Measuring Economic Insecurity with a Joint Income-Wealth Approach

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Abstract

In this paper, we propose the use of a joint distribution of income and wealth to measure objective economic insecurity. Our main purpose is to overcome the dichotomy between income and net wealth when assessing economic insecurity in developed countries. While income reflects the individuals' standard of living, wealth can be understood as an emergency buffer stock which can be converted into an income flow when individuals are prone to suffer from an economic distress in a near future. Therefore, we first construct the unidimensional distribution of well-being with income and wealth that approximates all available economic resources of individuals and subsequently calculate economic insecurity as the probability of experiencing short-term well-being losses, capturing the objective exposure to future financial hazards. As an empirical illustration, we analyse economic insecurity in the United States using the Panel Study of Income Dynamics (PSID) data from 1999 to 2017. We find that economic insecurity levels are larger when considering our extended well-being variable rather than just income. Household income and non-liquid assets are the sources that most affected to the less protected group, and therefore, the main drivers that cause them have higher probability of being insecure.

Keywords: income, wealth, economic insecurity, objective risk, PSID.

JEL codes: D63, I39

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1. Introduction

There is a general feeling that good times have past and economic progress for low and middle classes is almost depleted. Recent trends in globalization, technological advances and changes in work organization have improved the living conditions of some population groups but have also brought to light the fragile situation of the vast majority, who face increasing risk and uncertainty (Hacker, 2020; United Nations, 2020).

It is only in recent years that social and economic researchers have become aware of the importance of economic insecurity, especially in the wake of the Great Recession. Many people suffered from negative financial shocks (huge income losses, an increase in unemployment risk and a rise in household debt among other economic distresses), which led to a deterioration of future economic prospects. In other words, people worried more about financial shocks in later periods and the impossibility to overcome their negative consequences, that is, they became more economically insecure (Hacker, 2018). These high levels of insecurity do not seem to have improved much with the recovery of economic activity but have been maintained due to growing labour precariousness and the transfer of risk from public institutions and corporations to individuals (Hacker, 2019). Nowadays, the COVID-19 pandemic and the uncertainty associated to its economic impact are likely to cause an unprecedented increase of individual insecurity. Disruptions in the labour market and the diverse measures adopted by public institutions to contain the disease have led to a larger unpredictability of future states and growing feelings of fear. Accordingly, the measurement of economic insecurity becomes one of the most relevant actions public agents must address in to mitigate its negative effects on the population.

Economic insecurity reveals itself as one of the greatest challenges of modern societies together with poverty and inequality. A larger exposure to economic risks will increase the anxiety that people feel about future financial situation, reducing their quality of life in the present and influencing their economic behaviour. Individuals will be less prone to engage in risk-taking activities and the negative effects of their decisions could also transcend to the macroeconomic level. Among its multiple effects, economic insecurity may impact consumption and housing investment (Benito, 2006); human capital acquisition (Stiglitz, Sen and Fitoussi, 2009); job mobility (McGuinness and Wooden, 2009; Swaen et al., 2002); fertility (Fiori et al., 2013; Mansour, 2018; Modena, Rondinelli

and Sabatini, 2014); physical and mental health (Rohde, Tang and Osberg, 2017; Rohde et al., 2016; Smith, Stoddard and Barnes, 2009; Staudigel, 2016; Watson, 2018), and even political participation and voting decisions (Bossert et al., 2020). However, there is still no consensus on the definition or measurement of economic insecurity despite its relevance, so further effort is required to understand this phenomenon in order to guide public policy.

In this context, an ideal measure of economic insecurity should capture three fundamental elements: the probability of an unfortunate future event, a negative economic consequence in case this event takes place and the absence of protection to cope with distress (Hacker, 2018). This reference to future economic hazards pose serious difficulties in designing indicators to assess this phenomenon. Even though some attempts have been made, the literature has not yet agreed on a standard method to compute insecurity.

One of the main issues when designing an insecurity indicator is the selection of variables or dimensions. There have been several proposals to assess the exposure to objective economic risk with standard variables traditionally used in the measurement of poverty and inequality, such as income or wealth. The consideration of these variables allows for the comparison of insecurity with other low well-being phenomena in a more homogeneous manner. For instance, Hacker et al. (2010, 2014) measure economic insecurity as the percentage of individuals who experience a large income drop in their household income from one year to the next and lack enough liquid financial wealth to cope with that loss. With a different approach, Rohde, Tang and Rao (2014) approximate insecurity as downward income instability, whereas Watson (2018) uses the predicted individual probability of experiencing a large income loss. Conversely, Bossert and D'Ambrosio (2013) believe that wealth is a more adequate variable to assess economic insecurity as it can be understood as an emergency buffer stock: in case an adverse event materialises, current wealth can be turned to an income flow to mitigate the negative consequences of distress.

