An Economic Security Index (ESI) for New Zealand: A Descriptive Analysis

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This paper presents an Economic Security Index (ESI) for New Zealand for the period 1999-2021. An ESI is a measure of economic wellbeing that identifies which subgroups of the New Zealand population are susceptible to financial loss due to events like an unanticipated rise in medical expenditures or a decline in income. The ESI also measures if these subgroups have sufficient financial resources to act as a buffer when economic shocks occur. The main index is constructed using micro-level data from New Zealand's Household Labour Force Survey and Household Economic Survey. An alternative index is constructed using longitudinal data from the Survey of Family, Income and Employment to test the robustness of the main index's findings. After controlling for various demographic and socioeconomic factors, the main findings of the ESI suggest that economic insecurity is highly cyclical, tracking closely to GDP growth and the unemployment rate. Recent data show that insecurity worsened during the first year of the Covid-19 pandemic but has since recovered. These results suggest that insecurity in New Zealand is largely an involuntary phenomenon. It is also observed that insecurity varies markedly by subgroups of the population, showing that some groups are disproportionately vulnerable to economic risk.

Keywords: income; economic insecurity; recession; pandemic; volatility; shocks; wellbeing

Disclaimer

Access to the data used in this study was provided by Stats NZ under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the author, not Stats NZ or individual data suppliers.

These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Stats NZ. For more information about the IDI, please visit https://www.stats.govt.nz/integrated-data/.

1. Introduction

Economic insecurity has become increasingly important as a measure of economic wellbeing. Although no commonly accepted definition of economic insecurity exists in the literature, the term is strongly related to the concepts of risk perception and loss aversion (Hacker et al., 2014). Economic insecurity is also grounded in the belief that uncertainty about future economic prospects tends to leave people worse off. This comes from the fear and anxiety that households or individuals may be incapable of overcoming hardship-forming economic losses in the future (Bossert & D'Ambrosio, 2013; Cantó et al., 2021a, 2021b; D'Ambrosio & Rohde, 2014; Hacker et al., 2010; Hacker et al., 2014; Osberg & Sharpe, 2002, 2005; Rohde & Tang, 2018; Rohde et al., 2020; Rohde et al., 2015; Romaguera-de-la-Cruz, 2019). Insecurity measures focus on how exposed different groups in society are to economic or social risk, which differentiates it from inequality measures which focus on the distribution of income or wealth and highlight the disparity between different groups of people.

A main feature that makes insecurity an important measure to include in New Zealand's wellbeing debate is that unlike inequality (and poverty) indicators, which primarily focus on static levels of income measured at a single point in time, insecurity accounts for the variation in income levels over time, making it a dynamic measure. The fallout of the Global Financial Crisis (GFC), the ongoing COVID-19 pandemic, as well as economic shocks caused by events such as natural disasters, have ignited interest in insecurity in recent years as academics, policymakers and other researchers aim to estimate how 'at-risk' different subgroups of the population are to ever-changing economic and social circumstances. Insecurity also has implications for a broad spectrum of the population. It affects all socioeconomic groups, not only those living beneath the low-income threshold, but also high- and middle-income groups (Hacker, 2019; Ranci et al., 2017).[1] As a result, most governments of the developed world have become focused on the degree to which individuals who experience income losses are protected from economic hardship. This is because groups that are vulnerable to economic insecurity could potentially experience a range of social ills. These social ills could include poor

[1] The established low-income threshold in New Zealand is 60 percent of the median household disposable income, after housing costs (Statistics New Zealand, 2016).

physical health outcomes and poor self-rated health (Cheng et al., 2005; Muenster et al., 2011; Offer et al., 2010; Smith et al., 2016; Smith et al., 2007; Wisman & Capehart, 2010), low subjective well-being (Luechinger et al., 2010), poor mental health outcomes (including psychological distress and non-specific psychological illnesses) (Benach et al., 2014; Hellgren et al., 1999; Menéndez-Espina et al., 2019; Rohde et al., 2016; Watson & Osberg, 2017), bad housing (Deloitte & Victoria University of Wellington, 2017) and food insecurity (Alaimo, 2005; Carter et al., 2011; Parnell et al., 2001; Rose, 1999; Stuff et al., 2004). Moreover, evidence suggests that insecure individuals tend to become myopic and are less likely to plan for the future if they are uncertain about it (Hacker, 2019). Therefore, knowing the subgroups of the population that are especially susceptible to income losses from economic shocks can help guide policymakers in their initiatives to assist households that are more likely to experience economic insecurity.

The multifaceted nature of insecurity makes its measurement a complicated task that usually consists of combining many different important elements. For this reason, there is no agreed-upon measure of insecurity in the literature. Several ways of measuring insecurity exist (Hacker et al., 2014; Lusardi et al., 2011; Osberg & Sharpe, 2005; Romaguera-de-la-Cruz, 2019), and each method captures different elements and, in some cases, they build on each other. In this study, we construct an Economic Security Index (ESI) for New Zealand modelled after the ESI for the United States, which was conceptualized and constructed by Jacob S. Hacker (Yale University), Gregory A. Huber (Yale University), Austin Nichols (The Urban Institute), Phillip Rehm (Ohio State University), Mark Schlesinger (Yale University), Rob Valletta (San Francisco Federal Reserve Bank) and Stuart Craig (Yale University). It was published in a 2014 paper in *The Review of Income and Wealth* titled, "The Economic Security Index: A New Measure for Research and Policy Analysis" (Hacker et al., 2014). An ESI is a measure of economic insecurity that identifies which subgroups of a population are most susceptible to financial loss due to unexpected income shocks, such as a fall in income or unforeseen household or medical expenses. An ESI also measures whether these groups have sufficient financial resources to act as a buffer in the event of economic shocks. Such an index has not yet been constructed for New Zealand so this is a novel addition to the empirical literature.

The New Zealand ESI uses micro-level data on individuals and households spanning from 1999 to 2021 and is intended to show how household economic wellbeing

has changed over time.[2] Measurement at the individual or household level can help determine the distributional characteristics of insecurity which could have important policy implications. The technique used in this study also extends the current methodology used in Hacker et al. (2014) to match New Zealand's unique datasets and economic environment. The ESI is also used to examine the marginal effect of being insecure based on different demographic characteristics to determine the possible drivers of income losses.

After controlling for various demographic and socioeconomic factors, the main findings from the index show that economic insecurity in New Zealand closely followed the business cycle over the past two decades, all else held constant. New Zealand's main urban centres, Auckland and Wellington, are found to be the most economically secure regions over the period of study, whilst Manawatu-Wanganui is the most insecure region. Population subgroups are also found to have variations in insecurity levels. The results suggest that ethnic minorities, young adults, people with no educational qualifications, single-adult households, persons whose relationships ended over the ESI year, and persons on temporary employment contracts are more likely to experience insecurity. There also exists an inverted U-shaped relationship between economic insecurity and household income. Policy interventions are recommended to assist the groups that are most susceptible to income shocks.

The rest of this paper proceeds as follows. Section 2 gives a review of the pertinent literature. Section 3 looks at the design and construction of the ESI with special considerations for the New Zealand economy. Section 4 discusses the data used for this study. Section 5 presents the descriptive findings of the index and discussion. Section 6 concludes with a summary of the findings and implications.

[2] The ESI for New Zealand constructed in this study spans from 1999 to 2021. However, data could not be matched over the years 2015 to 2016 due to a change in data collection techniques by Statistics New Zealand in 2016, so there are no insecurity estimates for 2016. This is discussed in more detail in Section 4.

2. Literature Review

Common wellbeing indicators, such as inequality and poverty, have been the primary focus of wellbeing studies so far. Only recently, following the seminal work of Osberg (1998), has the literature expanded to include economic insecurity as a new measure of wellbeing. Since then, this burgeoning field of study has been increasing in importance amongst researchers. Probably the most prominent theme in the literature is insecurity's discernible link to the business cycle, which tends to be consequential to all aspects of life, including labour market activities, investment and consumption decisions, fertility decisions, education and housing. Most studies find a negative relationship between insecurity and the business cycle whereby the probability of experiencing large falls in income decreases during economic booms, and increases during economic downturns (Cantó et al., 2019; Clyne & Smith, 2021; Espinosa et al., 2014; Hacker et al., 2014; Ranci et al., 2017; Rohde et al., 2015; Romaguera-de-la-Cruz, 2019). A main feature of economic downturns is unemployment which is commonly cited as a major driver of economic insecurity, whether that unemployment is voluntary (for example, planned withdrawal from the workforce to care for children or a sick relative) or involuntary (for example, job loss due to recessions) (Cantó et al., 2019; Hacker et al., 2014; Rohde et al., 2015). Moreover, perceived job security affects subjective feelings of insecurity, whether those feelings are rational or not (Cantó et al., 2019; Espinosa et al., 2014; Rohde et al., 2017; Rohde et al., 2015; Rohde et al., 2016; Romaguera-de-la-Cruz, 2019).

Insecurity is dynamic in nature in that it incorporates present as well as future wellbeing in determining quality of life. The forward-looking nature of insecurity presents a psychosocial element to insecurity as future expectations significantly affect individual/household decision-making behaviour. Uncertainty about the future can strongly dictate current consumption and investment decisions, which could have an impact on future generations. Some studies have shown that individuals with a pessimistic view about their financial future, based on their current situation and all available information, may forego investment in housing or their children's education (Diaz-Serrano, 2005; Romaguera-de-la-Cruz, 2019; Stiglitz et al., 2009). Moreover, insecure individuals are found to be more likely to delay fertility (Fiori et al., 2013; Mansour, 2018; Modena et al., 2014), reduce household consumption spending (Benito, 2006; Bowman, 2013; Romaguera-de-la-Cruz, 2019), alter labour market decisions

(Ashford et al., 1989; Cantó et al., 2019; Espinosa et al., 2014; Rohde et al., 2017; Rohde et al., 2015; Rohde et al., 2016; Romaguera-de-la-Cruz, 2019) and even change their political affiliation (Lepinteur et al., 2018). Studies have also found that in order to buffer future uncertainty, forward-looking households will boost precautionary savings in the present (Benito, 2006; Klemm, 2010). The main takeaway from these studies is that where there are constraints on households' ability to smooth their consumption over time because of economic insecurity, there is likely to be diminished lifetime utility due to under-consumption in some periods and over-consumption in others (Rohde et al., 2014).

Not only has insecurity been linked to changes in individual decision-making behaviour, it is also related to negative socioeconomic and health outcomes. Economic insecurity has been linked to adverse health outcomes, including mental health (psychological distress and non-specific psychological illnesses) (Benach et al., 2014; Carter et al., 2011; Catalano, 1991; Clyne, 2021; Kopasker et al., 2018; Mandal et al., 2011; Menéndez-Espina et al., 2019; Mucci et al., 2016; Rohde et al., 2016; Watson & Osberg, 2017), suicide (Blakely et al., 2003b; Catalano, 1991; Houle & Light, 2014; Howden-Chapman et al., 2005; Mucci et al., 2016; Nandi et al., 2012), heart disease (Catalano, 1991; Mucci et al., 2016) and obesity (Muenster et al., 2011; Rohde et al., 2017; Smith et al., 2016, 2017; Wisman & Capehart, 2010). Some researchers have also found insecurity to be related to low subjective wellbeing and self-rated health (Clyne, 2021; De Witte, 1999; László et al., 2010; Luechinger et al., 2010).

Such evidence suggests that insecurity has implications for broad areas of society. Given its social and economic importance, there has been significant progress made in recent years in developing techniques to measure insecurity. The existing research is grounded in uncertainty about the future; but although this common ground exists, the measurement of insecurity varies widely as does the inclusion/exclusion and relative importance of various economic risks. Moreover, unlike inequality indices that are based on a static perspective, insecurity is based on the anticipation of future economic distress making its measurement quite challenging. As a result, there is no general consensus on the measurement of insecurity and the measures tend to differ on several dimensions.

Some researchers present subjective measures that are drawn from individuals' perceptions about their economic futures (Anderson, 2001; Espinosa et al., 2014; Mandal et al., 2011). Such measures capture the undeniable psychological component of

insecurity. Opponents have found these methods unreliable especially considering that people in similar situations could possess inherent characteristics (for example, personality traits, culture and ambition) that make their perception of wellbeing vary widely (Krueger & Schkade, 2008). To overcome this limitation in subjective measures, some researchers advocate the use of objective measures, though they acknowledge the importance of the psychological element in analysing insecurity (D'Ambrosio & Rohde, 2014; Hacker et al., 2010; Hacker et al., 2014; Osberg, 1998; Osberg & Sharpe, 2002, 2005, 2009). Both objective and subjective measures undoubtedly have clear benefits when used separately, since it is possible that an individual could perceive themselves as insecure but could be found to not be objectively insecure. Such comparisons on a population scale can produce useful information that can help researchers generalise if there are patterns in perceptions across demographic groups about themselves and their societies. There is a third group that constructs insecurity measures by combining both subjective and objective elements of insecurity (Cantó et al., 2019; Rohde et al., 2017; Rohde et al., 2015; Rohde et al., 2016; Romaguera-de-la-Cruz, 2019). These authors argue that this multidimensional approach presents a more comprehensive measure of insecurity. An example of this method is called the 'counting approach' and is drawn from the poverty literature. The traditional approach creates a multidimensional poverty measure by using a technique of counting the number of dimensions in which people suffer deprivation (Alkire & Foster, 2011; Alkire et al., 2015; Atkinson, 2003). The counting approach was adapted to the insecurity literature that applies a similar procedure which aggregates multiple insecurity dimensions into a single indicator (Bucks, 2011; Cantó et al., 2019; Rohde et al., 2015; Romaguera-de-la-Cruz, 2019). Commonly used objective indicators could include income drops and unemployment, while subjective indicators could include discontent about one's financial circumstances and changes in the ability to take a vacation (Cantó et al., 2019; Rohde et al., 2015). A downside to this measure is that it only captures whether an individual is insecure or not insecure in each dimension but does not capture the magnitude of insecurity.

Insecurity indexes can also be categorised into either aggregate or individual measures. Aggregate measures are most popular in the literature. These present indices for the population as a single unit (usually by region or country) based on macroeconomic indicators such as unemployment and relative poverty rates (Berloffa & Modena, 2014; Osberg, 1998; Osberg & Sharpe, 2002, 2005, 2014; Sharpe & Osberg, 2009). Osberg

(1998), who was the pioneer in insecurity measurement, as well as follow-up work with other researchers (for example, Osberg & Sharpe, 2002, 2005, 2014), developed aggregate measures of insecurity using a 'named-risk' approach.[3] A criticism of aggregate measures is that they do not capture mean-preserving variations in insecurity across the population (Rohde et al., 2015; Romaguera-de-la-Cruz, 2019). For instance, there could be large variations in the risk of job loss amongst different demographic groups even if, say, the unemployment rate is constant. Hence, some more recent papers advocate measures using micro-level data which have the advantage of showing the prevalence of insecurity amongst different demographic groups, the distribution of insecurity and how it varies over time (D'Ambrosio & Rohde, 2014; Nichols & Rehm, 2014; Osberg, 2015; Rohde et al., 2015; Romaguera-de-la-Cruz, 2019). Moreover, micro-level indicators could easily be aggregated into a population-level indicator as is done in works such as Bossert and D'Ambrosio (2013, 2016), D'Ambrosio and Rohde (2014), Hacker et al. (2014) and Osberg (2015).

Another feature that distinguishes insecurity measures is whether they assume a prospective (forward-looking) or retrospective (backward-looking) approach. Unlike other measures of wellbeing, insecurity indexes explore not only current wellbeing, but also future uncertainty which needs to be captured in the indicator. This is quite difficult to do, and as a result, the majority of the literature presents retrospective measures which estimate anxiety about the future based on past experiences (Hacker et al., 2014). There is an emerging strand of the literature that explores a prospective approach that tries to predict what future conditions could explain current states of insecurity (Osberg, 2015; Rohde et al., 2015, 2016, 2017).

2.1. The Conceptualisation of the ESI

The debate about the measurement of insecurity is ongoing in the literature, but authors all have sound justifications for the methods chosen in their respective studies. The ESI constructed in this study follows the methodology used in Hacker et al. (2014) and is based on the combination of three key approaches found in the literature. This

[3] This is discussed in Section 2.1.

section of the literature review gives a brief overview of these approaches and will explain how they contribute to the ESI.

One approach uses multiple factors to construct a weighted index of economic insecurity. This is the foundation of the works of Osberg (1998) and Osberg and Sharpe (2002, 2005, 2009) who developed an index of economic wellbeing using a *'named-risk'* approach. In this and similar approaches, the index constructed measures the percentage change over time in economic risks associated with events such as widowhood, unemployment, illness and old age. They model the risk of economic loss associated with each event as a conditional probability and then weight the prevalence of economic risks by the proportion of the population affected. A major shortcoming of this measure is that the inclusion and weighting of each component is highly subjective (since theory provides limited guidance on this) and is likely biased by the personal values of each researcher (Hacker et al., 2014). Moreover, a named-risk approach does not account for possible differences in economic risks across different demographic groups and over time.

The second approach explores the buffering capacity of households as it measures whether or not each household has the capacity to cover any losses associated with economic shocks (Bossert & D'Ambrosio, 2013; Lusardi et al., 2011). It is a simple measure that presents the level of economic resources needed to have financial security. Although such asset sufficiency measures are quite important in establishing economic security, it is only part of the whole picture since they do not model the probability that an individual or household will experience an income shock and need to draw from precautionary savings or other forms of wealth to replace the lost income.

The third approach measures income or expenditure volatility, a main component of insecurity and financial risk. This growing body of literature explores the probability of large swings in income or expenditure from one year to the next (Carter et al., 2014; Deloitte & Victoria University of Wellington, 2017; Gorbachev, 2011; Gottschalk & Moffitt, 2009; Hacker & Jacobs, 2008; Moore, 2017; Nichols & Zimmerman, 2008). Though this is a fundamental part of measuring insecurity, these measures do not account for the risk of large, unforeseen expenses (for example, medical costs or funeral expenses), and also do not account for the buffering capacity of individuals or households.

The ESI constructed by Hacker et al. (2014) for the United States combines elements of all the previous approaches into a comprehensive measure. The ESI captures

the proportion of individuals who experience large unbuffered loss and the extent to which they are protected against those losses. The researchers focus on the three main factors associated with economic insecurity in the United States. Firstly, they explore the *probability of income loss,* which is the focus of the income or expenditure volatility measure and the weighted index of multiple measures mentioned previously. In this regard, they look at the proportion of individuals who are susceptible to a year-on-year decline in their annual disposable household income of 25 percent or greater. This 25 percent threshold is considered appropriate since the authors find considerable evidence to suggest that the median American household would experience some form of economic hardship if their household income declined by that amount. Secondly, they include *medical spending shocks* in their calculation. Medical out-of-pocket (MOOP) expenses, which include doctor/hospital fees and insurance payments, are a significant risk to American households and are considered to be beyond the control of individuals. MOOP spending is shown to reduce disposable income for Americans and is therefore considered a major threat to economic security. Thirdly, they incorporate the *buffering effects of financial wealth* (the focus of resource adequacy or asset sufficiency measures) to explore how resilient individuals are when faced with large economic losses. This component measures households' capacity to replace their lost income until it returns to its original level following a negative financial shock. Their insecurity estimates for the United States are used to explore the variability of economic insecurity by year, state and across different demographic groups.[4] The design of the ESI by Hacker et al. (2014) is outlined in Appendix A and forms the basis of this study.

