	0.161* (0.091)
Level of stock market index (positive)	AFE	−0.070* (0.040)	0.031 (0.071)	−0.150*** (0.051)	0.161* (0.086)	−0.044 (0.045)	0.003 (0.091)
Level of stock market index (negative)	AFE	0.201*** (0.049)	−0.093 (0.085)	0.087 (0.059)	−0.017 (0.100)	0.233*** (0.052)	−0.356*** (0.104)
p-value for $\beta^+ = -\beta^-$	Wald test	0.008	0.471	0.315	0.177	0.001	0.001
52-week volatility	POLS	2.177*** (0.563)	−1.498 (1.025)	1.573** (0.666)	0.343 (1.158)	2.151*** (0.594)	−0.735 (1.136)
52-week volatility	SFE	2.859*** (0.474)	−2.022** (0.826)	2.508*** (0.523)	−1.238 (0.887)	2.916*** (0.432)	−1.507* (0.864)
52-week volatility (positive)	AFE	3.066*** (0.443)	−2.741*** (0.772)	2.063*** (0.536)	−1.434 (0.909)	2.606*** (0.470)	−1.259 (0.941)
52-week volatility (negative)	AFE	−1.655*** (0.527)	1.012 (0.919)	−1.781*** (0.631)	1.736 (1.070)	−1.938*** (0.541)	1.391 (1.085)
p-value for $\beta^+ = -\beta^-$	Wald test	0.014	0.084	0.698	0.806	0.296	0.918
N(Observations)		136,308	134,149	82,714	81,650	72,439	71,060

Note: I list the results from 54 models using three different samples, age 15–44, age 45–60 and age 60+, two different dependent variables, GHQ-12 and SF-12 MCS, and three different regressions, pooled OLS, standard fixed effects and asymmetric fixed effects regression. I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence, total individual income, total household income, individual investment income, household investment income, GDP, inflation, and

year, month and week dummies. Coefficients are reported. Standard errors are in parentheses. Coefficients and standard errors for level of stock market index are multiplied by 1,000. * if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

Table A.4 Spillover Effects Regression Results

		(1)		(2)		(3)	
		GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS
52-week return	POLS	−0.634*** (0.221)	0.447 (0.408)	−0.660** (0.272)	0.267 (0.497)	−0.310 (0.201)	0.148 (0.365)
52-week return	SFE	−0.971*** (0.188)	0.756** (0.332)	−1.070*** (0.256)	1.037** (0.453)	−0.164 (0.173)	−0.240 (0.310)
52-week return (positive)	AFE	−0.729** (0.301)	1.222** (0.533)	−0.092 (0.407)	0.052 (0.723)	−0.240 (0.264)	0.141 (0.473)
52-week return (negative)	AFE	0.786** (0.326)	−0.065 (0.577)	1.385*** (0.438)	−0.463 (0.773)	−0.006 (0.294)	0.088 (0.525)
p-value for $\beta^+ = -\beta^-$	Wald test	0.900	0.147	0.034	0.704	0.536	0.748
Level of stock market index	POLS	−0.135** (0.058)	−0.011 (0.106)	−0.068 (0.071)	−0.050 (0.129)	−0.100* (0.053)	0.115 (0.097)
Level of stock market index	SFE	−0.283*** (0.049)	0.204** (0.087)	−0.196*** (0.067)	0.141 (0.118)	−0.086* (0.046)	0.014 (0.082)
Level of stock market index (positive)	AFE	−0.210*** (0.047)	0.204** (0.083)	−0.052 (0.062)	0.077 (0.110)	−0.081** (0.040)	0.164** (0.072)
Level of stock market index (negative)	AFE	0.259*** (0.055)	−0.098 (0.097)	0.187*** (0.071)	−0.077 (0.126)	0.133*** (0.048)	−0.207** (0.086)
p-value for $\beta^+ = -\beta^-$	Wald test	0.389	0.291	0.071	0.996	0.285	0.616
52-week volatility	POLS	3.525*** (0.596)	−2.500** (1.098)	1.355* (0.704)	0.771 (1.283)	1.656*** (0.541)	−0.903 (0.976)
52-week volatility	SFE	4.575*** (0.493)	−4.001*** (0.873)	2.925*** (0.643)	−1.125 (1.134)	1.638*** (0.455)	−0.586 (0.809)
52-week volatility (positive)	AFE	3.565*** (0.512)	−1.672* (0.903)	2.487*** (0.643)	−0.810 (1.136)	1.683*** (0.432)	−1.949** (0.770)
52-week volatility (negative)	AFE	−3.219*** (0.605)	3.678*** (1.073)	−1.195 (0.764)	−0.302 (1.352)	−1.770*** (0.509)	2.169** (0.907)
p-value for $\beta^+ = -\beta^-$	Wald test	0.616	0.101	0.134	0.466	0.877	0.825
N(Observations)		79,087	78,407	67,374	66,497	145,000	141,955