While income and wealth may be equally valid to measure economic insecurity from a theoretical perspective, empirical analyses reveal that results are highly conditioned to the dimension selected. Using information on changes in household wealth, D'Ambrosio and Rohde (2014) find that US households have more economic security than those in Italy due to a larger accumulation of financial assets. On the contrary, Rohde, Tang and

Rao (2014) find that economic insecurity (measured as downward income instability) is the highest in the United States (US) when considering post-government incomes. These results evince that the use of a single dimension limits the correct measurement of economic insecurity and cannot fully capture the diverse aspects in which insecurity is manifested (Rohde, Tang and Osberg, 2017; Romaguera-de-la-Cruz, 2020). On one hand, income represents the monetary flow of resources obtained by an individual or household at a given time and which can be easily disposed of. Wealth instead corresponds with the accumulation of resources over a person's lifetime (stock variable) and captures the permanent component of well-being. Hence, the consideration of a joint income and wealth measure brings us closer to assess economic insecurity to its full extent: it combines the liquidity scope of income with the future realization of wealth, providing the best predictor of yearly consumption possibilities to cope with unfortunate events.

In this paper, our main aim is to disentangle the dichotomy between income and wealth when assessing economic insecurity. We focus on unidimensional indices of economic insecurity and study if the selection of different variables delivers various results regarding the evolution and distribution of economic insecurity. We start from the conception of income as an indicator of individuals' standard of living and wealth as a buffer stock which could become an income flow in case a negative event takes place. Therefore, we follow Weisbrod and Hansen (1968) to convert current wealth stock into an income flow which is added to pre-tax income in a given period in order to obtain an extended well-being indicator. We then approximate economic insecurity as the probability of experiencing short-term well-being losses, which is a forward-looking measure that reflects objective risk and captures the likelihood of future large declines of the individuals' resources. This indicator therefore reflects the absence of a sound safety net when an economic hazard takes place. The anticipation of future objective economic risk is a very effective tool for policy makers. They could design specific interventions to prevent drops in households' well-being ex-ante, which represent an advantage over those policies that aim to reduce inequality and poverty ex-post, when the problem already exists. For instance, in a context with high level of inflation, monetary authorities may study the overall effects on economic insecurity of the increase in interest rates in order to stabilise prices and to protect households' savings, although at the same time, among other effects, it would increase the mortgage payments. Moreover, we propose a fixed effects estimates to examine how each component of our extended well-being measure

shapes the economic insecurity by splitting the population into those with higher and (on the other hand) lower probability of suffering an economic loss, looking into the economic changes that lead them into a more or less protected future situation.

As an empirical illustration, we apply the resulted measures to US data to analyse the level, evolution and distribution of economic insecurity over the last two decades and compare our extended well-being approach with previous insecurity indices proposed by the literature. We find that the average probability of being economically insecure is approximately 22% when considering income only, whereas that probability increases to 43% when we take into account wealth. Conversely, the results using our extended well- are balanced between income and wealth, with an average probability of 33%. The fixed-effects model estimates suggest that the steep decline in household income and the drop in the flow of non-liquid assets (real estate, business assets, and pension assets) after the Great Recession were the main drivers of the higher probability of being insecure for part of US population, while those theoretically more protected were able to offset the higher amount of mortgage payments with higher returns from non-liquid assets.

The paper is structured as follows: the next section reviews preceding literature on economic insecurity indices as well as previous research on the joint distribution of income and wealth. Section 3 contains a description of the transformation of income and wealth into a unique variable, the calculation of the economic insecurity measures and the data used in our empirical illustration. Section 4 reports the main results, while Section 5 gathers our major conclusions and policy recommendations.

2. Literature review

Despite the undoubted interest of economic insecurity and its impact on several well-being dimensions, no general agreement could be reached on its definition and calculation. Each article in the literature starts from an ad-hoc definition of insecurity, even though most of them include the following key elements: (1) an exposure to financial distress which could have not yet materialised; (2) future economic losses, and (3) difficulties to mitigate negative consequences of the unfortunate event (Berloffa and Modena, 2014; D'Ambrosio and Rohde, 2014; Hacker et al., 2010; Osberg, 1998; Osberg and Sharpe, 2005; Rohde, Tang and Rao, 2014; Rohde and Tang, 2018; Romaguera-de-la-Cruz, 2020). Both expectations about forthcoming experiences as well as past

misfortunes shape the level of current economic insecurity regardless of the individuals' position in the income distribution (Cantó et al., 2020; Hacker, 2020; Osberg, 2015; Ranci et al., 2017). Most of researchers have focussed on measuring objective economic insecurity aiming to capture the exposure to downside risk. This kind of measures reflect the probability of an economic hazard in a near future with negative consequences in case risk materialises and individuals lack sufficient protection mechanisms (Hacker, 2018; Osberg, 2018). The objective approach offers many advantages, as economic insecurity indices can be based on living conditions surveys which are broadly available and regularly produced. Moreover, the use of objective indicators provides reliable information on individual risks, simplifying the design and implementation of public policies. In this vein, the use of objective indicators avoids the potential bias and high heterogeneity more frequently associated with subjective measures.

Thus, we can find several proposals to measure objective economic insecurity with both unidimensional and integrated approaches. Within the indices based on a single indicator, many articles use standard variables in the welfare analysis. Income is the most used dimension since it is a well-established indicator of living standards and represents the most liquid monetary resource to turn to in the event of financial difficulties or unexpected expenses. Furthermore, data on income is widely available and regularly produced, and there are some harmonised databases which allow for the comparison of well-being phenomena in several countries. In this vein, we can find a variety of economic insecurity measures in the literature considering income as the key dimension. Rohde, Tang and Rao (2014) identify economic insecurity with downward income instability (estimated as descending deviations from the trend in household incomes), while Nichols and Rehm (2014) estimate a measure of income risk as the aggregate income variability across individuals and time. Watson (2018) assesses economic insecurity with a forward-looking approach based on the individual propensity to experience a large income drop from one period to the next. Bossert et al. (2020) estimate insecurity through income streams (as they believe individuals' prospects are shaped by past variations of resources rather than their levels), while Rohde et al. (2020) measure individual economic insecurity as unforeseeable volatility in future monetary resources by using prospect theory.