2.2. Economic Insecurity in New Zealand

The majority of the existing studies on insecurity focus on the United States (for example, Bucks, 2011; D'Ambrosio & Rohde, 2014; Gottschalk & Moffitt, 2009; Hacker, 2019; Hacker et al., 2010; Hacker et al., 2014; Hacker & Jacobs, 2008; Nichols & Rehm, 2014). The main findings of these studies suggest that insecurity in the US has increased over the past two to three decades and that insecurity is strongly correlated with the business cycle. These studies have prompted interest in exploring the dynamics of

[4] For current information on the ESI for the United States, see http://www.economicsecurityindex.org/.

insecurity in other developed countries (for example, Cantó et al., 2019; Diaz-Serrano, 2005; Romaguera-de-la-Cruz, 2019). Of these, there is a handful of papers that focus on Oceania, namely works by Sharpe and Osberg (2009), Osberg and Sharpe (2011) and Rohde et al. (2015) on Australia. Sharpe and Osberg (2009) and Osberg and Sharpe (2011) aggregate insecurity measures for a group of OECD countries, including Australia, based on indicators such as poverty rates and unemployment rates. Rohde et al. (2015) used micro-level data to estimate insecurity in Australia from 2001 to 2011. They used a range of different approaches and find that when aggregated, their insecurity estimates correlate with the trends in unemployment and GDP growth rate. They also find that insecurity varies across different demographic groups and that high levels of insecurity persist for most individuals over time.

Economic insecurity has not yet been explicitly examined in the context of New Zealand. Although there has been extensive work done examining the economic wellbeing of New Zealanders, these focus primarily on inequality or poverty (for example, Ballantyne et al., 2004; Barnett et al., 2004; Blakely et al., 2003a; Boston, 2014; Boston & Chapple, 2014; Carter et al., 2013; Creedy et al., 2019; Creedy et al., 2018; Gunasekara et al., 2012; Podder & Chatterjee, 2002; Rashbrooke et al., 2017; Rashbrooke, 2013; Stillman et al., 2012). There are a few studies that attempt to capture economic uncertainty by focusing on income volatility or income mobility. These terms have largely been used interchangeably in New Zealand population studies and seek to capture relative or absolute changes in personal incomes over time (Moore, 2017). Some studies capture both upward and downward movements, while others tend to focus on downward movements in income. Tracking temporal changes in New Zealanders' incomes over time has garnered much attention from academics and policymakers in recent years and is considered key in understanding the wellbeing of different groups in the population. The main technique used in New Zealand studies to measure income changes over time focuses on movements up and down the rungs of the income ladder to capture income volatility or mobility (Carter & Gunasekara, 2012; Carter et al., 2014; Crawford, 2009; Deloitte & Victoria University of Wellington, 2017; Moore, 2017). These rungs are typically expressed by income quintiles or income deciles.

Crawford (2009) used data from the Linked Income Supplement (LIS) of the Household Labour Force Survey (HLFS) to explore changes in hourly wages of working age New Zealanders from 1997 to 2004 that can be attributed to human capital (proxied

by educational achievement) and demographic differences. The paper focused on both upward and downward movements and found that human capital affects growth in earnings. Particularly, higher levels of education are associated with growth in earnings and thus movement up the income ladder.

Carter and Gunasekara (2012) examined income mobility in New Zealand using data from the first seven waves of the Survey of Family, Income and Employment (SoFIE) to estimate the probability of changing income quintile from one year to the next. They report high levels of both upward and downward income mobility from year to year over the seven-year period. They found that about 50 percent of individuals in the middle-income quintiles experience year-on-year income mobility, while the highest and lowest income quintiles are the most stable groups. They reported a 72 percent probability of an individual remaining in the highest quintile and a 65 percent probability of an individual remaining in the lowest quintile.

Carter et al. (2014) also used longitudinal data from SoFIE to examine income mobility in New Zealand over the eight SoFIE waves, from 2002 to 2010. Their paper examined the absolute and relative income mobility in disposable income in New Zealand. They presented a descriptive analysis of income mobility at two different time horizons, the short and long terms. The short-term analysis examined annual changes in income while the long-term interval focused on the change over eight years. Their study measures the extent of income mobility by examining the proportion of the population that move up and down the income ladder, with income deciles as rungs. Their results show that over 60 percent of the New Zealand population changed income decile groups in the short term over the period of study, with only about 20 percent maintaining the same income decile over the 8 years of study, i.e., long-term mobility. The trends were similar in both increasing and decreasing income groups. The research did not address the reasons for the income changes.

Moore (2017) measured the degree of volatility of New Zealanders' incomes using data from Statistics New Zealand's linked employer–employee data (LEED). The study estimated the share of the working-age population that fell two or more deciles between 2000 and 2014. Using the midpoint of each income decile, a two-decile drop is estimated to be about 40 percent of an individual's income. This method limits the sample size. This is because a two-decile income drop cannot be measured for deciles 1 and 2, since these groups are the lowest two deciles. This excludes these two important groups for which a

relatively small income drop in income could represent a significant shock. The author found that about one in nine working-age New Zealanders (about 11 percent) are susceptible to a two-decile decline in income in any given year and that income volatility is cyclical. Unsurprisingly, income volatility peaked at about 12.5 percent of the population in 2009 which is most likely capturing the effects of the Global Financial Crisis. Moore also used 2010 wealth data from Rashbrooke et al. (2017) to analyze the buffering capacity of households. The author found that most individuals do not have sufficient wealth to buffer income drops as defined by the study. There are limitations to this finding since the wealth data are reported at the household level, while the income volatility estimates are for individuals. This makes it difficult to ascertain whether a fall in an individual's income could be buffered by others in their household unit.

The results of Moore's study contributed to the State of the State report 2017 published by Deloitte & Victoria University of Wellington, for which Moore was one of the principal authors. The report examined the resilience of New Zealanders in the face of uncertainty and explored how sustainable improvements in wellbeing can be achieved using a social investment approach. Since the report was based on Moore's 2017 work, the results reported were the same. Their report suggested that New Zealanders from all socioeconomic backgrounds are susceptible to economic problems, unforeseen health problems or other adverse changes in their lives. However, not all households have the resources available to buffer unforeseen shocks, especially low- and middle-income households. They also found that the ability to withstand a household shock depends on the nature of the shock, with New Zealand's vulnerabilities being either economic, social or environmental. Their report pinpointed that some of the main threats to the overall wellbeing of New Zealanders include lack of economic diversification, a low savings rate, high external debt and a vulnerable natural environment. These vulnerabilities highlight the importance of having a reliable measure of economic insecurity which is one of the main policy recommendations of the report. Specifically, the authors call for the government to "engage with New Zealanders to build a wellbeing and resilience index" (Deloitte & Victoria University of Wellington, 2017, p. 35). The index constructed in this study is a vital contribution toward this recommendation.

3. Design and Construction of an ESI for New Zealand

The construction of an ESI for New Zealand follows the design developed by Hacker et al. (2014) as closely as the data permit. We also adopt the definition of the economic security index as put forth in their paper. The authors define the ESI as "an annual index that represents the share of individuals who experience at least a 25 percent decline in their inflation-adjusted 'available household income' from one year to the next (except when entering retirement) and who lack an adequate financial safety net to replace this lost income until it returns to its original level" (Hacker et al., 2014, p. S8). The 25 percent threshold does not change based on individual or household characteristics, such as income level, region or ethnic makeup. The ESI for New Zealand is constructed using the following formula:

For each household, *i (=1,2,…., n*), in time, *t*,

$$ESI_t = \frac{\sum_{i=1}^{n_t} L_{it}}{n_t} \tag{3.1}$$

L is defined as:

$$L_{it} = \begin{cases} 1 \;\; if \;\; \left(\frac{y_{it} - M_{it} - D_{it} - H_{it}}{e_{it}} < \left(\frac{3}{4}\right)\frac{y_{it-1} - M_{it-1} - D_{it-1} - H_{it-1}}{e_{it-1}}\right) \cap (W_{it} < W_{it}^{*}) \cap (1 - R_{it}) \\ 0 \;\; otherwise \end{cases} \tag{3.2}$$

where ESI_t is the proportion of the population experiencing large losses, L_i is the household-level insecurity status (whether the household experienced a loss or not), y_i is total real household income, M_i is annual household out-of-pocket medical spending (MOOP), D_i is annual household debt service burden and H_i is annual household housing costs. e_i = [(1*first adult$_i$) + (0.5*additional adults$_i$) + (0.3*children$_i$)] and represents the OECD-modified family size equivalence scale, which gives less weight to children and

each subsequent adult after the head of the household.[5] $(W_{it} < W_{it}^*)$ and $(1 - R_{it})$ are dichotomous indicators. $(W_{it} < W_{it}^*)$ is an indicator for "*lacking* sufficient financial wealth" and $(1 - R_{it})$ is an indicator for "*not* transitioning into retirement". The intersection symbol, ∩, signifies that all conditions in Equation (3.2) need to be satisfied for $L_{it} = 1$.

The ESI for New Zealand is constructed in a fundamentally similar way to Hacker et al. (2014) with a couple of alterations to suit New Zealand's unique socioeconomic landscape. Firstly, housing costs, an important component of household expenditures in New Zealand, are added to the economic insecurity formula. Secondly, the National Academy of Sciences (NAS)-recommended equivalence scale is replaced by the OECD-modified equivalence scale as the preferred household income equivalization technique. The rationale for these changes as well as detailed descriptions of all the ESI components are presented in Appendix D of the data supplement for this paper.

New Zealand's ESI, like the ESI for the US, reports insecurity estimates retrospectively, meaning that the estimates for each household in a particular year are based on data from the previous year leading up to the report date. This is referred to as the ESI year in this study. For example, the 2006 insecurity estimate for 'Household *i*' is based on income data reported in the June quarters of 2005 and 2006.

3.1. What do Equations (3.1) and (3.2) show?

ESI_t represents the risk of large income losses in the New Zealand population or in a subgroup of the population. This rate is based on household losses (mean *L* in Equation (3.1)). Any increases in *mean L* from one year to the next is considered an increase in economic insecurity for that population group and could be a sign of financial instability in an economy. At the micro level, a value of $L_{it}=1$ indicates that a household, *i*, in time, *t*, is insecure, while $L_{it}=0$ indicates that the household is secure.

As is shown in Equation (3.2), a household is considered insecure if all three conditions in the formula hold. Firstly, there needs to be a 25 percent decline in the

[5] This study uses the same classification for children and adults as used by Statistics New Zealand. A respondent is classed as a child if they are aged 0 to 14. Respondents aged 15 and above are classed as adults.

household's equivalized disposable income, either due to a fall in income or an increase in debt servicing obligations, MOOP expenses or housing costs. Although economic insecurity is commonly associated with income loss (for example, from sudden job loss), an increase in non-discretionary spending can also constitute significant shocks. For New Zealand, this could also include an increase in MOOP expenses, especially for persons using the private healthcare system. Any one or combination of these shocks could significantly reduce the availability of household disposable income. It is important to note here that the extent to which these income shocks may trigger hardship depends on public transfers, such as welfare payments or unemployment benefits, as well as private transfers, such as gifts from family members or friends. To account for this, the measure of household income used in this study is quite broad and incorporates income from as many sources as are available in the data.

Secondly, the household needs to *lack* sufficient liquid financial wealth to replace a 25 percent or greater loss in annual household income. In the context of this study, this is represented by households having less than 25 percent of their current household income in the form of liquid financial wealth. This liquid financial wealth should be easily accessible in the event of an income shock to be considered an adequate buffer. For example, a household that must sell an illiquid asset, like its home or farm, when it experiences hardship would be considered insecure. This makes the buffering capacity of a household reliant on their level of precautionary savings in the form of liquid assets, which should be a sufficient financial safety net even if the household experiences very large, unanticipated drops in their income.

Thirdly, the head of the household or the spouse of the head should *not* have transitioned to retirement in the ESI year. This is because retirement is associated with a decline in incomes due to the transition away from the labour force. Discretionary spending could decline as there would be less disposable income available, but it could also increase based on the level of precautionary savings accrued over an individual's life. Non-discretionary spending is likely to decline since things like income tax payments typically fall substantially as the individual transitions away from the labour force. Moreover, the ability to survive 'comfortably' during retirement years, i.e., with an adequate safety net to account for the expected fall in income, depends on the financial decisions made by retirees throughout the course of their lives. Such an analysis is beyond the scope of this project. Hence, households entering retirement are excluded

from the ESI calculations in the year the retirement event occurs but will reappear in the following years and be analyzed based on their retirement income.

4. Data

4.1. The Household Labour Force Survey

The datasets used in the construction of the ESI for New Zealand were provided by Statistics New Zealand through their Integrated Data Infrastructure (IDI).[6] The main dataset of interest in the construction of the ESI is the Household Labour Force Survey (HLFS), which includes the New Zealand Income Survey (NZIS) (the income supplement). The temporal coverage for both HLFS and NZIS data used for this study is 1998 to 2021. The HLFS is the official source for New Zealand's employment and unemployment statistics, providing estimates of the number of people employed, unemployed and not in the workforce. Demographic information, such as gender, household type, qualifications and ethnicity, are also collected about each individual taking part in the survey. The HLFS interviews respondents over eight consecutive quarters. Because of this eight-quarter rotating panel design, individuals residing in the same household unit can be matched over two years. The questions in the HLFS are designed to ask respondents about their activities during the particular reference week. The survey comprises of approximately 15,000 private households and about 30,000 individuals across the North Island, South Island and Waiheke Island. Other New Zealand Islands, such as Stewart and Chatham Islands are excluded.[7] The NZIS, which is a yearly supplement to the HLFS that collects income data from the same individuals and households in the HLFS, is run in the June quarter (April to June) of each year. This means that there are two successive data points from one year to the next representing income data of each respondent in each panel. These are used to calculate the annual change in income in the construction of the ESI.

[6] The information in Section 4 is from unpublished user guides and data dictionaries for the various datasets available within the Integrated Data Infrastructure environment, unless other sources are explicitly cited

[7] The populations of Stewart and Chatham Islands are ~450 and ~600, respectively (Statistics New Zealand, 2018a).

The HLFS has been surveying the New Zealand labour force since October 1985, while the NZIS was first run in the June quarter of 1997.

It is important to note that the HLFS was redeveloped in 2016, which included changes to some existing variables and the inclusion of new variables. This was the first major change to the survey since its introduction in 1985. The main aim was to improve the quality and relevance of New Zealand's labour market statistics. The NZIS was also discontinued in June 2016. Since then, some of its content has been integrated into the HLFS. The redeveloped HLFS was introduced into the field in April 2016 to collect data for the June 2016 quarter. New households were surveyed and, as a result, there are no repeat households from 2015 to 2016. This made it impossible to calculate the probability of income loss and ESI figures for 2016. Other than this gap in the data, the change had no other effect on this analysis.[8]

4.2. The Household Economic Survey (HES)

Since the HLFS does not contain all the data necessary to construct an ESI, it is supplemented by New Zealand's Household Economic Survey (HES). The HES provides information on household income and expenditure, along with demographic information on respondents. It collects information both at a household level and for each household member, but expenditure data are only reported at the household level. The survey consists of about 5,000 private households and is run on a three-yearly basis since March 1998 in its full form. Since 2007, Statistics NZ has been running a mini version of the HES - called HES (Income) - in the years between the full HES in which respondents are given the income questionnaire, the household demographic questionnaire, and a reduced household expenditure questionnaire.

HES data are not available prior to 2006 for this study. The HES coverage is from 2006/2007 to 2015/2016. There is also a net worth supplement to the HES available for the 2014/2015 and 2017/2018 HES years. This supplement was used to estimate

[8] Although the HLFS is not a pure longitudinal dataset, it does contain repeated cross-sectional data over eight consecutive quarters that could suffer from attrition. A discussion of attrition in NZIS is presented in Appendix D of the data supplement for this paper.

household savings patterns. Like the HLFS, the HES uses statistically representative samples from rural and urban areas across New Zealand.

4.3. Additional Data Sources

In addition to the IDI data from Statistics New Zealand, supplemental data, such as the Consumer Price Index (CPI), are sourced from the Reserve Bank of New Zealand (2022b), and other data from Statistics New Zealand (*but outside the IDI*), such as fertility rates, are also used.[9] Table 4.1 provides a summary of the data source(s) for each ESI component.

Table 4.1: Summary of Data Sources for each ESI Component

ESI Component	Data Source
Real household income	NZIS, RBNZ & Statistics New Zealand
Annual debt service burden	HES
Medical out-of-pocket expenses (MOOP)	HES
Housing costs	HES
Household savings	HES (Net Worth Supplement)
Demographic information (ethnicity, age, region, etc.)	HLFS, NZIS & HES

[9] These data are discussed in Appendix D of the data supplement for this paper, as well as more detailed descriptions of the computation of the variables used to construct the ESI.

5. Findings of the ESI and Discussion

This section presents a descriptive analysis of economic insecurity in New Zealand. In Section 5.1, we explore the raw insecurity estimates. In Section 5.2, we look at the average marginal effects of being insecure, using statistical tests for time trends and differences between groups.

5.1. Raw Insecurity Estimates

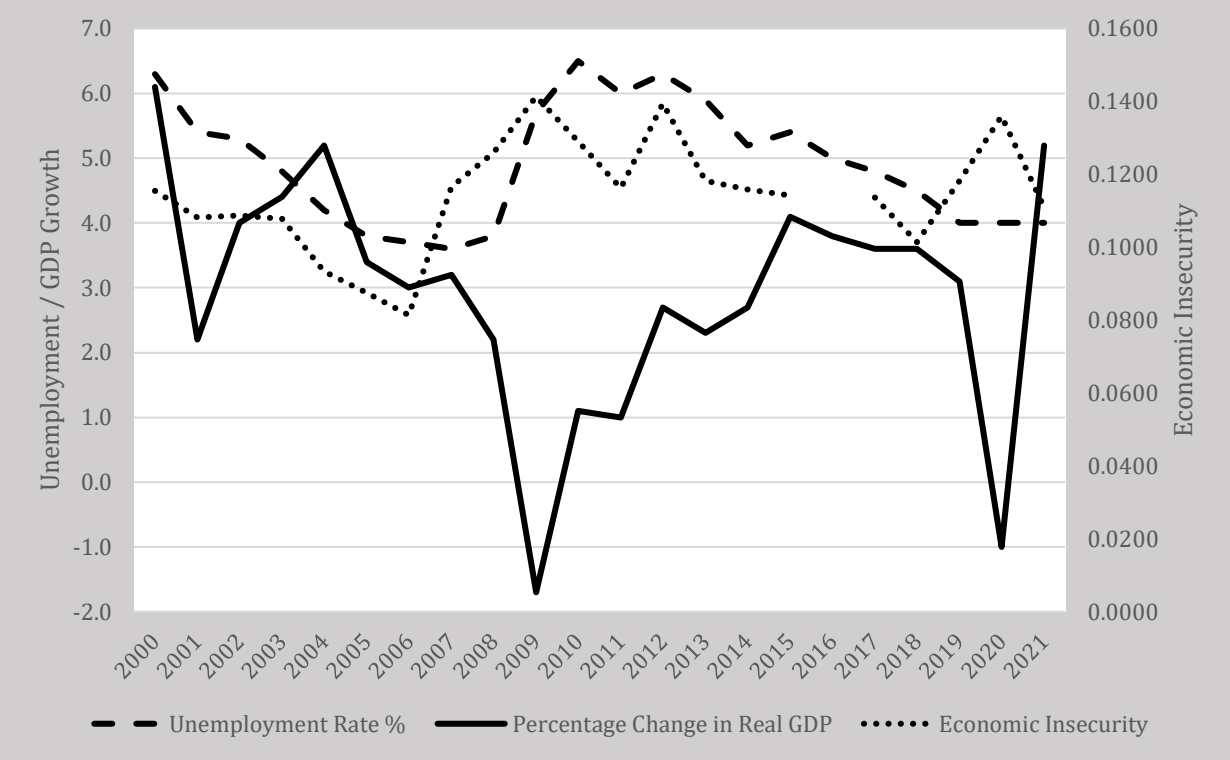
Table B1 in Appendix B presents the raw insecurity estimates (unconditional means) for the period 1999 to 2021. The estimates represent the probability of income loss for the entire New Zealand population and by subgroups of the population as estimated using Equations (3.1) and (3.2).