Note: I list the results from 54 models using three different samples, (1) individuals with investment income, (2) individuals with household investment income but no individual investment income and (3) individuals without any individual or household investment income, two different dependent variables, GHQ-12 and SF-12 MCS, and three different regressions, pooled OLS, standard fixed effects and asymmetric fixed effects regression. I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence, total individual income, total household income, individual investment income, household investment income, GDP, inflation, and

year, month and week dummies. Coefficients are reported. Standard errors are in parentheses. Coefficients and standard errors for level of stock market index are multiplied by 1,000. * if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

Table A.5 Interactions between Symmetric Effects and Reliance on Investment Income

	All				Individuals with investment income			
	GHQ-12		SF-12 MCS		GHQ-12		SF-12 MCS	
	POLS	SFE	POLS	SFE	POLS	SFE	POLS	SFE
52-week return (R)	−0.474*** (0.134)	−0.523*** (0.108)	0.186 (0.244)	0.186 (0.193)	−0.630*** (0.228)	−0.860*** (0.194)	0.189 (0.420)	0.584* (0.343)
Reliance on investment income (I)	−1.315*** (0.095)	−0.269*** (0.090)	2.457*** (0.172)	0.456*** (0.159)	−0.617*** (0.093)	−0.209** (0.102)	1.287*** (0.171)	0.448** (0.181)
$R \times I$	−0.227 (0.743)	−1.309** (0.625)	2.859** (1.349)	2.319** (1.110)	−0.141 (0.667)	−1.458** (0.631)	3.354*** (1.228)	2.290** (1.120)
Level of stock market index (X)	−0.108*** (0.035)	−0.144*** (0.028)	0.040 (0.064)	0.058 (0.050)	−0.167*** (0.058)	−0.284*** (0.050)	0.021 (0.108)	0.189** (0.088)
Reliance on investment income (I)	−3.809*** (0.811)	−0.094 (0.703)	4.110*** (1.476)	−1.537 (1.251)	−3.074*** (0.730)	−0.402 (0.722)	3.787*** (1.348)	−0.705 (1.281)
$X \times I$	0.379*** (0.123)	−0.032 (0.106)	−0.240 (0.223)	0.312* (0.189)	0.374*** (0.110)	0.024 (0.109)	−0.368* (0.204)	0.183 (0.193)
52-week volatility (V)	1.988*** (0.357)	2.617*** (0.282)	−0.741 (0.648)	−1.501*** (0.500)	3.459*** (0.610)	4.348*** (0.505)	−2.185* (1.122)	−3.672*** (0.894)
Reliance on investment income (I)	−1.625*** (0.262)	−0.885*** (0.222)	3.363*** (0.475)	1.313*** (0.394)	−0.733*** (0.239)	−0.652*** (0.227)	1.915*** (0.439)	1.098*** (0.403)
$V \times I$	1.977 (1.591)	3.808*** (1.327)	−5.398* (2.883)	−5.207** (2.353)	0.739 (1.431)	2.677** (1.320)	−3.529 (2.631)	−3.883* (2.339)
N(Observations)	291,461	291,461	286,859	286,859	79,087	79,087	78,407	78,407