Conversely, Bossert and D'Ambrosio (2013) approximate economic insecurity with wealth, considering net wealth levels (assets minus liabilities) as an emergency reserve

that individuals could convert to income in the event of an adverse financial shock, while past variations in net wealth shape individuals' economic prospects. Nonetheless, this measure does not consider the entire wealth stock but only private stocks, leaving out most liquid assets as well as public and private entitlements (Cantó et al., 2020b; Osberg, 2018).

Both income and wealth have theoretical basis to be used in the economic security measurement. Nevertheless, unidimensional insecurity indices show contradictory results when used in empirical analysis depending on the key variable considered. Regarding measures based on income, Rohde, Tang and Rao (2014) discover that the US is the most insecure country when considering post-government incomes, in the same vein as Nichols and Rehm (2014). When comparing economic insecurity in Germany and the US, Rohde et al. (2020) also points out to the US as the country with the highest levels of exposure to income risk. On the contrary, the Bossert and D'Ambrosio (2013) wealth-based index reveals lower levels of insecurity in the US when compared to Italy because of greater financial assets' accumulation but also a larger negative impact of the Great Recession on the former because of the decline in assets' prices (D'Ambrosio and Rohde, 2014).

Previous proposals highlight that the use of domain-specific measures to approximate economic insecurity are highly conditioned to the selected variable, as using either income or wealth can capture one undesirable facet of risk but not the phenomenon to its full extent, leading us to opposite conclusions for the same country or population (Rohde, Tang and Osberg, 2017; Romaguera-de-la-Cruz, 2020). In this context, Hacker et al. (2010, 2014) come up with an integrated measure (*Economic Security Index*, ESI) that identifies economic insecurity with the share of individuals at a given society who experience a large income drop (equal or higher to 25%) as long as they lack sufficient liquid financial wealth to deal with economic loss and subtracting medical out-of-pocket expenditure (especially relevant in the US). The existence of precautionary savings offers the individuals an additional protection against economic distress beyond income, leaving those people with low and volatile incomes who lack accessible savings much more exposed to objective risk than those owning some liquid wealth. Despite the advantage of taking into account both income and wealth, the ESI measure does not capture variations in asset accumulation that could be an additional source of financial distress beyond income losses, considering wealth just as a buffer stock. Furthermore, this measure does not include other less liquid assets as housing or real estate and is not able

to reflect the individual exposure to risk since the use of retrospective data only enables the researchers to infer the risk of a given subpopulation through actually realised hazards (Hacker et al., 2014). Moreover, voluntary reductions in household income cannot be distinguished from involuntary losses, the latter being the only ones relevant to insecurity (Osberg, 2018).

There have been other efforts to measure economic insecurity with composite indicators and a variety of dimensions (Osberg and Sharpe, 2005, 2014; Rohde et al., 2015, 2016; Rohde, Tang and Osberg, 2017; Romaguera-de-la-Cruz, 2020). It is true that multidimensional measures of economic insecurity may be useful when trying to capture diverse aspects of the phenomenon. However, the analysis of separate dimensions may lead to inconclusive results while the construction of a synthetic index is not straightforward and implies several normative decisions regarding the selection of indicators, aggregation and weighting procedures (Nardo et al., 2005). Moreover, data requirements are highly increased, especially when computing insecurity indices at the individual level.

In this paper, we analyse objective economic insecurity by using a joint distribution of household income and wealth. We benefit from the advantages of an integrated measure that represents all potential resources that individuals can turn to in case they suffer from a downward economic loss in a near future. We consider income as the most accessible monetary resource and wealth as a short-term protection mechanism and its loss as a cause of future economic hardship. We believe this mixed approach will enable us to measure objective economic insecurity to its full extent.

3. Methodology

3.1. Construction of an extended well-being measure

We follow the Weisbrod and Hansen (1968) approach to approximate individuals' potential resources by combining income and wealth into a single distribution through the following formula in a similar manner as Wolff and Zacharias (2009):

$$Y_i = L_i + (H_i - M_i) + (W_i - D_i) + P_i \quad (1)$$

where Y_i represents the level of well-being for household i. L_i denotes labour income and includes both wages and self-employment income. The net income flow generated by

housing is then added, where H_i represents the imputed rent to owner-occupied housing and M_i the reported values of mortgage payments. Moreover, we take into consideration the net income flow from other assets such as other real estate or business assets (W_i denotes annuitized wealth beyond housing and D_i the annuitized value of other debt) as well as the value of public transfers (P_i). This household well-being level Y_i is then adjusted for inflation and equivalised using the OECD-modified scale.[1]