The raw estimates show that economic insecurity was on a downward trajectory in the early 2000s, but rose during the GFC and has remained at a somewhat elevated level since. Insecurity also appears to follow the business cycle, tracking closely with the unemployment and GDP growth rates. Insecurity peaked in 2009, where 14.14 percent of the population was insecure, which is likely picking up the effects of the GFC. Other spikes in insecurity were recorded in 2012, which is likely capturing the effects of the Canterbury earthquakes and a severe drought in 2012, and in 2020, where insecurity almost reached GFC levels and is likely linked to the effects of the Covid-19 pandemic.[10] The temporal changes in insecurity and its relationship with unemployment and GDP growth is depicted in Figure 5.1.[11]

[10] More on these economic shocks in Section 5.3.1.

[11] Real GDP growth rate and unemployment rate are sourced from Reserve Bank of New Zealand (2022c) and Reserve Bank of New Zealand (2022a), respectively. Unemployment is defined as the proportion of people who are without paid work, where a person is available for and actively searching for employment. GDP growth rate is given by the year-over-year annual percentage change in production-based real GDP. These figures are seasonally adjusted (Reserve Bank of New Zealand, 2022a)

Figure 5.1: Raw Economic Insecurity Estimates, Unemployment and GDP Growth, June 1999 to June 2021



When examining subgroups of the population, another key finding in the raw estimates is that insecurity varies by ethnicity, with ethnic minorities exhibiting relatively higher levels of economic insecurity. Specifically, the likelihood of experiencing economic insecurity is approximately double for Māori and more than double for Pacific peoples when compared to Pākehā.[12] Other population subgroups which are more susceptible to experiencing insecurity include young adults, households with children, persons with a university degree, persons whose relationships ended over the ESI year, persons in higher income brackets, persons living in rural areas, persons employed in certain industries (for example, mining, agriculture, accommodation, construction and food services) and those on full-time employment contracts. The raw data also show that insecurity varies across regions in New Zealand, ranging from 7.16 percent of the

[12] Pākehā is a Māori-language word for a New Zealander of European descent (Te Aka Online Māori Dictionary, 2020a).

population of the Nelson/Tasman/Marlborough/West Coast region to 13.84 percent in Waikato.

While some of these results seem plausible, some are surprising. For instance, one would expect individuals with higher educational qualifications and those in higher income brackets to be less insecure, as is shown in Hacker et al. (2014). It is possible that these unconditional means may be biased by other observable and/or unobservable characteristics. Hence to test the reliability of these estimates, the next section estimates the marginal effects for each group to see if these results hold when several demographic characteristics are controlled for.

5.2. Marginal Effects of Being Economically Insecure

The regression analysis explores economic insecurity by estimating the average marginal effects, i.e., the rate at which economic insecurity changes with respect to a change in a variable of interest while holding all covariate values constant (Leeper, 2018). This is analysed using linear probability models (LPM) as well as generalised linear models (GLM). The following Ordinary Least Squares (OLS) model is specified to determine the linear probability of being insecure:

$$ESI_{it} = \beta_0 + \beta_1 X_{it-1} + \beta_2 Inc_{it-1} + \beta_3 Inc_{it-1}^2 + \beta_4 Year_{it} + \varepsilon_{it} \qquad (5.1)$$

where ESI_{it} is a binary variable representing household i's experienced economic insecurity in year t and X_{it-1} is a vector of demographic characteristics (ethnicity, age group, gender, region, education, employment status and an indicator for partnership dissolution over the ESI year).[13] Inc_{it-1} and the quadratic term, Inc_{it-1}^2, represent equivalised real annual household income. This examines whether household income has a non-linear relationship with economic insecurity. A small sample of outliers with extreme incomes of less than NZD -$400,000 and more than NZD $1,000,000 are removed

[13] In the context of this study, partnerships include anyone living with a significant other, be it by marriage, de facto relationship or civil union. The variable for partnership dissolution was constructed to indicate whether the household head's relationship ended over the ESI year. No explicit reason is given for partnership dissolution in the data, but could be due to factors such as divorce, separation, death or any other circumstance that may cause the dissolution of a partnership.

from the regression sample to decrease variability and increase statistical power. $Year_{it}$ represents the ESI year. Since ESI is a retrospective measure, all demographic variables (except year and partnership dissolution) are lagged to capture each household's circumstances at the beginning of the ESI year. All independent variables are categorical to show marginal effects, except for the income variables. ε_{it} is the error term.[14]

All regressions were run using sample weights provided by Statistics New Zealand. Since the data used in this analysis are repeated cross-sections, it is possible that respondents may be nested within clusters which can potentially bias the standard errors (Moulton, 1990). For instance, households that share observable characteristics, such as region or socioeconomic status, may also share unobservable characteristics, such as motivation, that would lead to correlation in the regression errors. To address this potential bias, all standard errors are clustered at the demographic group level so that they are robust to heteroscedasticity and within-group correlation.[15]

For the OLS model given in Equation (5.1), the average marginal effect of a variable of interest, for example, X_j, is given by:

$$\frac{\partial p}{\partial X_j} = \beta_j \tag{5.2}$$

where the index j refers to the j^{th} independent variable; so, if, for instance, there are five independent variables, there will be five coefficients estimated. The marginal effect is a constant (β_j) and does not depend on anything else; hence the estimated coefficients of the OLS model can be interpreted directly.

[14] The variable labour force status was dropped from the regression models due to multicollinearity. Industry and urban/rural code were also dropped since there are data missing for these variables for several years early in the time series, specifically all pre-2003 data. The Stata command vif (variance inflation factor) is run in postestimation to ensure multicollinearity is not present in the preferred model. The test estimated vif < 10 and 1/vif > 0.10 for all variables, except for income and income squared. This is expected since income has a quadratic relationship with insecurity. I conclude that multicollinearity is unlikely to be a problem.

[15] Sandwich robust standard errors are clustered by demographic group level (ethnicity, gender, age and income) using the Stata's vce(robust clustvar) command. The pweight option is used to apply population weights to the regression models.

There are well-known limitations to using LPM to determine the drivers of economic insecurity considering that the dependent variable, *ESI,* is binary. A problem with using LPM for binary outcomes is heteroscedasticity. Linear regression models are based on the assumption that the variance of the errors is constant. With binary outcome variables, the variance is not constant as the mean changes. Another fundamental problem of LPM is that it is possible to get a probability below zero or above one for a fitted regression, which is outside the range of probabilities. To overcome these problems, we also run a GLM model (probit) which is specifically designed to account for binary outcome variables, where the predicted probabilities are constrained to lie between 0 and 1. To derive the probability of being insecure using probit, the following model is specified:

$$Pr\ (ESI_{it} = 1|\boldsymbol{X}_{it}) = \ \phi(\beta_0 + \ \beta_1 X_{it-1} + \beta_2 Inc_{it-1} + \beta_3 Inc_{it-1}^2 + \beta_4 Year_{it} + u_{it}) \qquad (5.3)$$

where $\boldsymbol{X}$ is a matrix of all explanatory variables, $\phi(\cdot)$ is the cumulative distribution function of the standard normal distribution and u_{it} is the error term. The variables X_{it-1}, Inc_{it-1}, Inc_{it-1}^2 and $Year_{it}$ are the same as in Equation (5.1). Equation (5.3) basically models the conditional probability of $ESI_{it} = 1$.

Since GLM models involve a non-linear transformation, their results cannot be interpreted directly as in OLS models, so estimating the marginal effects requires the application of partial derivatives (Leeper, 2018).[16] The marginal effects for the probit model are obtained by computing the derivative of the conditional mean function with respect to X given by:

$$\frac{\partial p}{\partial X_j} = \phi(\mathbf{X}'\beta)\beta_j \qquad (5.4)$$

while the average marginal effects are estimated as the average of the individual marginal effects in the following equation:

[16] For the probit model, marginal effects are calculated in postestimation using Stata's margins, dydx(*) command.

$$\frac{\partial p}{\partial X_j} = \frac{\sum \phi(\mathbf{X}'\beta)}{n} \beta_j \tag{5.5}$$

Most of the independent variables used in the regression analysis are categorical, namely ethnicity, age group, gender, region, education, relationship status and employment status. Marginal effects are computed differently for categorical independent variables. Specifically, marginal effects measure the discrete change, i.e., the change in the predicted probabilities that come about from a change in the independent variable (Leeper, 2018). To compute partial effects for discrete variables, predict the probabilities of two discrete values of a variable and take the difference:

$$F(\hat{\beta}_0 + \hat{\beta}_1(k+1)) - F(\hat{\beta}_0 + \hat{\beta}_1(k)) \tag{5.6}$$

5.3. Regression Results

The results of the most parsimonious LPM and GLM models are presented in Table 5.1. The estimates show the marginal effects vary over time and for different subgroups of the population. Both the LPM and GLM models produce largely similar point estimates and standard errors. Considering this, it is likely that little or no predicted probabilities fall outside the unit interval in the LPM model. Hence, the estimated parameters of the linear regression are assumed to be consistent and unbiased.

LPM is therefore used as the preferred model in this analysis because it is more straightforward to interpret. Hence, the results discussed in Sections 5.3.1 and 5.3.2 are from the LPM model, after controlling for each household's observable characteristics. It is important to note that the results do not assume causality. The study is unable to control for group-level correlation based on the demographic factors that are used to construct 'predicted' values for MOOP expenses, housing costs, debt service and savings for use in the ESI formula.[17] Also, like in most social or behavioural science studies, it is unlikely that all the relevant predictors would be captured by the regression models. For instance, unobservable characteristics such as conscientiousness and other personality traits may not be captured by the models.

[17] See Appendix D in the data supplement for more on this.

Table 5.1: Determinants of Economic Insecurity in New Zealand[18]

	Economic Insecurity	
	LPM	Probit
Ethnicity (Reference Category: NZ European)		
New Zealand Māori	0.090**	0.087**
	(0.034)	(0.031)
Pacific Peoples	0.156***	0.160***
	(0.041)	(0.040)
Asian	0.092*	0.096**
	(0.036)	(0.036)
	(0.028)	(0.026)
Age Group (Reference Category: 15-24)		
25-34	0.015	0.015
	(0.027)	(0.025)
35-44	-0.015	-0.013
	(0.029)	(0.027)
45-54	-0.060**	-0.056**
	(0.022)	(0.020)
55-64	-0.105***	-0.098***
	(0.029)	(0.024)
65+	-0.113***	-0.133***
	(0.025)	(0.024)
Household Income (in NZD $100,000s)	0.363***	0.278***
	(0.034)	(0.029)
Household Income Squared (in NZD $100,000s)	-0.028***	-0.027***
	(0.006)	(0.005)
Education (Reference Category: Post-School Qualification)		
University Degree	-0.034***	-0.029***
	(0.005)	(0.004)
High School	-0.001	-0.002
	(0.004)	(0.004)
No Qualification	0.009*	0.013***
	(0.004)	(0.004)

…Table continues on next page

[18] Full LPM regression models are presented in Appendix G of the data supplement. The results for insecurity by gender are not discussed in the results section since gender is reported for the principal earner, typically the household head, who responds to income questions in the HLFS and the HES. This captures the gender of the responder, but not gender of their partner in the case of a multiple-adult household. There is a high likelihood that the gender of household heads are uncorrelated, considering that less than 4 percent of the New Zealand population identify as being in same-sex relationships (Statistics New Zealand, 2019a). Hence, reporting the findings on gender may not be a true representation of gender differences in insecurity. We disregard this reasoning for the results of the other demographic characteristics (for example, age and education), since these are more likely to be positively correlated. For instance, highly educated individuals generally tend to marry individuals of similar educational status.

Table 5.1 *(continued)*: Determinants of Economic Insecurity in New Zealand

	Economic Insecurity	
	LPM	Probit
Relationship Status (Reference Category: With Partner)		
Relationship Ended Over ESI year	0.076**	0.069**
	(0.024)	(0.022)
Region (Reference Category: Auckland)		
Northland	0.046***	0.044***
	(0.008)	(0.007)
Waikato	0.068***	0.070***
	(0.009)	(0.008)
Bay of Plenty	0.050***	0.050***
	(0.008)	(0.006)
Gisborne/Hawke's Bay	0.064***	0.067***
	(0.009)	(0.007)
Taranaki	0.070***	0.073***
	(0.012)	(0.010)
Manawatu-Wanganui	0.071***	0.076***
	(0.011)	(0.009)
Wellington	0.020***	0.019***
	(0.005)	(0.005)
Nelson/Tasman/Marlborough/West Coast	0.024***	0.017**
	(0.006)	(0.005)
Canterbury	0.049***	0.050***
	(0.007)	(0.006)
Otago	0.059***	0.063***
	(0.009)	(0.008)
Southland	0.072***	0.075***
	(0.011)	(0.011)
Full-time/Part-time Code (Reference Category: Full-Time)		
Part-Time Employment	0.020**	0.013*
	(0.007)	(0.006)
Household Composition (Reference Category: Single Parent)		
Two or More Adults with Kids	-0.028*	-0.022*
	(0.012)	(0.010)
Two or More Adults without Kids	-0.001	-0.012
	(0.014)	(0.012)
Single Person Household	0.020	0.000
	(0.010)	(0.009)

…Table continues on next page

Table 5.1 *(continued)*: Determinants of Economic Insecurity in New Zealand

	Economic Insecurity	
	LPM	Probit
Year (Reference Category: 1999)		
2000	-0.015	-0.010
	(0.009)	(0.010)
2001	-0.021*	-0.018
	(0.008)	(0.010)
2002	-0.027**	-0.022*
	(0.009)	(0.010)
2003	-0.032***	-0.029**
	(0.009)	(0.011)
2004	-0.042***	-0.040***
	(0.010)	(0.011)
2005	-0.041***	-0.034**
	(0.009)	(0.011)
2006	-0.054***	-0.052***
	(0.011)	(0.011)
2007	-0.023*	-0.032*
	(0.011)	(0.013)
2008	-0.016	-0.026
	(0.011)	(0.013)
2009	-0.002	-0.012
	(0.009)	(0.010)
2010	-0.024**	-0.032**
	(0.009)	(0.010)
2011	-0.034***	-0.041***
	(0.010)	(0.012)
2012	-0.021*	-0.029*
	(0.009)	(0.012)
2013	-0.029**	-0.035**
	(0.010)	(0.012)
2014	-0.048***	-0.053***
	(0.011)	(0.013)
2015	-0.053***	-0.057***
	(0.011)	(0.013)
2017	-0.079***	-0.082***
	(0.011)	(0.011)
2018	-0.099***	-0.096***
	(0.012)	(0.012)
2019	-0.088***	-0.088***
	(0.011)	(0.012)
2020	-0.074***	-0.077***
	(0.011)	(0.011)
2021	-0.104***	-0.100***
	(0.013)	(0.012)
Constant	-0.007	
	(0.032)	
Observations~	100,455	100,455
R-squared	0.162	

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05
~Observations are randomly rounded (up or down) to the nearest multiple of three given Statistics New Zealand's rounding rule.

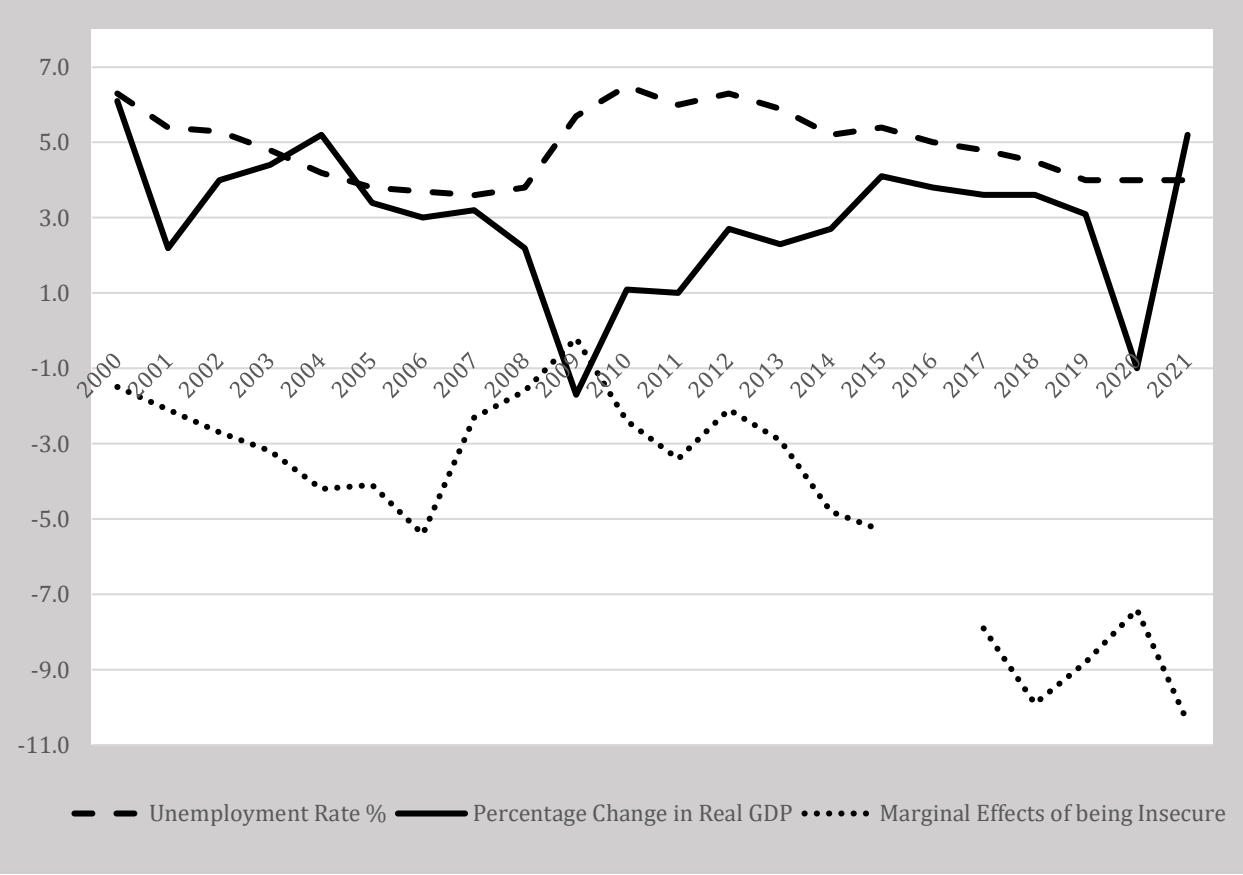
5.3.1. Insecurity by Year

Table 5.1 presents the yearly marginal effects on the probability of being insecure compared to 1999. All else held constant, insecurity appears to be affected by changes in the business cycle. The apparent cyclical nature of insecurity is reflected in its correlation with two of the country's key macroeconomic indicators – unemployment and GDP growth. Figure 5.2 compares the trend in insecurity with these two indicators and clear patterns emerge. Economic insecurity appears to be positively correlated with the unemployment rate and negatively correlated with GDP growth. This is the case in most years except in 2001, when New Zealand experienced a recession associated with the 2001 slowdown triggered by the Dotcom crash in technology stocks. Even though the country experienced a negative output gap, the downturn did not have a strong impact on the New Zealand economy. Reddell and Sleeman (2008) put forth several reasons that might explain this, including stable commodity prices for New Zealand exports during the downturn, a record low exchange rate in late 2000, and strong business and consumer confidence. A stable macroeconomic environment at the time likely countered some of the effects of the 2001 slowdown.