Note: I list the results from 24 models using two different samples, all and respondents with individual investment income, two different dependent variables, GHQ-12 and SF-12 MCS, and two different regressions, pooled OLS and standard fixed effects regression. I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence, total individual income, total household income, individual investment income, household investment income, GDP, inflation, and year, month and week dummies. Coefficients are reported. Standard errors are in parentheses. Coefficients and standard errors for level of stock market index are multiplied by 1,000. * if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$

Table A.6 Interactions between Asymmetric Effects and Reliance on Investment Income

	All		Individuals with investment income	
	GHQ-12	SF-12 MCS	GHQ-12	SF-12 MCS
52-week return (positive) (R^+)	-0.318* (0.162)	0.408 (0.289)	-0.742** (0.302)	1.192** (0.536)
52-week return (negative) (R^-)	0.471*** (0.180)	-0.105 (0.320)	0.702** (0.331)	0.077 (0.586)
Reliance on investment income (I)	-0.375*** (0.143)	0.207 (0.255)	-0.438*** (0.164)	0.548* (0.292)
$R^+ \times I$	-0.145 (0.399)	1.268* (0.707)	0.209 (0.422)	0.437 (0.747)
$R^- \times I$	1.029 (0.658)	-0.942 (1.166)	0.948 (0.664)	-1.596 (1.176)
p-value for $\beta^+ = -\beta^-$	0.120	0.747	0.043	0.252
Level of stock market index (positive) (X^+)	-0.090*** (0.025)	0.114** (0.045)	-0.211*** (0.047)	0.187** (0.084)
Level of stock market index (negative) (X^-)	0.150*** (0.030)	-0.091* (0.053)	0.245*** (0.056)	-0.067 (0.099)
Reliance on investment income (I)	-0.322*** (0.121)	0.221 (0.215)	-0.379*** (0.138)	0.424* (0.245)
$X^+ \times I$	-0.109 (0.094)	0.336** (0.168)	0.011 (0.098)	0.238 (0.173)
$X^- \times I$	0.264* (0.139)	-0.231 (0.246)	0.177 (0.141)	-0.388 (0.251)
p-value for $\beta^+ = -\beta^-$	0.100	0.531	0.048	0.374
52-week volatility (positive) (V^+)	2.262*** (0.270)	-1.350*** (0.479)	3.300*** (0.522)	-1.492 (0.924)
52-week volatility (negative) (V^-)	-1.731*** (0.318)	1.664*** (0.566)	-3.075*** (0.615)	3.513*** (1.090)
Reliance on investment income (I)	-0.275** (0.117)	0.240 (0.209)	-0.330** (0.133)	0.487** (0.236)
$V^+ \times I$	3.666*** (1.231)	-2.760 (2.185)	3.184** (1.247)	-2.130 (2.210)
$V^- \times I$	-3.339** (1.328)	5.464** (2.363)	-1.711 (1.347)	1.913 (2.390)
p-value for $\beta^+ = -\beta^-$	0.726	0.103	0.116	0.897
N(Observations)	291,461	286,859	79,087	78,407

Note: I list the results from 12 asymmetric fixed effects models using two different samples, all and respondents with individual investment income, and two different dependent variables, GHQ-12 and SF-12 MCS. I control for sex, age, education, marital status, job status, resident in urban or rural area, country of residence, total individual income, total household income, individual investment income, household investment income, GDP, inflation, and year, month and week dummies. Coefficients are reported. Standard errors are in parentheses. Coefficients and standard errors for level of stock market index are multiplied by 1,000. * if $p < 0.10$, ** if $p < 0.05$, *** if $p < 0.01$