Household current wealth stock needs therefore to be converted into an income flow so both variables are measured in the same unit of analysis. Thus, one unit of wealth is transformed into one unit of income as follows (Brandolini et al., 2010; Weisbrod and Hansen, 1968):

$$W_{ij} = \left[\frac{\rho_j}{1-(1+\rho_j)^{-n}}\right] * A_{ij} \quad (2)$$

where W_{ij} refers to annuitised income of asset j for household i; ρ_j is the average annual nominal rate for asset j from 1997 until 2019; A_{ij} is the reported value of asset j for household i; and n represents the length of the annuity.[2] As households do not report the rate of returns for each asset type, we use the information in the System of National Accounts (SNA) to be consistent with the macroeconomic trend of wealth and its importance for household sector following the approach of Wolff et al. (2012).The annuity length is approximated as the expected remaining years of life of the oldest person in the household, which is measured by the years of life expectancy regarding age and gender obtained from National Center for Health Statistics (NCHS). Furthermore, we modulate this annuity length according the civil status of individuals: $n = T$ for unmarried, and $n = T_1 + (T - T_1)b$ for married persons; where T_1 refers to the remaining years of life for the person who dies first, *T* are the remaining years of life of the survivor and b is the reduction in the equivalence scale after the death of the first person. In this paper, we annualise six asset and debt classes: main residence, real estate, financial assets, business assets, mortgage debt and other debt (see Table 1).[3] The value of main residence

[1] See Table A1 in Appendix for more details of the definition of extended well-being measure

[2] We could also use the bond coupon method to obtain the flow from wealth (Larrimore et.al, 2016; Smeeding and Thomson, 2011). However, this method is more suitable to compute non-realized capital gains instead of households' potential resources, which is the interest of our analysis.

[3] Real estate does not include the main household residence. Financial assets include stocks and other assets such as life insurance. Mortgage debt is calculated for the main residence when households do not report monthly mortgage payments, while other debt includes credit card debts, student loans and other values

is transformed into an annual income flow to approximate the imputed rents for owner occupied households (Wolff and Zacharias, 2009).

This procedure allows to estimate all potential economic resources that households could use to smooth our consumption, either to save or to face unexpected negative shocks, which leads us to a more precise measurement of economic insecurity. Our method goes beyond the consideration of income (which is the most common variable used to capture living standards and therefore individual well-being) to measure economic insecurity and aims to disentangle the additional role of wealth and financial liabilities in this phenomenon. The joint consideration of income and wealth may imply that households are more (or less) vulnerable to insecurity than their income level would suggest. Moreover, our approach allows for the variation of wealth over the lifetime of the holder, while we use different interest rates for each type of assets. Therefore, we are able to compute households' possibilities to smooth out consumption depending on their income level, wealth composition and age, which is crucial for our analysis: those households that may offset their loss in income (for instance, as a consequence of job loss) with annuitized wealth will not be considered economically insecure.

We must also keep in mind that this method also has some limitations. For instance, the same wealth level will result in a larger income flow for older individuals as their expected remaining years of life are lower than for younger people, resulting then in a higher concentration of annuitized wealth. Also, we consider bequests equal to zero as we assume that the wealth component is totally consumed by the end of expected lifetime. Nevertheless, we do not believe these limitations to be affecting the study of economic insecurity as our aim is to capture the exposure to financial risk and the lack of sufficient protection mechanisms. Therefore, smoothing consumption means of individuals will necessarily depend on age. On other hand, bequests are not likely to influence much on economic insecurity as, in a context of hard financial difficulties, individuals would resort to all their available resources to overcome distress.

reported by households. We do not annuitize the value of current and saving accounts; we use the reported value.

3.2. How do we measure objective economic insecurity?

From the definition of economic insecurity, it is clear that this phenomenon involves future economic states. Therefore, analysing directly short-term well-being drops do not enable us to estimate economic insecurity individually: these falls in well-being are the realization of a given economic risk but do not identify the exposure to the risk itself as we are using retrospective data. Therefore, an individual cannot be classified as insecure or secure, and we can only assume that individuals belonging to a specific subpopulation suffer from the average level of insecurity (Hacker et al., 2014). For this reason, we chose to estimate economic insecurity as the individual predicted propensity to suffer from well-being losses conditional of a series of sociodemographic explanatory variables[4].

Accordingly, we fit a variety of pooled probit estimations in which the dependent variables are dummy indicators of large short-term well-being reductions. We calculate several dummy variables to compute the proportion of individuals who have suffered from a sizable well-being loss from one period to the next as follows:

$$EI_{it} = \begin{cases} 1 & if \ \dfrac{wb_{it} - wb_{it-1}}{wb_{it-1}} \leq k \\ 0 & otherwise \end{cases} \tag{3}$$

where wb_{it} is an equivalised real measure of well-being for individual i at moment t, wb_{it-1} is that of the preceding period, and k is the minimum amount of loss in order to consider a reduction in well-being as sizable.

First, we identify well-being with income and wealth separately: the marginal distribution of income represents the individuals' standard of living and the immediate access to monetary resources, whereas wealth captures long-term economic resources and risk-coping mechanisms due to its role of buffer stock. It must be noted that, when considering income, we subtract medical out-of-pocket expenses (which are one of the most important sources for economic insecurity in the US; see Hacker et al., 2019) and exclude income declines due to entering retirement. Then, we estimate short-term losses in our extended well-being measure.