For the remainder of the early- to mid-2000s (pre-GFC), falling levels of economic insecurity coincided with relatively low volatility in GDP tied with falling unemployment rates. In December 2007, New Zealand reported an unemployment rate of 3.3 percent, which was its lowest level since 1986 (Statistics New Zealand, 2018b). Following this, the country entered an economic recession due to the effects of the GFC. New Zealand experienced consecutive falls in real GDP which began in 2007 and continued contracting until 2009. The unemployment rate as well as economic insecurity rose during the GFC years, with insecurity peaking in 2009. New Zealand's recession was reported by the New Zealand Treasury (2015) as being amongst the first to enter the recovery stage and was considered shallow compared to other advanced economies. Economic recovery in the years following the recession may have been slowed down by another uptick in insecurity

over the 2012/2013 ESI years, which may be capturing the effects of a severe drought in 2012 and the Canterbury earthquakes (September 2010 and February 2011).[19]

Figure 5.2: Economic Insecurity, Annual Percentage Change in Real GDP and Unemployment Rate, New Zealand, June 1999 to June 2021



[19] Canterbury and surrounding areas experienced two major earthquakes in September 2010 and February 2011. On Saturday 4th September 2010, a magnitude 7.1 earthquake occurred at Darfield near Christchurch. It was the largest earthquake to hit New Zealand since 1931. On Tuesday 22nd February, a magnitude 6.3 earthquake (considered an aftershock of the 2010 quake) struck Canterbury with the epicentre near Lyttelton. Multiple aftershocks occurred throughout 2011. These quakes caused 185 casualties and significant damage to infrastructure. Christchurch's central business district as well as the economy of New Zealand experienced significant economic costs due to this natural disaster shock (Te Ara - The Encyclopedia of New Zealand, 2017).

5.3.1.1. COVID-19 Implications

Following a mostly downward trajectory since 2012, New Zealand experienced another uptick in economic insecurity in 2020. This was likely related to the effects of the ongoing Covid-19 pandemic. The first wave of the pandemic hit New Zealand in late February 2020, and since then considerable efforts were made by the government to mitigate the health risk to the population. However, a series of lockdowns (which periodically interrupted business activity), border closures (which interrupted international migration), and global supply chain disruptions have significantly impacted the country's economy. Key macroeconomic indicators for the first half of 2020 show that by the March 2020 quarter, consumer spending fell by 0.3 percent, business confidence declined, unemployment rose by 5 percent and GDP fell by 1.6 percent (Statistics New Zealand, 2020a, 2020d; The Treasury New Zealand, 2020). In September 2020, Statistics New Zealand announced that GDP fell by 12.2 percent in the June 2020 quarter, plunging New Zealand into the worst economic recession on record (Statistics New Zealand, 2020b).

Moreover, evidence from a survey administered early in the pandemic also presents a case for increased economic insecurity in the first year if the pandemic. In the last two weeks of April 2020, the Commission for Financial Capability (CFFC) surveyed 3,000 New Zealanders as part of a larger international study spanning eight countries. They found that 13 percent of the households surveyed lost more than a third (or all) of their income due to the impacts of Covid-19, with a further 25% suffering losses less than a third (Galicki, 2020). The figures account for government wage subsidies. CFFC's study found that almost 35% of households were experiencing financial hardship at this time. This anecdotal evidence suggests that over a third of New Zealand's households suffered unbuffered economic losses as a result of the pandemic less than two months after the first Covid case was reported in New Zealand, and could explain why the data show a rise in insecurity in the 2020 ESI year.

Following the June 2020 recession, the New Zealand economy experienced a 14 percent increase in quarterly GDP in September 2020, the largest quarterly rise on record (Statistics New Zealand, 2020c). Since then, the country has managed to escape economic recessions with the help of government stimulus packages, which have played a tremendous role in in supporting the economy throughout the pandemic. The wage

subsidy and small business cashflow scheme have helped companies retain employees during the pandemic, providing a much-needed buffer to household earnings. This may have also helped stave off a rise in insecurity in 2021 - the ESI shows that insecurity has recovered in 2021 following its 2020 rise.

Although New Zealand is returning to greater normality at this stage in the pandemic, the unpredictability of Covid, as well as other emerging challenges, such as the war in Ukraine, Monkeypox and climate change/natural disasters, could potentially affect future trends in insecurity. If the effect of past economic shocks on household insecurity is any indication as to what to expect for future economic shocks, having a plan in place to mitigate the economic and social risk to especially vulnerable households becomes an important task for policymakers (Clyne & Smith, 2021).

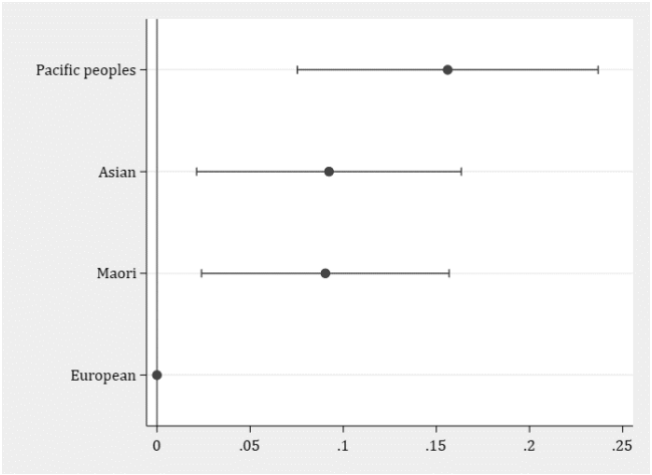
5.3.2. Insecurity by Demographic Characteristics

In addition to temporal variation in insecurity, Table 5.1 suggests that insecurity varies by subgroups of the population. Of all the demographic characteristics examined, statistically significant differences were found by ethnicity, age group, education/qualification, income, relationship status, region, household composition and employment status. These results are also depicted graphically in Figure 5.3, which show the average marginal effects with a 95 percent confidence interval (CI) by different demographic characteristics.[20]

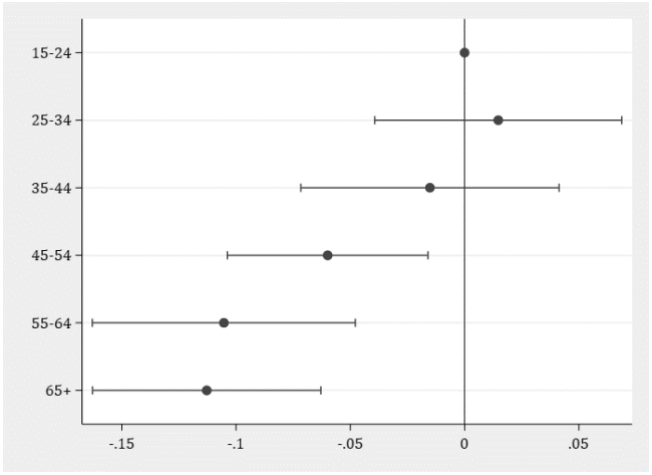
[20] The *coefplot* command was used in Stata to plot the point estimates and their confidence intervals from the regressions.

Figure 5.3: Average Marginal Effects of Being Insecure with 95% CI by Demographic Characteristics, New Zealand Households, 1999 to 2021

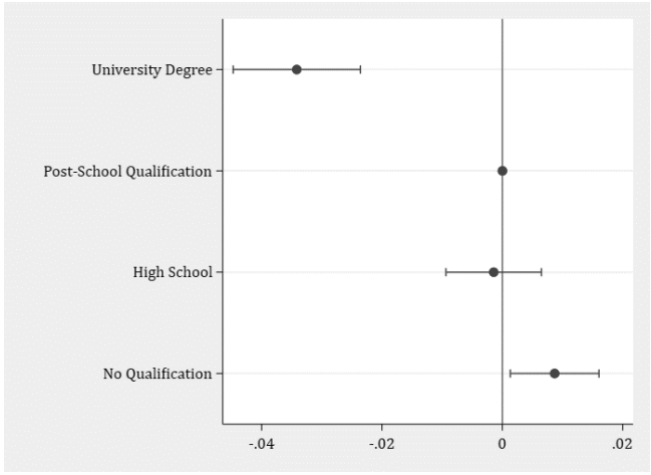
1. Ethnicity



2. Age Group



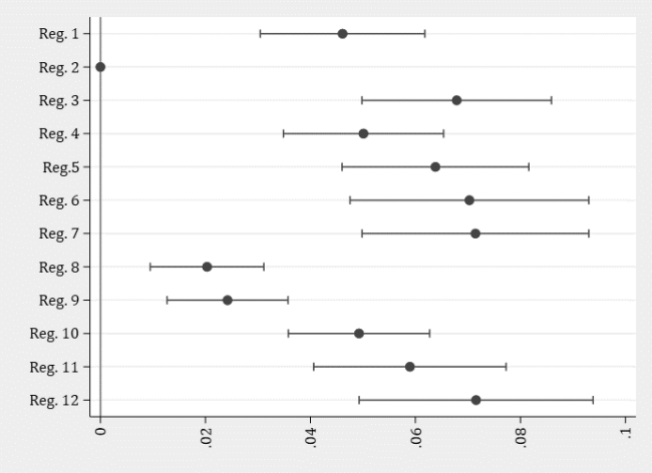
3. Education



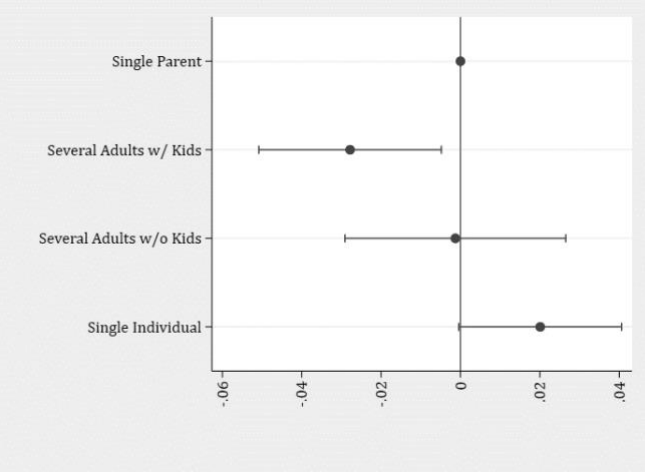
…Figure continues on next page

Figure 5.3 (*continued*): Average Marginal Effects of Being Insecure with 95% CI by Demographic Characteristics, New Zealand Households, 1999 to 2021

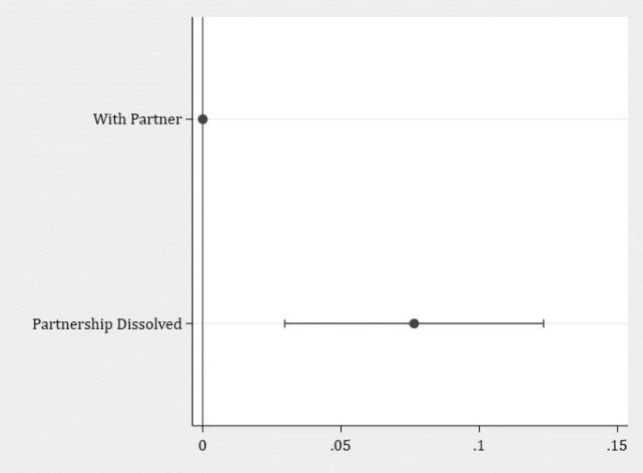
4. Region[21]



5. Household Composition



6. Relationship Status

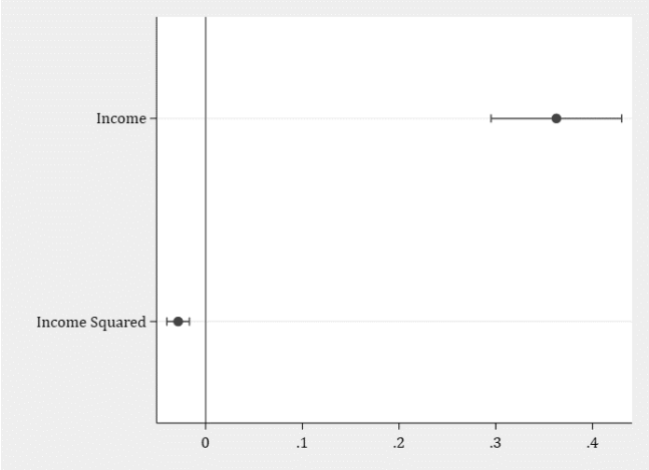


…Figure continues on next page

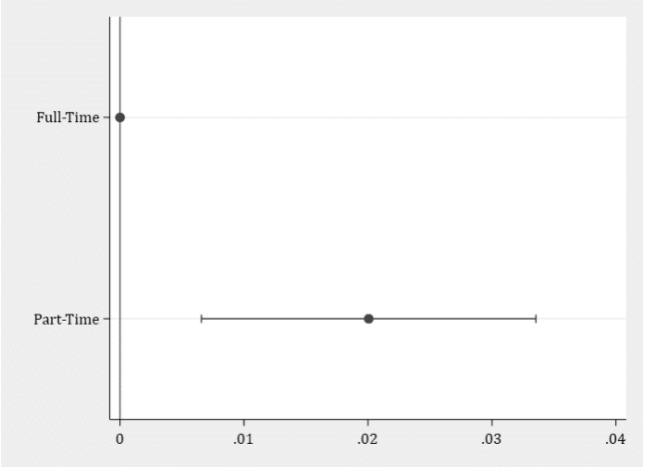
[21] Reg 1 to Reg 12 respectively: (1) Northland, (2) Auckland, (3) Waikato, (4) Bay of Plenty, (5) Gisborne/Hawke's Bay, (6) Taranaki, (7) Manawatu / Wanganui, (8) Wellington, (9) Nelson / Tasman / Marlborough / West Coast, (10) Canterbury, (11) Otago and (12) Southland.

Figure 5.3 (*continued*): Average Marginal Effects of Being Insecure with 95% CI by Demographic Characteristics, New Zealand Households, 1999 to 2021

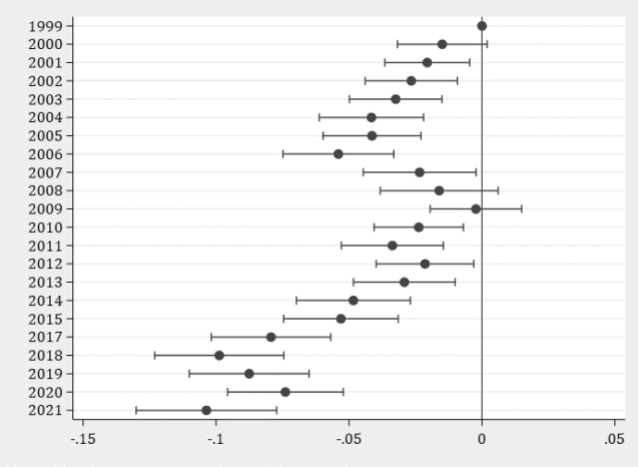
7. Household Income



8. Employment Status



9. Year



5.3.2.1. Insecurity by Ethnicity

The results in Table 5.1 suggest that the probability of experiencing economic insecurity varies by ethnicity.[22] The results suggest that Pākehā is the least insecure ethnic group in New Zealand. Economic insecurity rates for Māori are likely to be about 9 percentage points higher than for Pākehā, all else held constant. This result is statistically significant at the 1 percent level. This means that if, for example, insecurity is estimated to be 10 percent for Pākehā and 19 percent for Māori (a difference of 9 percentage points), then Māori would be ~90 percent more insecure than Pākehā. This is consistent with the findings of the raw insecurity data which show that economic insecurity for Māori (~19.4 percent) is about twice that of Pākehā (~9.7 percent). Moreover, economic insecurity rates amongst Asians are likely to be about 9 percentage points higher than for Pākehā ($p<0.05$), while for Pacific peoples, it is likely to be more than 15 percentage points higher than for Pākehā ($p<0.001$).

To explain the ethnic disparities in economic insecurity, we propose an argument for what I will refer to as a "prosperity tax". This concept came about from observed similarities in the way ethnic minorities in New Zealand distribute their household incomes to what is termed the "black tax" in parts of Africa and the United States. Black tax is a phenomenon that typically refers to the social and economic burden faced by gainfully employed middle-class ethnically black professionals who consider it a duty to share their income with extended family members, especially if they are the first ones to succeed in their family (Magubane, 2017; Mhlongo, 2019; Ngwadla, 2019). This form of income redistribution decreases the income available for their own personal development, savings and investment (Magubane, 2017). A possible reason for the black tax could be that ethnic minorities are only recently being treated fairly in the workplace in many countries and were not able to grow family wealth over the past generations in social and economic systems that largely favoured the dominant ethnic group, leading to an ethnic wealth divide.

[22] As part of the ethics approval process, Ngāi Tahu Research Consultation Committee was consulted at the beginning of this study and they consider this research to be of importance to the Māori community. A process to report the findings of this study to Māori health organisations, including the local Te Kaika health centre and to Te Rūnanga o Ngāi Tahu, was established.

Similarly, ethnic minority communities in New Zealand are expected to provide social and economic support to their kinship networks. A study by Fleming (1997) shows that the way in which New Zealand households distribute their earnings varies by ethnicity and is largely related to each ethnic group's definition of family.[23] For Pacific peoples and Asians, the extended family is considered as part of the family unit, while for Māori people the whānau[24] is a significant part of their family life and tribal structure; conversely, for Pākehā, the family unit typically consists of a couple and their children living together in a household (Fleming, 1997; New Zealand Law Commission, 2017). Fleming (1997) finds that it is each group's definition of family that determines what they consider to be their primary social and economic unit.

Hence, Pacific peoples and Māori find it their duty to tend to the economic demands of not just their immediate households, but also their extended families and whānau, with Pacific peoples considering it selfish and individualistic if they do not (Fleming, 1997). Similarly, in Asian culture, the responsibility of financial care for both immediate and extended family members tends to fall on the earning members of the family (Rahman, 2015). It is also important to note that these extended family units are not just local but could also extend across country borders. For example, there are strong economic ties between New Zealand and the Pacific Islands, which include economic cooperation through labour mobility and remittances (Ministry of Foreign Affairs and Trade (MFAT), 2020). MFAT estimates that about 12,850 workers come to New Zealand from the Pacific Islands for work and send remittances back to their home countries valued at about NZD$37.5 million per year. That is almost NZD$3,000 per person. For Pākehā, on the other hand, family money is not distinguishable from household money and tends to be passed down the generations from parents to children (Fleming, 1997).

These differences put an extra financial burden on ethnic minorities in the form of a "prosperity tax" and make it more difficult for them to save and grow wealth to the same

[23] Households that partook in this study were interviewed in 1992 and 1993. The sample consisted of 20 Māori families, 32 Pacific Island households and 59 Pākehā couples (Fleming, 1997).