[4] We may note that the household is our unit of measure even if the individual is considered as the unit of analysis: to estimate economic insecurity we make use of household data as we believe negative financial shocks are usually smoothed by the pooling of monetary resources of all household members.

As for the thresholds used to define well-being losses, we start from the ESI measure of Hacker et. al (2014), who set a threshold of 25 percent or more of household income loss from one period to the next. This threshold represents the three months that the US population could maintain their well-being levels without their current income before experiencing hardship, as suggested by the American National Election Study (Hacker et al., 2013). In this context, we propose a 15 percent well-being loss from one period to the next to estimate our insecurity index, which is the equivalent amount of 25 percent of annual income in our extended well-being measure. In addition, we apply the same logic to net wealth, setting a threshold of 7 percent.[5]

As economic insecurity is a forward-looking concept, we need to anticipate the individuals' degree of risk in later periods, for which we make use of lagged sociodemographic explanatory variables related to the head of the household, since we assume complete pooling of the monetary resources of all members:

$$Pr(EI_{it} \mid X_{it-1}, \delta t) = \emptyset(\beta X_{it-1} + \delta t + u_{it}) \qquad (4)$$

where EI_{it} are the dummy indicators previously described, $\emptyset$ is the cumulative distribution function of the standard normal distribution, X_{it-1} represents a variety of sociodemographic characteristics of the household head in the previous period and t are year dummies. As demographic variables we include gender, age, race, years of completed education and region of residence. We also include the civil status of the head as well as his overall health status to account for two of the main possible causes of future distress: family breakup and illness (Osberg and Sharpe, 2005, 2014). To capture the insecurity stemming from the labour market, we consider the employment status of the head, whether he is self-employed, whether he works for the government, and the occupation and industry of his main job. Long-term average household income is introduced to capture with the permanent socioeconomic status of households.

[5] Alternatively, we estimate the probability of being insecure using the threshold of 10% and 20% for our extended well-being measure (see Figure A6 and A7 in Appendix). The trend in economic insecurity does not change, while its level increase slightly for the 10% threshold and decrease for the 20%, as we could expect. Therefore, our results using the 15% threshold are consistent and it is established following an exogenous information about future economic losses and insecurity, avoiding potential endogeneity problems in the regression analysis.

Additionally, we take into account household composition by including the number of household members as well as the number of children. Finally, we introduce yearly dummies to capture the effects of the business cycle.

This strategy allows us to predict economic insecurity in the subsequent period through present characteristics of the head, thus generating a prospective insecurity measure and capturing We consider several characteristics of the household head as explanatory variables which try capture the household exposure to objective risk. The resulted measure is an economic insecurity index ranging from 0 to 100 and captures the part of economic insecurity which is due only to the personal characteristics of individuals. Unlike large short-term drops in well-being, this individual propensity enables us to analyse economic insecurity with a prospective approach: we can study which part of insecurity can be predicted due to individual and household characteristics beyond risks already realised. Nonetheless, this method also has some limitations as we are not able to capture unpredictable economic shocks that are independent of household characteristics.

3.3. Sources of economic insecurity

Once we have estimated our economic insecurity index, we apply an econometric strategy to understand the role of each source of our joint distribution of income and wealth in shaping this phenomenon. First, we split the population into two groups: those with higher or lower probability to be economically insecure in the next period compared with the average population. For these two groups we examine the changes in their extended well-being components to disentangle the main drivers that make them more or less likely to be economically insecure.

To accomplish our goal, we estimate the following equations via ordinary least squares (OLS) with individual fixed effects based on Amuedo-Dorantes and Borra (2018):

$$y_{it} = \delta_0 + \delta t + \theta X_{it} + \alpha_i + u_{it}, \qquad for\ i = higher\ prob\ of\ being\ insecure \quad (5)$$

$$y_{jt} = \delta_0 + \delta t + \theta X_{jt} + \alpha_j + u_{jt}, \qquad for\ j = lower\ prob\ of\ being\ insecure \quad (6)$$

$$Pr(y_{it} = 1 | X_{it,} \delta t) = \delta_0 + \delta t + \theta X_{it} + \alpha_i + u_{it}, for\ i = higher\ prob\ insecure \quad (7)$$

$$Pr(y_{jt} = 1 | X_{jt,} \delta t) = \delta_0 + \delta t + \theta X_{jt} + \alpha_j + u_{jt}, for\ j = lower\ prob\ insecure \quad (8)$$

where in (5) and (6), y_{it} and y_{jt} is the logarithm of each component of our joint

distribution of individual i and j in year t; while in Eq (7) and (8), y_{it} and y_{jt} is the probability of owning each source that conforms our extended well-being measure. This distinction helps us to deal with negative and zero values from the realization of wealth. When examining the likelihood of owning one particular source, households reporting a zero or negative value for a particular source are coded with a zero to reflect lack of ownership of that source. Reporting a positive value is coded as an owner of one component of the joint distribution. These regressions allow us to disentangle the importance of price effects Eq (5) and Eq (6) and the ownership of each source Eq (7) and Eq (8) in shaping the economic insecurity. δt is the time year dummy that captures the changes of each source with respect to 1999 and, therefore, is our variable of interest. We take 1999 as the reference year given that for our first year of analysis we cannot predict the insecurity levels. Moreover, both equations incorporate a variety of time-varying household characteristics as a controls (captured by X_{it}) such as age, marital status, health status, race, and years of education of its head, region of residence, type of household, household size, and the number of children. Finally, the variable α_i captures all unobserved, time-invariant individual level characteristics that have an influence on y_{it}, whereas u_{it} is the idiosyncratic error term. These regressions are performed using 2019 longitudinal household weights from the PSID data to account for the stratified sampling design and attrition.

We perform Eq (5) and Eq (7) for those with higher probability to be economically insecure than the average population (33%) and Eq (6) and Eq (8) for those with lower probability. Then we compare the coefficients for these two groups to study the main determinants of their insecure/secure situation across all the years of analysis.

3.4. Data

Our data come from the Panel Study of Income Dynamics (PSID), which is a household longitudinal survey conducted in the US by the University of Michigan since 1968. This database contains household information on employment, income, wealth, expenditures, health, civil status and education among other subjects. Since 1997, data is collected on a biennial basis. In this paper, we use data from 1999 to 2019 to analyse economic insecurity in the last two decades, studying the impact of the Great Recession on this phenomenon and the later economic recovery.

Data are collected in the year of the survey; income is reported for the previous year, and wealth for the survey year (time of the interview). We define income as the sum of labour income (wages and self-employment income obtained from managing a household business or any other professional activity), capital income (business profits, dividends, rents or trust funds) public transfers (such as social security transfers or unemployment benefits, among others), and private transfers (transfers from relatives or inheritance) of all household members. On other hand, total household wealth is constructed as the sum of seven asset classes minus its corresponding debt. The considered asset variables are home equity, farm and business assets, checking and savings, other real estate (second home, land, rental real estate), stocks, other assets (such as life insurance), and annuities from Individual Retirement Accounts (IRAs). It must be noted that debt was reported in the database as a single total value until 2007. Since 2009, debt is calculated as the sum of total debt from farm or business, real estate, credit cards and several loans (student, medical, legal, family or other loans). Moreover, for 2003 and 2005 we drop the observations for which real estate (other than the main residence) is equal to one, and also some outliers in the values reported for business assets, mortgage payments, card debt, and medical debt.

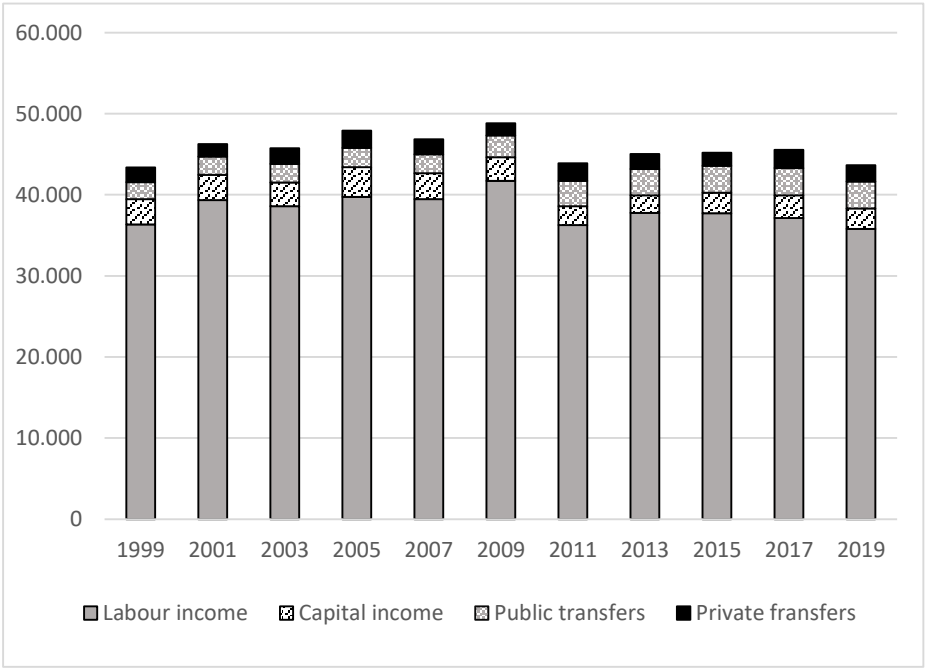
To estimate our joint distribution of income and wealth, we assume that income is reported in year t and wealth at the beginning of that same year. This could generate double counting of some resources especially those related with asset income or rental income. Therefore, we exclude from household income all concepts related with capital income. From an economic insecurity perspective, the exclusion of capital income seems reasonable: in the event of unexpected economic difficulties, individuals will first turn to their income from work and public or private transfers. If this income is not enough to cope with distress, people will then rely on past savings and accumulated wealth up to that moment. Then, our joint distribution is the sum of all non-capital income concepts and the flow obtained from wealth components. We use the reported values for current accounts, cash and savings, as in case of economic shock household would use those in first place before selling other assets. We also consider the reported value for monthly mortgage payments that we convert into annual amount multiplying by 12. For those households we do not have monthly mortgage payments we annualise the value of the total mortgage considering the years left to pay the mortgage.