[24] Whānau is a Māori-language word typically used to refer to the extended family or a family group of traditional Māori society (Te Aka Online Māori Dictionary, 2020b). In a more modern context, it could also include friends who may not be related to other members. The term is based on a tribal world view making its definition multi-layered and complex, and could extend past the definition used here. See Te Ara - The Encyclopedia of New Zealand (2020) and Te Aka Online Māori Dictionary (2020b) for further information.

level as Pākehā can. In line with this postulation, the savings statistics estimated for this study using the HES net worth supplement show that the weighted median savings for Pākehā is more than 1.5 times higher than the median savings for Asians, more than 5 times higher than for Māori and more than 8 times higher than for Pacific peoples. A higher savings rate could lessen the chance of experiencing unbuffered income losses. It could also possibly be related to more positive feelings of subjective economic security. The assumption is that having higher levels of precautionary savings reduces anxiety and worry about encountering financial loss because one has a financial safety net. For instance, consider a New Zealand resident of European descent. Since this group earns higher incomes on average and is likely to have a higher level of savings, they could possibly comfortably invest in the stock market with a portion of their wealth because they feel secure in their buffering capacity in the event of a drop in the value of their shares or unforeseen expenses. Conversely, an individual of Pacific descent may have less leeway for such activities and may be more risk averse when making financial decisions.

5.3.2.2. Insecurity by Age Group

The results in Table 5.1 show that, all else held constant, the marginal effects of being insecure persistently decline with increasing magnitude with increasing age. This effect becomes statistically significant from around the age of 45. These estimates suggest that young adults, aged 15 to 45, the bulk of whom are millennials, are the most financially insecure group in New Zealand and that insecurity falls as an individual gets older. Compared to persons aged 15 to 24, economic insecurity is estimated to be ~6 percentage points lower for persons aged 45 to 54 ($p<0.05$) and ~11 percentage points lower for persons aged 55 and above ($p<0.001$).

These results are unsurprising since millennials, more than any other generation, are oftentimes reported as being the most financially insecure (e.g., Charles Schwab & Co. Inc., 2019; Deloitte Touche Tohmatsu Limited, 2019).[25] In Schwab's 2019 Modern Wealth report on millennials in the United States, it is reported that even though about 60

[25] The Millennial Generation includes individuals born between 1981 to 1997, Generation X between 1965 and 1980 and Baby Boomers between 1946 and 1964 (Fry, 2016). Different sources may show slight variations in the starting and ending birth years for each cohort.

percent of millennials report feeling financially insecure and live paycheck-to-paycheck, they also spend upwards of US $500 each month on non-essential purchases and almost half typically carry a negative credit card balance. The trend is similar in other countries across the globe as is reported in the Deloitte Global Millennial Survey 2019, which surveyed 13,416 millennials from 42 countries, of which 300 respondents were from New Zealand.

The survey also reports that millennials are generally pessimistic about the economic, political and social environments in their respective countries, are sceptical of the motives of businesses and believe that their generation faces high barriers to social mobility. A main reason cited for the lack of optimism is the Global Financial Crisis of the late 2000s, which saw millennials entering the job market at that time being met with uncertain and unstable job prospects that negatively impacted their future wages and career paths. The report observes that millennials typically had lower real incomes than the previous generations at comparable ages, coupled with fewer assets and higher levels of debt. Moreover, unlike the period following World War II, where globalization was taking hold in many economies and economic expansion benefited the majority of populations, the post-2007 recession period has arguably led to a rise in inequality, a decline in social safety nets, a rise in '*divisionist*' governments and major changes to employment contracts (Deloitte Touche Tohmatsu Limited, 2019).

Continuing along the spectrum, Baby Boomers tend to be especially secure and wealthier as they were born in years marked with economic expansion and opportunities for upward mobility - opportunities that also benefited Generation X. Retirees are the most economically secure in New Zealand, which is possibly linked to the country's social welfare system. Most New Zealand residents get superannuation when they turn 65 and/or local or overseas pension from their employer or union. In addition, a large proportion of the population also save for retirement through a voluntary work-based savings scheme called KiwiSaver which was introduced in 2007 to supplement the NZ Superannuation. As of April 2022, 3.2 million New Zealand residents were enrolled in the KiwiSaver scheme (Inland Revenue, 2022). Other welfare benefits such as public healthcare as well as lifetime savings could also contribute to more economic security for over 65s.

5.3.2.3. Insecurity by Household Income

The results in Table 5.1 suggest an inverted U-shaped relationship between economic insecurity and household income, all else held constant. This result is significant at the 0.1 percent level. We apply a differential calculus approach to find the vertex (or turning point) of the real quadratic function of the form:

$$f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = ax^2 + bx + c \tag{5.7}$$

where a, b and c are real numbers and a ≠ 0. The turning point occurs when the first derivative $f'(x) = 2ax + b$ is equal to zero or $x^* = -\frac{b}{2a}$ (Kojić & Škrinjarić, 2019). This was calculated in postestimation as approximately $490,000 (rounded to the nearest $10,000).

The existence of a turning point suggests that there is a non-linear relationship between insecurity and income where the likelihood of being insecure rises with income up to the turning point, after which insecurity declines as income increases. Although this inverted U-shaped relationship exists, the turning point falls into the top 0.01 percent of income earners in the sample. This suggests that New Zealand's ultra-rich are shielded from experiencing insecurity, but for the majority of the population, there is a positive relationship between insecurity and income. This seems a counter-intuitive finding as most would assume that low-income individuals would be most insecure with insecurity falling with higher incomes. However, New Zealand's relatively high minimum wage could be driving the limited variability in low incomes. This study's finding corroborates the findings of a study on income dynamics in New Zealand carried out by Carter and Gunasekara (2012). Using data from SoFIE, the authors found more stability in incomes in the highest and lowest income quintiles, with the most volatility being concentrated in the middle-income groups.[26]

A possible reason for more year-on-year variation as income rises could be related to increased flexibility in employment contracts in modern times, which has decreased the stigma associated with changing employers or career paths over the course of life. Highly skilled and educated workers, which tend to command relatively higher salaries,

[26] For more on this, see the literature review in Section 2 of this paper.

may be more comfortable switching jobs or careers since they tend to be more marketable. In contrast, low-skilled individuals, which tend to command relatively lower salaries, may hold on to jobs longer because it may be difficult to find another one. Moreover, households with higher incomes are more likely to have multiple working adults. If there are two or more people contributing to household income, there is a higher probability that one may lose their job, or choose to stop working, than for single-earner households.

Another possible reason for the mostly positive relationship between insecurity and household income finding may be related to the nature of careers that command higher incomes, such as the non-standard careers of self-employed contractors and entrepreneurs. For example, large long-term government contractors could register large income gains in one year and close to none in the following years. Higher income earners may also be more likely to accumulate enough wealth to make investments in financial instruments such as stocks and bonds, which may be more susceptible to changes in the macroeconomic environment. Arguably, as income increases, it may be more financially prudent to hold fewer liquid assets.

For the proportion of households that fall into the over NZD $490,000 income category (that is, above the turning point), it is assumed that with such high incomes, there is a greater capacity to save and create a sufficient financial safety net to buffer income shocks.

5.3.2.4. Insecurity by Education/Qualification

The marginal effects by education/qualification presented in Table 5.1 are analysed with reference to New Zealanders with post-school qualifications. All else held constant, the results show that there is no significant difference between persons with high school education and those with post-school qualifications. An explanation for this could be related to New Zealand's heavy reliance on primary industries, like agriculture and tourism. Such industries are quite diverse in New Zealand and may require tertiary training in some cases; however, jobs in these fields are also highly accessible with a high school degree coupled with on-the-job training, vocational training or other training qualifications specific to each industry making tertiary education unnecessary. In this way, these qualifications may be comparable, to an extent, in the labour market.

Unsurprisingly, New Zealanders with no formal qualifications appear to be the most insecure category, while university graduates appear to be the least insecure, all else held constant. This is likely due to the positive correlation between education and economic outcomes that is found in many studies. The New Zealand government, as well as private individuals and their families, invest heavily in tertiary education and the advancement of human capital every year, which translates into economic payoffs for New Zealanders. According to research by Nair et al. (2007), investment in tertiary education, both private and public, leads to greater social and economic outcomes for New Zealanders. These benefits include higher earnings and a higher likelihood to gain and sustain employment, especially during economic recessions (Nair et al., 2007). Their research suggests that there is more stability in labour market outcomes from investment in tertiary education, while HLFS data show that individuals with tertiary education have lower unemployment rates.

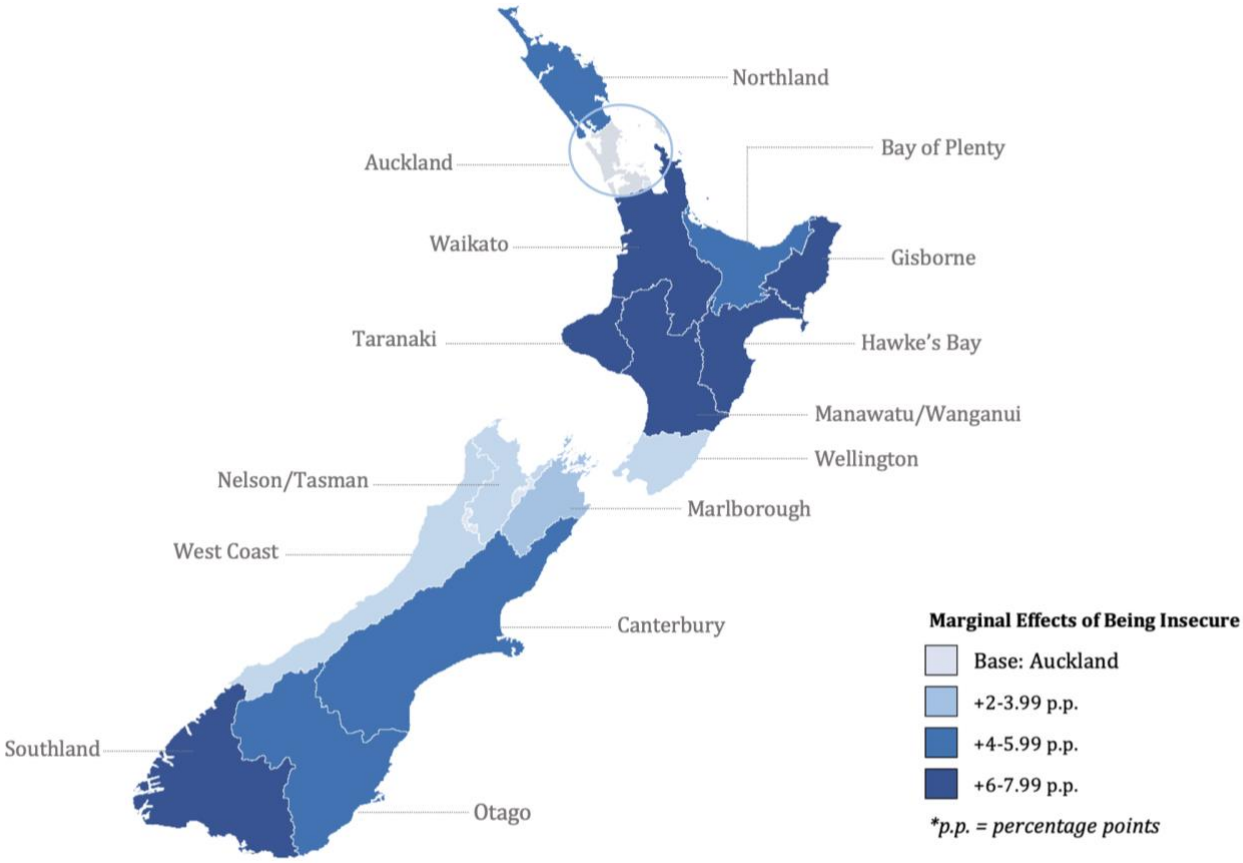
5.3.2.5. Insecurity by Region

The marginal effects by region are analysed with reference to Auckland, New Zealand's largest region. Holding all else constant, the results in Table 5.1 suggest that all regions have higher levels of economic insecurity compared to Auckland, but to varying degrees. This finding is statistically significant at the 0.1 percent level for all regions. Auckland is the most economically secure region in New Zealand, followed closely by Wellington. At the other end of the spectrum, Manawatu-Wanganui appears to have the highest levels of insecurity, estimated at over 7 percentage points higher than Auckland. Figure 5.4 presents a visual representation of these findings.[27]

[27] Figure 5.4 was generated in Microsoft Excel, powered by Bing, © GeoNames, Microsoft, TomTom.

Figure 5.4: Regional Economic Insecurity

New Zealand Households, 1999 to 2021 (Base: Auckland)



Auckland and Wellington, New Zealand's most secure regions, are also the country's main urban centres. They tend to stand out when compared to the other regional economies for several reasons, many of which may explain their relatively lower levels of economic insecurity. Firstly, Auckland is New Zealand's largest regional economy, followed by Wellington (Statistics New Zealand, 2019b). Auckland's regional specialisation is quite varied and is mainly driven by professional, scientific and technical services; construction; wholesale trade; financial and insurance services; and education and training (Eaqub & Stephenson, 2014; Statistics New Zealand, 2019b). Wellington's main regional specialisation is in financial and insurance services, professional, scientific, technical, administrative and support services, public administration, defence and safety (Eaqub & Stephenson, 2014). Auckland is commonly considered New Zealand's "economic powerhouse" while Wellington is the country's political capital. There are high levels of specialisation and diversity in both regions creating high concentrations of

skilled and high-paying jobs. This feature tends to attract high levels of human capital and business investment to both regions. This also means that these regional economies are less economically volatile and more resistant to economic shocks (Eaqub & Stephenson, 2014). Wellington's economic security could also be attributed to its large proportion of stable government jobs. The region has the largest share of the country's national defence, safety and public administration industries. These services are arguably quite valuable and necessary to modern societies, even during economic downturns. They ensure the implementation of government policy which drives the smooth functioning of society and offers citizens protection from external or internal threats. This could contribute to more stable regional economies.

Manawatu-Wanganui is the country's most insecure region and tends to rank relatively low on many economic metrics compared to other regions. Manawatu-Wanganui's main specialisation is in agriculture and to a lesser extent, public administration, defence and safety (Eaqub & Stephenson, 2014). The region's heavy reliance on exports from primary industry (mainly agriculture) makes it highly susceptible to commodity price volatility and natural disasters. Susceptibility to such economic shocks contribute to high volatility in the region's incomes. For example, there were fluctuations in the prices for milk, forestry products, meat, coal, and oil over the period of study, and these were reflected in large swings in the value of the region's primary industries (Statistics New Zealand, 2014, 2019c). Moreover, the 2012-2013 drought affected primary production in many parts of the country, especially in the North Island. The effects were severe in the Manawatu-Wanganui region where sheep, beef and dairy farming all declined (Statistics New Zealand, 2014). These examples demonstrate the region's susceptibility to economic shocks.

5.3.2.6. Insecurity by Household Composition

The household composition results are estimated with reference to single-parent households. What is clearly coming through from the results in Table 5.1 is that households with two or more adults, whether they have children or not, tend to be less insecure than single-adult households, all else held constant.

This likely reflects more stability in joint incomes and the sharing of responsibilities with others who can form a support system in good and bad economic

times. It is unsurprising that single-parent households are more insecure than multi-adult household since single parents are most vulnerable to being economically disadvantaged in New Zealand, both in absolute terms as well as when compared to two-parent households (Centre for Social Research and Evaluation, 2010).

A surprising finding is that single-person households are likely to be ~2 percentage points more insecure than single-parent households. This could possibly be due to single parents getting extra support from the other parent or from the New Zealand Government through programmes like the Sole Parent Support (Ministry of Social Development, 2020). Also, living alone is likely more expensive than living with others since one has no opportunity to benefit from decreased living expenses due to the economies of scale from living with others.

5.3.2.7. Insecurity by Relationship Status

The results in Table 5.1 suggest that economic insecurity for persons whose relationships ended over the ESI year is ~8 percentage points higher than for those who maintained a stable relationship over the ESI year ($p<0.01$), all else held constant. This is likely because people living together as partners may have dual incomes and contribute jointly to household expenses. In such cases, the household's lifestyle may be set up with dual incomes in mind. If such a partnership ends over the ESI year, causing the household to transition from dual incomes to a single income, this may have a significant impact on the ability of the household to meet their regular expenses.

5.3.2.8. Insecurity by Employment Status

The results in Table 5.1 suggest that economic insecurity for persons on part-time employment contracts are likely to be ~2 percentage points higher than those on full-time employment contracts ($p<0.01$), all else held constant. Considering insecurity's close link to the labour market, this is an unsurprising finding. This link is so important that job insecurity is a commonly used proxy for economic insecurity in the literature.

Precarious employment contracts have been increasing in the past few decades globally. However, part-time workers typically, but not always, have less stable employment contracts, are usually paid less and are less likely to receive employment

benefits (Haines III et al., 2018; Hirsch, 2005; Zeytinoglu & Cooke, 2005). Less stability in incomes might hinder an individual's ability to effectively plan for their financial future, especially if their income stream and job security is uncertain.

6. A comparative analysis of economic insecurity using SoFIE

One of the main limitations of the ESI constructed for New Zealand using data from the HLFS and HES is that the data were not sourced from genuine panel surveys. The only appropriate panel survey available from Statistics New Zealand that contains the relevant data to construct an ESI is the Survey of Family, Income and Employment (SoFIE). SoFIE is a longitudinal survey that provides information about the changes in the economic well-being of individuals and families over time. SoFIE followed the same individuals over eight waves from October 2002 to September 2010.[28] This section supplements the preceding analysis by creating a second ESI for New Zealand using SoFIE for comparison purposes. To avoid confusion, the ESI constructed using HLFS & HES - the "main" index - will be referred to as ESI_{hlfs} while the SoFIE version will be referred to as ESI_{sof}.

There are two main reasons why the ESI_{hlfs} is considered the main index in this study. Firstly, ESI_{hlfs} has greater temporal coverage. ESI_{hlfs} covers the period 1999 to 2021, while ESI_{sof} is limited to the period 2004 to 2010. Secondly, a large proportion of the SoFIE sample was removed in 2018 by Statistics New Zealand due to confidentiality concerns. Sample weights were not revised since the data removal, so weights are not employed for the portion of the analysis using SoFIE.[29] Due to the limitations of the SoFIE dataset, this alternative ESI is used mainly to compare trends in the data.

The components as well as the methodology used to construct ESI_{sof} are the same as in ESI_{hlfs}. The only difference is that ESI_{sof} does not adjust for medical out-of-pocket (MOOP) expenses and debt service since these data are not available in SoFIE. ESI_{sof} is constructed using the following formula:

[28] A detailed description of the SoFIE dataset is presented in the Appendix E of the data supplement.

[29] The implications of the data removal are covered in more detail in Appendix E of the data supplement.

For each household, *i*, in time, *t*,

$$ESI_t = \frac{\sum_{i=1}^{n_t} L_{it}}{n_t} \tag{6.1}$$

where L, is defined as:

$$L_{it} = \begin{cases} 1 \;\; if \left(\frac{y_{it} - H_{it}}{e_{it}} < \left(\frac{3}{4}\right)\frac{y_{it-1} - H_{it-1}}{e_{it-1}}\right) \cap (W_{it} < W_{it}^{*}) \cap (1 - R_{it}) \\ 0 \;\; otherwise \end{cases} \tag{6.2}$$

where ESI_t is the proportion of the population experiencing large losses, L_i is the household-level insecurity status (whether the household experienced a loss or not), y_i is total inflation-adjusted household income, H_i is annual household housing costs, e_i represents the OECD-modified family size equivalence scale, $(W_{it} < W_{it}^{*})$ is an indicator for "*lacking* sufficient financial wealth" and $(1 - R_{it})$ is an indicator for "*not* transitioning into retirement". The intersection symbol, ∩, means that all conditions in Equation 4.4. need to be satisfied for L_{it} = 1. In order to make a fair comparison between ESI_{sof} and ESI_{hlfs}, the components of ESI_{hlfs} were reduced to incorporate the same formula used in this section and to cover the same time period (2004 to 2010).