4. Results

4.1. How are income and wealth distributed in the US?

Figure 1 shows the evolution of household pre-tax income by sources from 1999 to 2019. Family income had an upward trend until 2009, followed by a sharp decline in 2011 when households lost around 5000 dollars on average because of the Great Recession. The later economic growth was insufficient to recover the pre-crisis levels. Despite the improvement of macroeconomic conditions, household income in 2019 declined to 2011 levels. In general, labour is the main source of this family income accounting for more than 80% of the total and, therefore, determines the evolution of total household income (see Figure A1 in Appendix). The importance of capital income increased during the expansionary period but declined after the Great Recession with 2019 levels similar to those in 2011. Conversely, public transfers show a steady growth during the whole period of analysis with an increase of 22% from 2009 and 2019, being the most important source after labour income.

FIGURE 1. Average household income by sources and year.



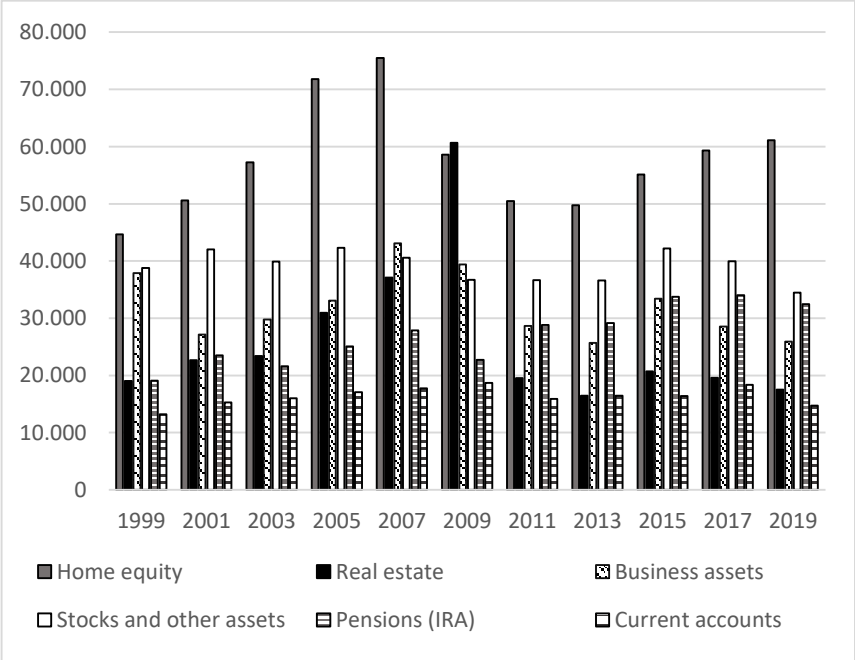
Source: Author's calculations based on PSID data set using cross-sectional weights.

Regarding the evolution of wealth, Figure 2 shows that home equity is the most important asset of households' net worth. We can observe a large rise in the mean value of this asset until 2009 due to the increase in housing prices and the boost of mortgages

(Wolff, 2017; see Figure A3 in Appendix). As a reaction to the subprime crisis, housing prices fell by 24% between 2007 and 2010. Home equity value was partially recovered with the constant decrease of mortgage debt of the last years. In the same vein, real estate (other than main residence) and business assets followed similar trend such as home equity, stimulated by the high rate of return prior to the financial crisis. The collapse of real estate market diminished its relative importance after 2011 in favour of stocks and other assets and private pension plans (IRAs), although the level of these sources decreased in the most recent years during the economic recovery.

Furthermore, US households increased gradually the average value of current and saving accounts until 2009. These liquid assets were used to smooth out consumption because of the fall of labour income after the Great Recession. Therefore, the less vulnerable households were those able to change their wealth composition to offset the large drop of real estate and business assets with the increase of stocks and private pensions (IRAs) and those who had sufficient amount of liquid savings to buffer the economic shock.

FIGURE 2. Average household net assets' value by year.

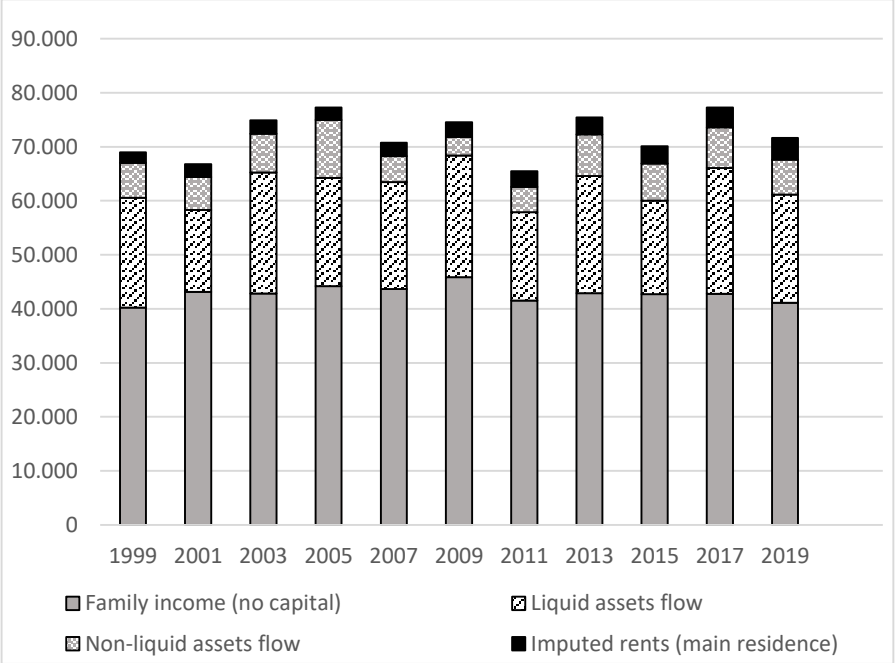


Source: Author's calculations based on PSID data set using cross-sectional weights.