6.1. Results and brief discussion

To compare the results of ESI_{sof} and $ESI_{hlfs,}$ we run OLS and probit regressions to determine the linear probability of being insecure using both indexes. The following regression models are specified to determine the marginal effects. Equation (6.3) represents the OLS model and Equation (6.4) represents the probit model.

$$ESI_{it} = \beta_0 + \beta_1 X_{it-1} + \beta_2 Inc_{it-1} + \beta_3 Inc_{it-1}^2 + \beta_4 Year_{it} + \varepsilon_{it} \tag{6.3}$$

$$Pr\,(ESI_{it} = 1|\boldsymbol{X}_{it}) = \phi(\beta_0 + \beta_1 X_{it-1} + \beta_2 Inc_{it-1} + \beta_3 Inc_{it-1}^2 + \beta_4 Year_{it} + u_{it}) \tag{6.4}$$

where ESI_{it} is a binary variable representing the proportion of individuals who experience loss (25 percent or greater decline in household income) and X_{it-1} is a vector

of demographic characteristics (ethnicity, age group, gender, region, education, partnership dissolution and household composition). Inc_{it-1} and the quadratic term, Inc_{it-1}^2, represent equivalised real annual household income.[30] $\boldsymbol{X}$ is a matrix of the explanatory variables. All demographic variables are lagged to capture each household's circumstances at the beginning of the ESI year. ε_{it} is the error term. All standard errors are clustered at the household level.

The results of the regression analysis comparing the marginal effects of being economically insecure using ESI_{hlfs} and ESI_{sof} are presented in Table 6.1. The signs of the coefficients are largely the same for both ESI_{hlfs} and ESI_{sof} showing similar patterns in insecurity for most subgroups. However, there is much variation in the effect sizes between the two indexes. For instance, although all the results show that ethnic minorities have a higher likelihood of being insecure compared to Pākehā, the magnitude is greater in ESI_{sof}, when compared to ESI_{hlfs}. Similarly, we observe larger effect sizes in ESI_{sof} for age group, education, region and household composition. With reference to year, ESI_{sof} shows a lower likelihood of being insecure in all years following 2005, whereas ESI_{hlfs} paints a different picture. The results from ESI_{hlfs} show no significant difference between most of the years, except in 2009, where insecurity was as its highest point since 2004. This could be picking up the effects of the GFC. The ESI_{hlfs} also shows a different trend than in the marginal effects by year presented in Table 5.1 in the preceding analysis, but this is likely due to having different reference years.

The results from both indexes paint largely similar pictures about insecurity in New Zealand, but the variation in magnitudes mean they should be interpreted with caution. This variation could possibly be related to the limitations in the SoFIE dataset. For instance, longitudinal weights are not used in the SoFIE analysis because of attrition and missing data, which will diminish the representativeness of the results. This could have introduced selection bias into the regression estimates. Regardless of the data limitations, the coefficient signs from both indexes are largely consistent and the general trends for subgroups of the population are considered reliable, but one should be cautious in interpreting the magnitude (especially of the SoFIE results).

[30] A small sample of outliers with extreme incomes are removed from the regression sample in both indexes. For ESI_{sof}, these are individuals who earn less than NZD -$500,000 and more than NZD $1,000,000, while for ESI_{hlfs}, these are individuals who earn less than NZD -$400,000 and more than NZD $1,000,000.

Table 6.1: Determinants of Economic Insecurity in New Zealand

(ESI_{hlfs} vs ESI_{sof} Comparison)

	Economic Insecurity (HLFS)		Economic Insecurity (SoFIE)	
Variables	LPM	Probit	LPM	Probit
Ethnicity (Reference Category: NZ European)				
New Zealand Māori	0.093***	0.086***	0.138***	0.094***
	(0.010)	(0.009)	(0.011)	(0.008)
Pacific Peoples	0.144***	0.148***	0.189***	0.166***
	(0.015)	(0.014)	(0.022)	(0.019)
Asian	0.095***	0.092***	0.116***	0.106***
	(0.013)	(0.013)	(0.018)	(0.015)
Age Group (Reference Category: 15-24)				
25-34	0.002	-0.001	-0.095***	-0.094***
	(0.011)	(0.010)	(0.014)	(0.013)
35-44	-0.026**	-0.023*	-0.191***	-0.188***
	(0.010)	(0.009)	(0.013)	(0.012)
45-54	-0.073***	-0.066***	-0.227***	-0.220***
	(0.010)	(0.009)	(0.012)	(0.012)
55-64	-0.098***	-0.100***	-0.352***	-0.345***
	(0.010)	(0.009)	(0.011)	(0.011)
65+	-0.091***	-0.134***	-0.346***	-0.365***
	(0.009)	(0.009)	(0.011)	(0.011)
Household Income (in NZD $100,000s)	0.390***	0.278***	0.325***	0.217***
	(0.014)	(0.011)	(0.016)	(0.008)
Household Income Squared (in NZD $100,000s)	-0.031***	-0.025***	-0.014***	-0.008
	(0.005)	(0.004)	(0.003)	(0.000)
Education (Reference Category: Post-School Qualification)				
University Degree	-0.021**	-0.016**	-0.083***	-0.050***
	(0.007)	(0.006)	(0.009)	(0.006)
High School	0.001	-0.001	-0.023***	-0.022***
	(0.006)	(0.006)	(0.007)	(0.005)
No Qualification	0.014**	0.014*	0.086***	0.084***
	(0.005)	(0.005)	(0.007)	(0.006)
Relationship Status (Reference Category: With Partner)				
Relationship Ended Over ESI year	0.076***	0.068***	0.045***	0.045***
	(0.010)	(0.009)	(0.009)	(0.008)

…Table Continued on Next Page

Table 6.1 (*continued*) – Determinants of Economic Insecurity in New Zealand (ESI_{hlfs} vs ESI_{sof} Comparison)

	Economic Insecurity (HLFS)		Economic Insecurity (SoFIE)	
Variables	LPM	Probit	LPM	Probit
Region (Reference Category: Auckland)				
Waikato	0.063***	0.064***	0.133***	0.111***
	(0.008)	(0.008)	(0.010)	(0.008)
Wellington	0.023**	0.021**	0.078***	0.061***
	(0.008)	(0.007)	(0.009)	(0.007)
Rest of North Island	0.052***	0.054***	0.114***	0.093***
	(0.005)	(0.005)	(0.008)	(0.006)
Canterbury	0.051***	0.053***	0.084***	0.072***
	(0.007)	(0.007)	(0.008)	(0.006)
Rest of South Island	0.045***	0.046***	0.134***	0.112***
	(0.006)	(0.006)	(0.009)	(0.007)
Year (Reference Category: 2004)				
2005	-0.000	0.004	0.010	0.014
	(0.008)	(0.009)	(0.008)	(0.007)
2006	-0.014	-0.013	-0.072***	-0.068***
	(0.008)	(0.008)	(0.007)	(0.007)
2007	0.003	0.005	-0.010	-0.002
	(0.007)	(0.008)	(0.007)	(0.007)
2008	0.003	0.005	-0.091***	-0.087***
	(0.008)	(0.008)	(0.007)	(0.007)
2009	0.017*	0.019*	-0.028***	-0.016*
	(0.008)	(0.008)	(0.008)	(0.007)
2010	-0.006	-0.001	-0.091***	-0.079***
	(0.007)	(0.007)	(0.007)	(0.007)
Household Composition (Reference Category: Single Parent)				
Two or More Adults with Kids	-0.022**	-0.018*	-0.023	-0.014
	(0.008)	(0.007)	(0.013)	(0.009)
Two or More Adults without Kids	-0.016	-0.019*	-0.051***	-0.028***
	(0.008)	(0.008)	(0.012)	(0.008)
Single Person Household	-0.011	-0.026***	-0.060***	-0.050***
	(0.008)	(0.008)	(0.012)	(0.008)
Constant	-0.035**		0.214***	
	(0.012)		(0.017)	
Observations~	32,181	32,181	27,225	27,228
R-squared	0.161			
Number of IDs (SoFIE)~			10,368	

Robust standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

~Observations and number of IDs are randomly rounded (up or down) to the nearest multiple of three given Statistics New Zealand's rounding rule.

7. Conclusion

This paper presents an ESI for New Zealand. Economic insecurity is deemed as important to social and economic policy, since it is a phenomenon that could affect individuals from all backgrounds. This distinguishes it from the concept of poverty or even income inequality. The ESI is a novel contribution to the literature since it is the first index constructed for New Zealand that aims to integrate key characteristics of insecurity into a single measure. The main contributing factors are income volatility, medical out-of-pocket expenditures, debt servicing, housing costs and household wealth in the form of liquid financial assets, which act as a potential buffer to economic shocks. Past studies on New Zealand have largely focused solely on income volatility.

The findings of the index show that insecurity is cyclical in New Zealand, tending to increase in times of economic downturns and decrease in times of economic booms. Insecurity also closely tracked GDP growth and unemployment, suggesting that much of the changes may be involuntary and related to economic shocks. This could mean that there is a major and challenging role for policymakers to play in ensuring stability in incomes in unstable economic times. There also exist differences in insecurity amongst population subgroups. The results of LPM and GLM regressions suggest that ethnic minorities, young adults, people with no educational qualifications, single-adult households, persons whose relationships ended over the ESI year, and persons on temporary employment contracts are more likely to be insecure. The inverted U-shaped relationship between insecurity and household income suggests that the New Zealand middle class is most vulnerable to experiencing insecurity. Insecurity also varies across regions, with Auckland and Wellington being the least insecure regions and Manawatu-Wanganui being the most insecure. These results are all statistically significant.

7.1. Implications

The use of a large representative sample spanning over 20 years means that the main index can be used to make generalisations about the wellbeing of the New Zealand population which could prove vitally important to policymakers in assessing how 'at-risk' different demographic groups are to economic shocks. Hence, a key recommendation is that the ESI developed in this study be adapted by Statistics New Zealand and published

on an annual basis. This will make economic insecurity an official government statistic that could provide a powerful tool to help inform research and policy decisions.

An important feature of insecurity is that it could affect households from all backgrounds, but some population subgroups are more vulnerable to economic risk. Knowing the groups of the population that are especially vulnerable to experiencing insecurity is important in developing initiatives to help households prepare for and mitigate economic shocks. For instance, data from the ESI can help the government ascertain whether welfare support that is not necessarily based on a set of pre-determined conditions but reaches all sociodemographic groups (such as a universal basic income) could provide an appropriate safety net to maintain a stable standard of living in all economic situations.

In addition to the obvious financial instability that accompanies insecurity, it is possible that insecurity could have other harmful effects on society and potentially exacerbate social issues, such as mental illness, crime, obesity, substance abuse and domestic violence. There is overwhelming evidence in the literature to suggest that insecurity is harmful to societies. In the context of New Zealand, Clyne (2021) shows that economic insecurity worsens the mental wellbeing and general physical health of residents. More research is needed to examine these relationships in New Zealand, and this could also be another important way to include the ESI in policy analysis

Finally, the ESI as a measure of wellbeing warrants further research and improved datasets to help improve its reliability. Though the HLFS contains repeated cross-sectional data which were used to construct the main index, the lack of up-to-date, genuine panel data is not ideal. The major limitation here is that the same individuals and households are not followed over time, which takes away from the richness of the dataset. Additionally, the ESI could also be expanded to include subject measures of insecurity. Although the objective nature of the index is one of its main strengths, creating a survey of subjective measures to complement the ESI would be a useful comparison to see the objective results match the general sentiment of New Zealand residents. Economic insecurity affects individuals and households from all backgrounds; hence, having a reliable measure that could inform policy and research could help identify and protect the vulnerable in the face of the socioeconomic challenges.

Appendix A: ESI Formula (Hacker et al., 2014)

For each household, *i*, in time, *t*,

$$ESI_t = \frac{\sum L_{it}}{n_t} \ (The\ proportion\ of\ individuals\ who\ experience\ loss) \tag{A1}$$

where Loss (L), is defined as:

$$L_{it} = 1\ if\ \left(\frac{y_{it} - M_{it} - D_{it}}{e_{it}} < \left(\frac{3}{4}\right)\frac{y_{it-1} - M_{it-1} - D_{it-1}}{e_{it-1}}\right) \cap (W_{it} < W_{it}^{*}) \cap (1 - R_{it}) \tag{A2}$$

$$L_{it} = 0\ otherwise.$$

where y_i is total household income (inflation-adjusted), M_i is household out-of-pocket medical spending and D_i is annual household debt service burden. e_i represents a family size equivalence scale, which gives less weight to children than adults and assumes a concave relationship between household size and needs: $e_i = [0.7(\text{children}_i) + 1(\text{adults}_i)]^{0.7}$. *($W_{it} < W_{it}^*$)* and *($1 - R_{it}$)* are dichotomous indicators. *($W_{it} < W_{it}^*$)* is an indicator for "*lacking* sufficient financial wealth" and *($1 - R_{it}$)* is an indicator for "*not* transitioning into retirement".

Appendix B: Raw Economic Insecurity Estimates for New Zealand

Table B1: Probability of a 25 percent drop in household income for subgroups of the New Zealand population (1999 to 2021)

Variables[31]	Economic Insecurity
New Zealand Long-Run Total (1999-2021)	0.1164
Year: 1999	0.1030
Year: 2000	0.1156
Year: 2001	0.1081
Year: 2002	0.1086
Year: 2003	0.1079
Year: 2004	0.0933
Year: 2005	0.0876
Year: 2006	0.0814
Year: 2007	0.1165
Year: 2008	0.1259
Year: 2009	0.1414
Year: 2010	0.1290
Year: 2011	0.1163
Year: 2012	0.1394
Year: 2013	0.1182
Year: 2014	0.1159
Year: 2015	0.1143
Year: 2017	0.1137
Year: 2018	0.1014
Year: 2019	0.1183
Year: 2020	0.1360
Year: 2021	0.1110
Ethnicity: European / Pākehā	0.0973
Ethnicity: Māori	0.1936
Ethnicity: Pacific Peoples	0.2367
Ethnicity: Asian	0.1774
Ethnicity: Male	0.1121
Ethnicity: Female	0.1199
Age: 15-24	0.1927
Age: 25-34	0.2093
Age: 35-44	0.1636
Age: 45-54	0.1339
Age: 55-64	0.0730
Age: 65+	0.0170

….Table continues on next page

[31] Estimates for Urban/Rural and Industry are for the period 2003-2021.

Table B1 (*continued):* Probability of a 25 percent drop in household income for subgroups of the New Zealand population (1999 to 2021)

Variables	Economic Insecurity
Income Quintile 1[32]	0.0310
Income Quintile 2	0.0403
Income Quintile 3	0.0872
Income Quintile 4	0.1367
Income Quintile 5	0.2822
Education: University Degree	0.1409
Education: Post School Qualification	0.1173
Education: High School	0.1236
Education: No Qualification	0.0910
Relationship Status: Partnership Ended Over ESI year	0.1992
Relationship Status: Did Not Lose Partner Over ESI year	0.1094
Region: Northland	0.0964
Region: Auckland	0.1171
Region: Waikato	0.1384
Region: Bay of Plenty	0.1122
Region: Gisborne/Hawke's Bay	0.1242
Region: Taranaki	0.1275
Region: Manawatu / Wanganui	0.1238
Region: Wellington	0.1271
Region: Nelson / Tasman / Marlborough / West Coast	0.0716
Region: Canterbury	0.1122
Region: Otago	0.1081
Region: Southland	0.1265
Household Composition: Single Parent Household	0.1113
Household Composition: Two or More Adults with Kids	0.1430
Household Composition: Two or More Adults without Kids	0.1077
Household Composition: Single Person Household	0.1000
Full-Time Employment	0.1732
Part-Time Employment	0.1277
Labour Force Status: Employed	0.1416
Labour Force Status: Unemployed	0.1118
Labour Force Status: Not in Labour Force	0.0545
Urban Areas	0.1163
Rural Areas	0.1317
Industry: Agriculture, Fishing and Forestry	0.1959
Industry: Mining	0.2095
Industry: Manufacturing	0.1604
Industry: Electric, Gas, Water and Waste Services	0.1506

….Table continues on next page

[32] Quintile 1 represents the lowest quintile, while quintile 5 represents the highest.

Table B1 (*continued):* Probability of a 25 percent drop in household income for subgroups of the New Zealand population (1999 to 2021)

Variables	Economic Insecurity
Industry: Construction	0.1901
Industry: Wholesale Trade	0.1477
Industry: Retail Trade	0.1606
Industry: Accommodation and Food Services	0.2112
Industry: Transport, Postal and Warehousing	0.1658
Industry: Information Media and Telecommunications	0.1707
Industry: Financial and Insurance Services	0.1721
Industry: Rental, Hiring & Real Estate Services	0.1758
Industry: Professional, Scientific and Technical Services	0.1752
Industry: Administrative and Support Services	0.1388
Industry: Public Administration and Safety	0.1393
Industry: Education and Training	0.1292
Industry: Health Care and Social Assistance	0.1319
Industry: Arts and Recreation Services	0.1700
Industry: Other Services	0.1479
Industry: Not Elsewhere Included	0.2234

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An Economic Security Index (ESI) for New Zealand: A Descriptive Analysis

Dawnelle V. Clyne & Trenton G. Smith

DATA SUPPLEMENT

This data supplement (i) presents further information on the Integrated Data Infrastructure (IDI) and the datasets used in the construction of the Economic Security Index (ESI) for New Zealand, (ii) discusses the methodology underlying the construction of the variables used in the ESI formula, and (iii) presents the characteristics of the sample and the full regression results for the determinants of economic insecurity. The information provided in this supplement regarding IDI data is from Statistics New Zealand's user guides and data dictionaries for the various surveys, unless other sources are explicitly cited.

Disclaimer

Access to the data used in this study was provided by Stats NZ under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the author, not Stats NZ or individual data suppliers.

These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Stats NZ. For more information about the IDI, please visit https://www.stats.govt.nz/integrated-data/.

Appendix C: The Integrated Data Infrastructure (IDI)

The datasets used in the construction of the ESI for New Zealand were provided by Statistics New Zealand through their Integrated Data Infrastructure (IDI). The IDI is a large research database that holds micro-level data about individuals and households, all sampled on a statistically representative basis, from rural and urban areas across New Zealand. The data in the IDI are de-identified, meaning that identifying information, such as names, addresses and dates of birth, have been removed. There are encrypted identifiers for each individual or household that are common across all datasets in the IDI, which make it easy to link records that belong to the same person or household unit using variables they have in common. The data are continually being updated by Statistics New Zealand. This study uses data from the *March 2022 refresh*, the latest data available in the IDI at the time of writing.

Appendix D: Supplemental Material for the Main ESI (HLFS and HES)

The datasets of interest for the main ESI are the Household Labour Force Survey (HLFS), which includes the New Zealand Income Survey (NZIS) (the income supplement), and the Household Economic Survey (HES). Descriptions of these datasets are presented in Section 4 in the main body of the paper. This section contains additional information on these surveys, including a discussion of their advantages and disadvantages (Section D1), a discussion of attrition rates in NZIS (Section D2) and detailed descriptions of the components of the ESI (Section D3).

D1. The Advantages and Disadvantages of HLFS and HES

The HLFS is a repeated cross-sectional survey, while the HES contains cross-sectional data. Each survey has its advantages and limitations when considering the design of the ESI, but they are deemed to be the best available options for this study on New Zealand. A major advantage of HLFS being a repeated cross-section is that such surveys have less of the usual problems associated with panel data, such as attrition and non-response (Verbeek, 2008). The NZIS supplement is particularly useful for exploring

income volatility since income can be matched from one year to the next. Since the HES contains demographic information on all the data relevant to the ESI design but which is lacking in the HLFS, these data can be matched to the HLFS data using their demographic information.

A major limitation of both the HLFS and the HES is that they are not genuine panel surveys. Their cross-sectional natures mean that the same individuals and households are not followed over time (maximum of two years in HLFS) making it impossible to include the respondents' histories in our analyses. Moreover, the HLFS and HES contain largely different households making matching of key variables derived from HES dependent on demographic information rather than household identifiers. The demographic data used for matching cover all HES years and a description of the matching process is covered in Section D3. The HES sample is also a much smaller dataset than the HLFS, so there could be much variability across households.

D2. NZIS Response Rates

Attrition is a common and expected methodological problem in longitudinal studies which can lead to potentially biased results. Individuals drop out from panels for a variety of reasons and this could degrade the generalisability of the results if the respondents who drop out are different from those who remain (Gustavson et al., 2012). Although the HLFS is not a pure longitudinal dataset, it does contain repeated cross-sectional data over eight consecutive quarters that could suffer from attrition.

The attrition rates for each NZIS wave are presented in Table D1. Since the NZIS is run over two consecutive June quarters of the HLFS for each household, the original sample members (OSMs) are considered to be the households that responded to the income supplement in the first June quarter for their respective ESI year. Hence, the attrition rate reported in this section will differ from that of the full HLFS sample. It is important to note that Statistics New Zealand routinely imputes income values for households with missing values in the NZIS. These imputed incomes are excluded from the study sample.[1] For comparison purposes, attrition rates are reported both inclusive

[1] For details on Statistics New Zealand's imputation process, please see *Household Labour Force Survey sources and methods: 2016*, available from www.stats.govt.nz.

and exclusive of imputed incomes. As expected, removing imputed incomes worsens attrition in each ESI year. [2]

Table D1: NZIS Attrition Rates by Year

		Including Imputed Incomes			Excluding Imputed Incomes		
ESI Year	Year Range	OSMs (Wave 1)	OSMs (Wave 2)	Attrition Rate	OSMs (Wave 1)	OSMs (Wave 2)	Attrition Rate
1999	1998-1999	2,949	2,940	0%	2,562	2,238	13%
2000	1999-2000	2,826	2,805	1%	2,454	2,115	14%
2001	2000-2001	6,147	6,081	1%	5,235	4,533	13%
2002	2001-2002	6,222	6,153	1%	5,325	4,647	13%
2003	2002-2003	6,621	5,547	16%	5,697	4,167	27%
2004	2003-2004	6,210	4,686	25%	5,472	3,519	36%
2005	2004-2005	5,970	4,539	24%	5,133	3,333	35%
2006	2005-2006	5,814	4,467	23%	5,070	3,315	35%
2007	2006-2007	5,604	5,412	3%	4,503	3,999	11%
2008	2007-2008	8,976	5,853	35%	8,037	4,362	46%
2009	2008-2009	8,583	5,658	34%	8,073	4,377	46%
2010	2009-2010	8,802	5,859	33%	8,193	4,431	46%
2011	2010-2011	8,976	5,892	34%	8,199	4,353	47%
2012	2011-2012	9,024	5,988	34%	8,364	4,419	47%
2013	2012-2013	8,715	5,775	34%	7,977	4,362	45%
2014	2013-2014	8,559	5,742	33%	8,049	4,461	45%
2015	2014-2015	9,354	5,985	36%	8,877	4,872	45%
2018	2017-2018	8,295	5,850	29%	7,869	4,926	37%
2019	2018-2019	8,487	6,060	29%	8,115	5,130	37%

**As per Statistics New Zealand's output rules, all counts are randomly rounded (up or down) to the nearest multiple of three.*

D3. Components of the ESI

This section outlines the specific variables used in the construction of the ESI. All variables are estimated using sample weights provided by Statistics New Zealand, which use integrated weighing for each survey to improve the robustness and accuracy of the survey estimates. These integrated weights reduce bias by ensuring that the estimates are nationally representative by adjusting statistical output to match population

[2] Attrition rates for the 2016 ESI year could not be calculated due to the 2016 redevelopment of the HLFS. Moreover, please note that very low attrition rates in earlier ESI years are due to the nature of the datasets provided by Statistics New Zealand. Some pre-2007 data were prepared by Statistics New Zealand for use by other government agencies and have already removed a large proportion of the households that were not matched over two years.

benchmarks that account for the underrepresentation of specified population groups. Both the HES and the HLFS include a '*FinalWgt*' variable which is the final weight that is used to produce outputs using micro data from Statistics NZ. It is set to '0' for individuals under 15 and for people out of scope. Respondents are considered to be 'out of scope' if they are deceased, have moved overseas for at least one year or have permanently moved into certain institutions. The weights allow for consistent estimation at both individual and household levels. Sections D3.1 to D3.8 provide descriptions and notes on the construction of each variable used in the ESI's construction.

D3.1 Annual Real Household Income (y_i)

The data used in the calculation of total annual real household income *(y_i)* are from the NZIS. The variable is the sum of gross weekly household income earned by all individuals in the household, aged 15 and over, from all income sources in the income module. Hence, every individual within a household will have the same value for total household income. Household income includes wage and salary income from employment, self-employment income, Accident Compensation Corporation (ACC) payments, other transfer payments (excluding ACC), private insurance payments, NZ superannuation and veteran pension, private superannuation or pension, student allowances and training benefit, and family support payments. Investment income is excluded by Statistics New Zealand due to confidentiality constraints. Net income would be preferred to have a more accurate estimate of each household's after-tax earnings; however, these data are unavailable and are tricky to estimate.

These income data are collected in the NZIS in the June quarter of each year. Only households that provided income data in both years of the survey are kept in the sample as this is required to calculate the probability of a 25 percent decline in household income from one year to the next. Zero values and negative income are both kept in the dataset for the analysis. A zero value signifies that the respondent did not receive income from any source in the reporting period, while negative income values could be reported by self-employed individuals if they experience a net loss of income. Negative income values accounted for less than 0.01 percent of the sample and did not have a large impact on the ESI results.

Since the weekly household income figures reported are for the reporting periods that correspond with the income module, they do not capture any changes in the price level, i.e., they are not inflation-adjusted. To adjust for the effects of inflation, CPI figures are sourced from the Reserve Bank of New Zealand (2022). The percentage change in the CPI statistics is used as a measure of inflation which is then used to calculate real household incomes for all New Zealand households included in the survey. The base year is 2017, June quarter.

D3.2 Annual Debt Service Burden (D_i)

The annual debt service burden variable represents the annual amount required to cover both the interest and principal on a debt for a given year. Annual debt service burden data are computed using household expenditure data in the HES. The variable used is the sum of credit card interest payments, personal loan payments and other miscellaneous debt (for example, debt service on sports or recreational equipment) accumulated by households. These data are cross-sectional and are available on a yearly basis by combining data from the full three-yearly HES survey and the mini (reduced) yearly HES supplement, which is run in the years in between the full HES. Since the debt service data are from the HES and had to be used in conjunction with HLFS data to construct the ESI, it was not possible to match by household ID as there are largely different households surveyed in the HES and the HLFS. In order to overcome this problem, the debt service burden data from HES are matched to the respondents in the HLFS dataset using demographic characteristics that are common to both datasets.

For the matching process, the HES dataset, which contains the variable of interest (derived debt service), was first appended to the HLFS dataset. Debt service was then regressed on observed demographic characteristics common to both datasets. Stata's *predict* command was run in postestimation to create a new variable containing "predicted values" of debt service burden for all possible observations in the HLFS dataset, whether they were used in fitting the model or not. After debt service statistics were estimated for each household in each survey year, the HES data were then dropped from the ESI master data. The linear regression specification for the matching process takes the form:

$$Debt\ Service_{it} = \beta_0 + \beta_1 X_{it} + \varepsilon_{it} \quad \text{(D1)}$$

where $Debt\ Service_{it}$ represents the annual debt service burden for household, i, in time, t, X_{it} is a vector of demographic characteristics (ethnicity, age, gender, region, education, income and relationship status) and ε_{it} is the error term. The predicted values for annual debt service burden were then used in the calculation of each household's insecurity.

All other variables that are derived from the HES dataset are matched to the HLFS master dataset using this same process. Hence, this matching process holds for the derivation of MOOP expenses, housing costs and savings (proxy for liquid financial wealth - $(W_{it} < W_{it}^{*})$).

D3.3 Medical out-of-pocket Expenses (M_i)

New Zealand has a mixed public-private healthcare system. About 80 percent of total healthcare expenditure is funded by the New Zealand government and about 18 percent is out-of-pocket health expenditure, including voluntary private health insurance (PHI) (Ministry of Health, 2016; Organisation for Economic Co-operation and Development, 2017). Government spending on healthcare represents about 11 percent of GDP, while out-of-pocket medical spending represents about 2.2 percent of household consumption (Organisation for Economic Co-operation and Development, 2017). As a result of such large public funding, the majority of the New Zealand population receives healthcare services provided by the public health system. There can be long wait times in the public system so, for convenience, some households voluntarily choose to pay out of pocket for private healthcare. It is estimated that about 35 percent of adults and about 28 percent of children are covered by PHI in New Zealand (Ministry of Health, 2016). For these reasons, it is assumed that any income shocks associated with MOOP could have a strong effect on household insecurity in New Zealand, but the effects may be significantly less in magnitude than it is for the United States.

The MOOP expenses data were computed using household expenditure data in the HES. MOOP represents the annual sum of all medical and other healthcare-related expenses by New Zealand households. As with the other HES-derived variables, MOOP expenses were estimated by using the same procedure outlined in Section D3.2. The linear regression specification for the matching process takes the form:

$$MOOP_{it} = \beta_0 + \beta_1 X_{it} + \varepsilon_{it} \quad \text{(D2)}$$

where $MOOP_{it}$ represents the annual medical out-of-pocket expenses for household, *i*, in time, *t*, and all the independent variables are the same as in Equation (D1).

D3.4 Housing Costs (H_i)

Housing costs are a unique addition to the economic insecurity formula. They are deemed an important inclusion since they represent the largest proportion of household expenditures in New Zealand (Statistics New Zealand, 2020). For the year ended June 2021, ~30 percent of renters and ~21 percent of homeowners with mortgages spent more than 40 percent of their disposable household income on housing costs (Statistics New Zealand, 2022). The housing costs variable comprises of all expenses related to owning and renting property that are available in the HES. This is the sum of mortgages, rent, property rates, building-related insurance, household maintenance costs, household operations costs, domestic fuel costs, power costs and other property costs.

The housing costs data are computed using household expenditure data in the HES. As with the other HES-derived variables, housing costs are estimated by using the same procedure outlined in Section D3.2. The linear regression specification for the matching process takes the form:

$$Housing\ Costs_{it} = \beta_0 + \beta_1 X_{it} + \varepsilon_{it} \quad \text{(D3)}$$

where $Housing\ Costs_{it}$ represents the annual housing costs for household, *i*, in time, *t*, and all the independent variables are the same as in Equation (D1).

D3.5 Family Size Equivalence Scale (e_i)

In the ESI calculation, the indicator e_{it} is used to represent a family size equivalence scale. Equivalised annual household income gives different weightings to each household member in order to account for variation in resource requirements. The equivalence scale used gives less weight to children and each subsequent adult after the

head of the household. The rationale for this is that as a household expands, the resource needs of each additional member increases, but not in a proportional way (Organisation for Economic Co-operation and Development, 2013). This is due to economies of scale in consumption as household size increases. Not only does the size of the household matter, but so does the composition. For instance, ceteris paribus, a three-person household that comprises of two adults and one child will likely have greater resource needs than a three-person household with one adult and two children for the two households to have comparable standards of living. This is because children generally consume less than adults. Hence, it is important to use an equivalisation technique to adjust for both household size and composition.

There are several different methods available for equivalisation. Martin (2017) recommends that the equivalence scale chosen should depend on a country's welfare system. The assumption is that the more expenses that are covered by the welfare system, the less the economic burden would be on households. For this reason, we veer away from the equivalisation method used in Hacker et al. (2014). In Hacker et al.'s 2014 paper, the authors employ the NAS-recommended equivalence scale in their insecurity formula, where [$\boldsymbol{e_{it}}$ = ((0.7*children$_i$) + (adults$_i$))$^{0.7}$]. The NAS-recommended equivalence scale for the poverty line adjusts household income to give less weight to children assuming a concave relationship between the size of the household and their needs (Hacker et al., 2014). Our study uses the OECD-modified equivalence scale, where [$\boldsymbol{e_{it}}$ = ((1*first adult$_i$) + (0.5*additional adults$_i$) + (0.3* children$_i$))]. The OECD-modified equivalence scale, first proposed by Hagenaars et al. (1994), has become an international standard and is the technique recommended by Statistics New Zealand (2019) in the measurement of child poverty.

One of the main reasons for using the OECD-modified equivalisation technique is the setup of New Zealand's healthcare system. Since the majority of New Zealanders' healthcare expenses is publicly funded, it is assumed that MOOP expenses, which includes doctor's/dentist's fees, hospital fees and prescription drugs, have less of an effect on the economic security of New Zealanders compared to that of Americans. The NAS-recommended equivalence scale specifically recommends the incorporation of MOOP expenses in determining poverty, since healthcare spending reduces disposable income (Burtless & Siegel, 2001; Citro & Michael, 1995; Hacker et al., 2014) and could represent a significant part of household expenditure in the United States. In addition to healthcare

being subsidised in New Zealand, tertiary education is also partially covered by the New Zealand government. Since healthcare expenses and higher education are subsidised by the New Zealand government, the cost of subsequent adults and children in New Zealand households is assumed to be lower than in the United States. Hence, the decision was made to use the OECD-modified equivalence scale as the main equivalisation technique.

A comparison of the NAS-recommended equivalence scale and the OECD-modified equivalence scale is presented in Table D2.

Table D2: Comparison of OECD-Modified Equivalence Scale and NAS-Recommended Equivalence Scale by Household Composition

Household Size	**Equivalence Value**	
	OECD-Modified Scale	NAS-Recommended Scale
First Adult/Household Head	1.0	1.0
Second and Each Subsequent Adult	0.5	1.0
Each Child Aged Under 14 (NAS)/ Under 15 (OECD)	0.3	0.7

Source: Adapted from Hacker et al. (2014) and Eurostat (2018).

Notes on deriving household composition for the computation of the OECD-Modified Equivalence Scale

This study uses the OECD-modified equivalisation technique in estimating economic insecurity, where [e_{it} = ((1*first adult$_i$) + (0.5*additional adults$_i$) + (0.3* children$_i$))]. Since data on the number of adults and the number of children in each household unit are not explicitly available in the IDI, these figures had to be imputed from a *household type* variable in order to calculate the family size equivalence scale. The *household type* variable breaks down New Zealand households by either couples or single parents, and is then further broken down by number of dependent and adult children based on age and labour force status. It also identifies if there are any 'other' people living in the household who are unrelated (non-family members). Single-person households are also identified. Using this information, we are able to construct variables for the number of children and the number of adults per household by making a few assumptions.

Firstly, the assumption is made that the average New Zealand woman gives birth to two children. This figure is computed using fertility data from Statistics New Zealand (2021) for which the average fertility rate between 1998 and 2020 is found to be 1.96. Hence, when deriving household composition variables for this study, the number of children is capped at two per household if the number of children is unspecified and is capped at four per household when the description specifies "three or more dependent children". This assumption holds for households with both dependent children (aged under 15 years) and adult children living in the same household.

The second assumption is that "other" people (i.e., unrelated/non-family members) would be capped at one adult. Additionally, single-person households will be classified as containing one adult, dependent children are classified as "children" and adult children (15 years and over) are classified as "adults".

D3.6 Indicator for "Lacking Sufficient Financial Wealth" ($W_{it} < W_{it}^{*}$)

Savings is the proportion of household income not spent on current expenditures, i.e., deferred consumption (Le et al., 2010). It is an important part of the insecurity calculation since its high liquidity means that it reduces insecurity. The indicator used for "*lacking* sufficient financial wealth" ($W_{it} < W_{it}^{*}$) is proxied by household savings and is estimated using net worth data from the HES. Since this represents households' buffering capacity for income shocks, only liquid financial assets are considered as savings. The rationale is that these can be readily accessed without having to convert non-liquid assets (such as property, vehicles or jewellery) to cash and without losing any use value.

Since household savings rates for New Zealanders are not routinely collected in the HES or the HLFS, household annual savings data were computed using the HES Net Worth Supplement for 2014/2015 and 2017/2018 HES years. This is the only dataset available from Statistics New Zealand that can be used to obtain a measure of liquid financial assets consistent with the definition used in this study. Each household's precautionary savings figure was calculated using several categories of household financial assets available in the HES net worth supplement that have high use value (high liquidity). It represents the sum of deposits and any other cash or currency held by each household. The specific components of household savings are presented in Table D3. As with the other HES-derived variables, savings are estimated by using the same procedure

outlined in Section D3.2. The linear regression specification for the matching process takes the form:

$$Savings_{it} = \beta_0 + \beta_1 X_{it} + \varepsilon_{it} \quad \text{(D4)}$$

where $Savings_{it}$ represents the annual savings for household, *i*, in time, *t*, and all the independent variables are the same as in Equation (D1).

Table D3: Components of Household Savings (*Liquid Financial Wealth*)

Currency	
1	Prepaid foreign currency travel cards worth at least NZ $1,000 in total.
2	Travellers cheques worth at least NZ $1,000 in total in any currency.
3	Gift vouchers worth at least NZ $1,000 in total.
4	Over NZ $1,000 in any currency that is not held in a bank.
Deposits	
5	Deposits with banks or other financial institutions that have generated income.
6	Deposits with banks or other financial institutions that have not generated income.
7	Deposits with a mixture of financial institutions that have not generated income.
8	Bonus bonds worth at least NZ $1,000 in total.

The ($W_{it} < W_{it}^{*}$) indicator used in this study differs from the one outlined in Hacker et al.'s paper. According to Hacker et al. (2014), an "adequate financial safety net" is defined as liquid financial wealth sufficient to cover a 25 percent drop in income based on the median recovery path (time and magnitude) for a typical individual with similar characteristics. Since the data used to compute precautionary savings are available on a cross-sectional basis only, we are unable to observe the duration of time it takes individuals with similar characteristics and with similar magnitudes of income loss to return to their original income after a large income loss. For the purpose of this study, the definition of "adequate financial safety net" is therefore simplified to 'liquid financial wealth sufficient to cover at least a 25 percent drop in household income for a given year'. W and W* are redefined as follows:

W = available liquid financial assets (precautionary savings)

W = minimum liquid financial assets required to cover at least a 25 percent loss in income*

D3.7 Indicator for "Not Transitioning into Retirement" (1 - R_{it})

The indicator for "not transitioning to retirement" is constructed using HLFS data. This is an indicator variable coded as "0" and "1". "1" represents a "retirement event" which establishes whether the household head transitioned to retirement in the ESI year. In the construction of the ESI, if a household experienced a 25 percent fall in household income in an ESI year which coincides with the household head transitioning to retirement, then that household is not counted as insecure. This is because a fall in income is expected when an individual transitions away from the workforce.

In the context of this study, an individual transitions to retirement if two conditions are met: (1) they are aged 65 or over in the ESI year, and (2) the number of hours worked declines from a positive number (>10 hours) to 10 hours or less over the ESI year. This definition of retirement is adopted since retirement data are not routinely collected by Statistics New Zealand and there is currently no official retirement age in New Zealand. This means that New Zealand residents can retire before or after the age of 65, aside from a few exceptions where retirement age is written into law, for example, coroners and judges. Nonetheless, the New Zealand Government's website states that many people stop working around the age of 65 which coincides with the beginning of New Zealand's superannuation and other forms of pension payments (New Zealand Government, 2020); hence, the choice of age 65 as the minimum for a retirement event.

D3.8 Notes on Ethnic Groups Classifications

Respondents are grouped into four ethnic groups for this study. They are described as follows:

(1) **New Zealand European / Pākehā** - Persons who identify as being of full European descent.

(2) **New Zealand Māori** - Persons who identify as Māori or persons who are of mixed descent that includes Māori.

(3) **Pacific peoples / Pacifika** - All Pacific peoples and persons who are of mixed descent that includes Pacifika, but excludes New Zealand Māori

(4) **Asian** - Persons who identify as Asian and who are of mixed descent that includes Asian, but excludes Māori and Pacifika.

Households that identify as multi-ethnic or mixed, but do not fall into one of the four categories outlined above, are captured by the "other" ethnic category, which was dropped from the analysis due to the small sample size of this group.

Appendix E: Supplemental Material for the Secondary ESI (SoFIE)

This section provides details of the Survey of Family, Income and Employment (SoFIE) dataset, which was used to construct a second version of the ESI for New Zealand. SoFIE collected information on the economic well-being of households over time focusing on areas such as employment, income, net worth and household/family circumstances. SoFIE followed the same individuals over eight waves from October 2002 to September 2010. Data are collected on an annual basis, with each interview cycle (wave) conducted from October to September each year. It is a regional survey and consists of approximately 22,000 individuals in 11,500 households and 7,500 children aged under 15 years. The target population for the first wave is the usually resident population living in private dwellings in the North and South Islands (including Waiheke Island, but excluding other offshore islands) during the year ended 30 September, 2003. "Eligible" respondents in wave 1 were all individuals who Statistics New Zealand attempted to survey, whether they got a response or not. These are referred to as the original sample members (OSMs). For subsequent waves, people who were no longer available (e.g., individuals who moved overseas, died or moved into institutions) were no longer considered eligible. Hence, the original target population consistently declined with each wave. SoFIE also contains a health supplement in waves 3, 5 and 7, and information about assets and liabilities in waves 2, 4, 6 and 8.

E1. Response Rates

The response rates for each SoFIE wave are presented in Table E1. Approximately 63 percent of OSMs responded in every wave. Attrition rates were particularly high for Māori and Pacific peoples, single parents, young people and low income individuals (Carter et al., 2010; Carter & Gunasekara, 2012). SoFIE's attrition rate appears to be as expected since studies have found it to be comparable to other international longitudinal

studies such as the British Household Panel Survey (BHPS) (~69 percent) and the Household Income and Labour Dynamics in Australia Survey (HILDA) (~67 percent) (Buck et al., 2006; Carter & Gunasekara, 2012; Carter et al., 2014; Wilkins et al., 2011). Sample weights were provided by Statistics New Zealand to account for attrition.

E2. Removed Responses

In addition to attrition, this study is dealing with a more recent methodological problem. A large proportion of the SoFIE data were removed by Statistics New Zealand in April 2018 due to confidentially issues. The removed data were of all the respondents (and their children) who did not consent to have their data linked to their health records. Table E1 presents a breakdown of the removed data. When this data removal is accounted for, in addition to attrition, only ~48 percent of OSMs responded in all eight waves. The removed data creates a sample selection problem for my analysis that could potentially lead to bias in the results. Unfortunately, since there are no other longitudinal data available through Statistics New Zealand that is appropriate for this analysis, we decided to proceed with the study on the assumption that the non-consenters are a random subgroup of respondents since the removal was apparently not based on any particular set of observable or unobservable characteristics. Hence, the removed responses are treated as attrition. Sample weights were not revised since the large data removal, so weights are not employed for this analysis.

Table E1: SoFIE Response Rates Before and After Data Removal, Waves 1-8.[3]

	Responses Before Data Removal				Responses After Data Removal			
SoFIE Wave	**Children**	**Adults**	**Total**	**Remaining OSMs**	**Children**	**Adults**	**Total**	**Remaining OSMs**
1	7,520	22,270	29,790	100%	5,700	18,200	23,900	80%
2	6,095	20,420	26,515	89%	4,500	16,300	20,800	70%
3	5,160	19,260	24,420	82%	3,600	15,100	18,700	63%
4	4,510	18,470	22,980	77%	3,100	14,500	17,600	59%
5	3,910	17,870	21,780	73%	2,700	14,000	16,700	56%
6	3,335	17,345	20,680	69%	2,300	13,600	15,900	53%
7	2,830	16,825	19,655	66%	2,000	13,200	15,200	51%
8	2,440	16,210	18,650	63%	1,700	12,700	14,400	48%

[3] Response rates before data removal sourced from Carter et al. (2014). Response rates after data removal are rounded to the nearest 100 given Statistics New Zealand's rounding rule.

Appendix F: Characteristics of the Sample

Table F1: Descriptive Statistics

Variables	Mean	Std. Dev.
Insecurity	0.1164	0.3290
Household Income (NZD $)	64546.72	61192.72
Equivalised Household Income (NZD $)	44947.13	40414.63
Debt Service (NZD $)	765.18	233.57
Medical Out-of-Pocket Expenses (NZD $)	288.23	66.45
Housing Costs (NZD $)	4023.49	1668.98
Savings (NZD $)	28850.65	22333.48
Ethnicity: European / Pākehā	0.6587	0.4742
Ethnicity: Māori	0.0915	0.2884
Ethnicity: Pacific Peoples	0.0365	0.1874
Ethnicity: Asian	0.0679	0.2515
Ethnicity: Male	0.4121	0.4922
Ethnicity: Female	0.4686	0.4990
Age	47.30	19.05
Age: 15-24	0.1146	0.3185
Age: 25-34	0.1510	0.3581
Age: 35-44	0.1547	0.3616
Age: 45-54	0.1413	0.3484
Age: 55-64	0.1304	0.3367
Age: 65+	0.3079	0.4616
Region: Northland	0.0349	0.1836
Region: Auckland	0.2674	0.4426
Region: Waikato	0.0851	0.2790
Region: Bay of Plenty	0.0578	0.2334
Region: Gisborne/Hawke's Bay	0.0417	0.2000
Region: Taranaki	0.0236	0.1519
Region: Manawatu / Wanganui	0.0497	0.2174
Region: Wellington	0.0998	0.2998
Region: Nelson / Tasman / Marlborough / West Coast	0.0371	0.1891
Region: Canterbury	0.1169	0.3213
Region: Otago	0.0458	0.2089
Region: Southland	0.0208	0.1426
Education: University Degree	0.1840	0.3875
Education: Post School Qualification	0.2836	0.4507
Education: High School	0.1962	0.3971
Education: No Qualification	0.2114	0.4083
Relationship Status: No Partner	0.3948	0.4888
Relationship Status: With Partner	0.4853	0.4998
Relationship Status: Lost Partner Over ESI year	0.0272	0.1627
Relationship Status: With Partner	0.9728	0.1627
Observations		330,261

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Table F1 (*continued*): Descriptive Statistics

Variables	Mean	Std. Dev.
Household Composition: Single Parent Household	0.1012	0.3016
Household Composition: Two or More Adults with Kids	0.2696	0.4438
Household Composition: Two or More Adults without Kids	0.2681	0.4430
Household Composition: Single Person Household	0.2417	0.4281
Labour Force Status: Employed	0.4725	0.4992
Labour Force Status: Unemployed	0.0224	0.1480
Labour Force Status: Not in Labour Force	0.2299	0.4208
Full-time Employment	0.3409	0.4740
Part-time Employment	0.0965	0.2953
Year: 1998	0.0341	0.1815
Year: 1999	0.0345	0.1824
Year: 2000	0.0359	0.1861
Year: 2001	0.0362	0.1868
Year: 2002	0.0367	0.1881
Year: 2003	0.0346	0.1827
Year: 2004	0.0351	0.1839
Year: 2005	0.0354	0.1848
Year: 2006	0.0624	0.2418
Year: 2007	0.0428	0.2025
Year: 2008	0.0432	0.2033
Year: 2009	0.0434	0.2037
Year: 2010	0.0443	0.2057
Year: 2011	0.0442	0.2055
Year: 2012	0.0448	0.2068
Year: 2013	0.0445	0.2063
Year: 2014	0.0452	0.2077
Year: 2015	0.0462	0.2100
Year: 2016	0.0407	0.1976
Year: 2017	0.0416	0.1996
Year: 2018	0.0423	0.2012
Year: 2019	0.0439	0.2048
Year: 2020	0.0443	0.2058
Year: 2021	0.0438	0.2047
Observations		330,261

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Table F1 (*continued*): Descriptive Statistics

Variables	Mean	Std. Dev.
Urban	0.6692	0.4705
Rural	0.0976	0.2968
Industry: Agriculture, Fishing and Forestry	0.0313	0.1741
Industry: Mining	0.0013	0.0359
Industry: Manufacturing	0.0523	0.2227
Industry: Electric, Gas, Water and Waste Services	0.0035	0.0589
Industry: Construction	0.0398	0.1954
Industry: Wholesale Trade	0.0209	0.1431
Industry: Retail Trade	0.0456	0.2086
Industry: Accommodation and Food Services	0.0222	0.1475
Industry: Transport, Postal and Warehousing	0.0198	0.1394
Industry: Information Media and Telecommunications	0.0082	0.0901
Industry: Financial and Insurance Services	0.0149	0.1213
Industry: Rental, Hiring & Real Estate Services	0.0188	0.1358
Industry: Professional, Scientific and Technical Services	0.0375	0.1900
Industry: Administrative and Support Services	0.0192	0.1371
Industry: Public Administration and Safety	0.0318	0.1756
Industry: Education and Training	0.0363	0.1871
Industry: Health Care and Social Assistance	0.0447	0.2065
Industry: Arts and Recreation Services	0.0068	0.0823
Industry: Other Services	0.0157	0.1243
Industry: Not Elsewhere Included	0.0015	0.0389
Observations		330,261

**All counts are randomly rounded (up or down) to the nearest multiple of three given Statistics New Zealand's rounding rule.*

Appendix G: Determinants of Economic Insecurity in New Zealand (HLFS Full Regressions)

Table G1: Determinants of Economic Insecurity in New Zealand (HLFS Full)

	Economic Insecurity (OLS)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Ethnicity (Reference Category: NZ European)										
New Zealand Maori	0.093**	0.093**	0.068*	0.093*	0.088*	0.086*	0.082*	0.092**	0.092**	0.090**
	(0.032)	(0.032)	(0.027)	(0.036)	(0.036)	(0.035)	(0.035)	(0.034)	(0.034)	(0.034)
Pacific Peoples	0.141***	0.141***	0.107**	0.133**	0.130**	0.126**	0.150***	0.154***	0.154***	0.156***
	(0.037)	(0.037)	(0.034)	(0.043)	(0.043)	(0.043)	(0.042)	(0.041)	(0.041)	(0.041)
Asian	0.077**	0.077**	0.041	0.049	0.060	0.058	0.077*	0.090*	0.090*	0.092*
	(0.029)	(0.029)	(0.027)	(0.038)	(0.037)	(0.037)	(0.037)	(0.036)	(0.036)	(0.036)
Gender (Reference Category: Male)										
Female		0.005	0.014	0.021	0.022	0.022	0.023	0.023	0.022	0.022
		(0.027)	(0.019)	(0.030)	(0.029)	(0.029)	(0.029)	(0.028)	(0.028)	(0.028)
Age Group (Reference Category: 15-24)										
25-34			0.024	0.007	0.014	0.012	0.011	0.011	0.015	0.015
			(0.020)	(0.031)	(0.030)	(0.030)	(0.030)	(0.029)	(0.028)	(0.027)
35-44			-0.016	-0.026	-0.019	-0.023	-0.023	-0.024	-0.019	-0.015
			(0.020)	(0.031)	(0.030)	(0.030)	(0.030)	(0.029)	(0.029)	(0.029)
45-54			-0.042**	-0.060**	-0.058**	-0.064**	-0.064**	-0.063**	-0.058*	-0.060**
			(0.014)	(0.021)	(0.022)	(0.023)	(0.022)	(0.022)	(0.022)	(0.022)
55-64			-0.101***	-0.101**	-0.101**	-0.103**	-0.104***	-0.099**	-0.095**	-0.105***
			(0.019)	(0.031)	(0.031)	(0.031)	(0.031)	(0.030)	(0.030)	(0.029)
65+			-0.158***	-0.104***	-0.106***	-0.106***	-0.106***	-0.094***	-0.098***	-0.113***
			(0.020)	(0.027)	(0.027)	(0.027)	(0.026)	(0.026)	(0.025)	(0.025)

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Table G1 (*continued*): Determinants of Economic Insecurity in New Zealand (HLFS Full)

	Economic Insecurity (OLS)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Household Income (in NZD $100,000s)				0.308***	0.325***	0.324***	0.332***	0.355***	0.364***	0.363***
				(0.037)	(0.036)	(0.036)	(0.036)	(0.036)	(0.035)	(0.034)
Household Income Squared (in NZD $100,000s)				-0.022***	-0.023***	-0.023***	-0.024***	-0.027***	-0.028***	-0.028***
				(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Education (Reference Category: Post-School Qualification)										
University Degree					-0.046***	-0.046***	-0.042***	-0.035***	-0.035***	-0.034***
					(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
High School					-0.010*	-0.009*	-0.008	-0.002	-0.002	-0.001
					(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
No Qualification					0.013**	0.013**	0.011**	0.010**	0.009*	0.009*
					(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Relationship Status (Reference Category: With Partner)										
Partnership Dissolved						0.065**	0.066**	0.064**	0.065**	0.076**
						(0.024)	(0.024)	(0.023)	(0.023)	(0.024)
Region (Reference Category: Auckland)										
Northland							0.042***	0.046***	0.046***	0.046***
							(0.008)	(0.008)	(0.008)	(0.008)
Waikato							0.066***	0.068***	0.069***	0.068***
							(0.009)	(0.009)	(0.009)	(0.009)
Bay of Plenty							0.046***	0.049***	0.050***	0.050***
							(0.007)	(0.008)	(0.008)	(0.008)
Gisborne/Hawke's Bay							0.062***	0.063***	0.064***	0.064***
							(0.009)	(0.009)	(0.009)	(0.009)

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Table G1 (*continued*) : Determinants of Economic Insecurity in New Zealand (HLFS Full)

	Economic Insecurity (OLS)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Region continued (Reference Category: Auckland)										
Taranaki							0.067***	0.069***	0.070***	0.070***
							(0.011)	(0.011)	(0.011)	(0.012)
Manawatu-Wanganui							0.069***	0.072***	0.073***	0.071***
							(0.011)	(0.011)	(0.011)	(0.011)
Wellington							0.021***	0.021***	0.021***	0.020***
							(0.006)	(0.006)	(0.006)	(0.005)
Nelson/Tasman/Marlborough/West Coast							0.019***	0.024***	0.024***	0.024***
							(0.006)	(0.006)	(0.006)	(0.006)
Canterbury							0.047***	0.050***	0.050***	0.049***
							(0.007)	(0.007)	(0.007)	(0.007)
Otago							0.057***	0.061***	0.061***	0.059***
							(0.009)	(0.010)	(0.010)	(0.009)
Southland							0.068***	0.070***	0.072***	0.072***
							(0.011)	(0.011)	(0.011)	(0.011)
Year (Reference Category: 1999)										
2000								-0.008	-0.008	-0.015
								(0.008)	(0.008)	(0.009)
2001								-0.013	-0.013	-0.021*
								(0.008)	(0.008)	(0.008)
2002								-0.018*	-0.019*	-0.027**
								(0.008)	(0.008)	(0.009)
2003								-0.022*	-0.023**	-0.032***
								(0.009)	(0.009)	(0.009)

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Table G1 (*continued*): Determinants of Economic Insecurity in New Zealand (HLFS Full)

	Economic Insecurity (OLS)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Year continued (Reference Category: 1999)										
2004								-0.030**	-0.031**	-0.042***
								(0.010)	(0.010)	(0.010)
2005								-0.031**	-0.032***	-0.041***
								(0.009)	(0.009)	(0.009)
2006								-0.044***	-0.045***	-0.054***
								(0.010)	(0.010)	(0.011)
2007								-0.026*	-0.016	-0.023*
								(0.010)	(0.011)	(0.011)
2008								-0.017	-0.008	-0.016
								(0.011)	(0.011)	(0.011)
2009								-0.004	0.005	-0.002
								(0.009)	(0.009)	(0.009)
2010								-0.025**	-0.016	-0.024**
								(0.008)	(0.008)	(0.009)
2011								-0.035***	-0.026**	-0.034***
								(0.010)	(0.009)	(0.010)
2012								-0.022*	-0.013	-0.021*
								(0.009)	(0.009)	(0.009)
2013								-0.032**	-0.023*	-0.029**
								(0.010)	(0.009)	(0.010)
2014								-0.049***	-0.040***	-0.048***
								(0.011)	(0.010)	(0.011)
2015								-0.055***	-0.046***	-0.053***
								(0.011)	(0.010)	(0.011)
2017								-0.082***	-0.073***	-0.079***
								(0.012)	(0.011)	(0.011)

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Table G1 (*continued*): Determinants of Economic Insecurity in New Zealand (HLFS Full)

	Economic Insecurity (OLS)									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Year continued (Reference Category: 1999)										
2018								-0.101***	-0.092***	-0.099***
								(0.013)	(0.012)	(0.012)
2019								-0.090***	-0.081***	-0.088***
								(0.011)	(0.011)	(0.011)
2020								-0.076***	-0.067***	-0.074***
								(0.011)	(0.011)	(0.011)
2021								-0.105***	-0.097***	-0.104***
								(0.013)	(0.013)	(0.013)
Full-time/Part-time Code (Reference Category: Full-Time)										
Part-Time Employment									0.017*	0.020**
									(0.007)	(0.007)
Not in Labour Force									0.021**	0.021**
									(0.007)	(0.007)
Household Composition (Reference Category: Single Parent)										
Two or More Adults with Kids										-0.028*
										(0.012)
Two or More Adults without Kids										-0.001
										(0.014)
Single Person Household										0.020
										(0.010)
Constant	0.104***	0.102***	0.161***	0.021	0.021	0.019	-0.021	0.003	-0.023	-0.007
	(0.017)	(0.019)	(0.022)	(0.030)	(0.030)	(0.030)	(0.029)	(0.029)	(0.029)	(0.032)
Observations~	100,515	100,518	100,515	100,455	100,455	100,455	100,455	100,455	100,455	100,455
R-squared	0.015	0.015	0.053	0.140	0.143	0.146	0.152	0.159	0.160	0.162

Robust standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05
~Observations are randomly rounded (up or down) to the nearest multiple of three given Statistics New Zealand's rounding rule.

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