Figure 3 shows the evolution of each component of the joint income and wealth distribution. extended well-being increased during the pre-crisis period up to 2009 (income reference year 2008), although the dotcom crisis in 2001 and the initial stage of

the Great Recession in 2007 affected households' well-being. The Great Recession hit hardest in 2011, when extended well-being reached its lowest value. During the expansionary period after 2011, this variable experienced an irregular growth following the evolution in liquid assets and household income.

FIGURE 3. Average extended well-being by sources and year.



Source: Author's calculations based on PSID data set using cross-sectional weights

Our extended well-being measure adds from 44 to 70% of income flow to standard gross family income.[6] Family income is the larger source of our extended measure with an average share of 60%, decreasing during the expansionary periods (figure A4 in Appendix). Regarding the flow we obtain from wealth concepts, liquid assets (current and saving accounts, stocks, and other assets) represent around 27% of total well-being with a higher share when the positive macroeconomic conditions lead to higher rates of return from stock markets and an increase in savings. We can also see that during the recession periods, especially in 2001 and 2011, the value of these assets decreases as people tend to use their savings to smoot out consumption and due to the volatility in stock markets. Non-Liquid assets (real estate apart from main residence, business assets and private pensions) represent on average 9% of well-being, following a similar trend as

[6] We add a higher amount of income flow compared with other authors such as Wolff et. al (2012) and Gallusser and Krapf (2019) mainly as we use the reported values from cash and currents accounts.

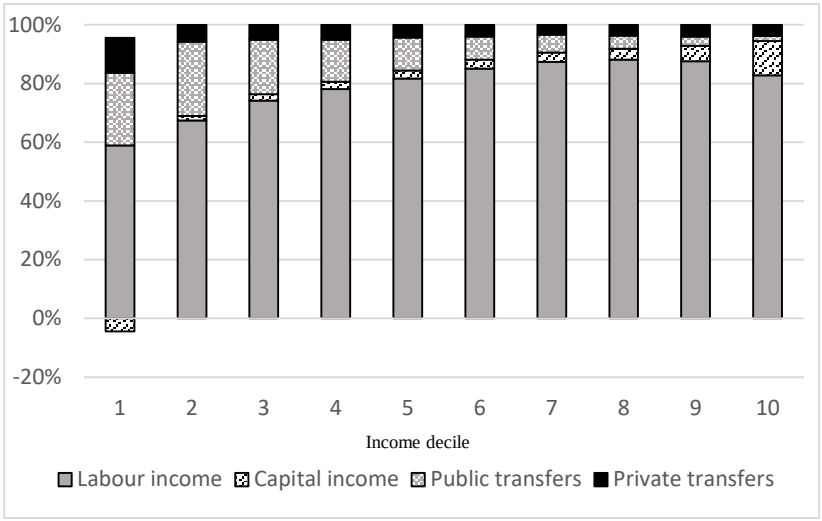
liquid assets, but even more conditioned to the business cycle. Finally, the average share of imputed rents is 6%, which has been constant during this period, while in absolute values has experienced a steady growth since 2007 despite the collapse in home equity values in 2009, 2011 and 2013 compensated with a lower value in annual mortgage payments (see Figure A5 in Appendix)

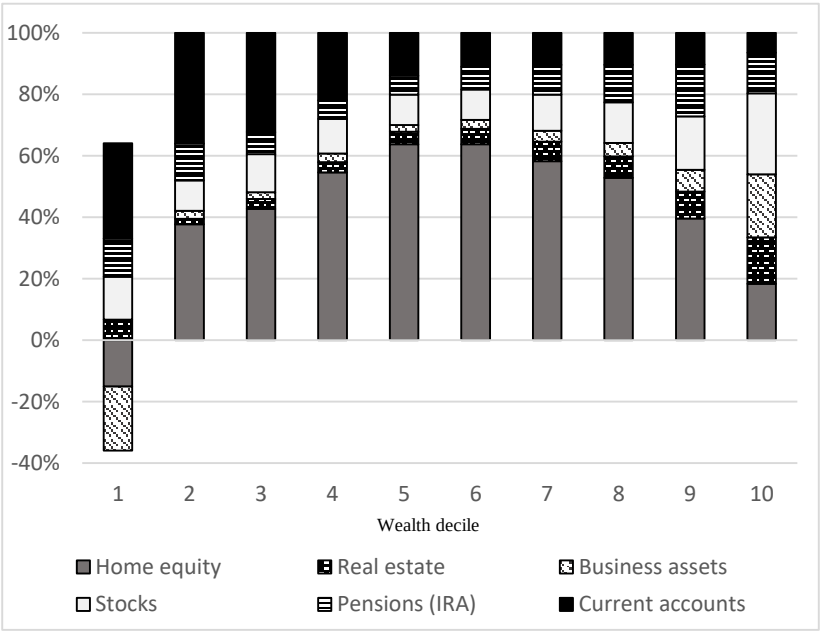
Previous results are average values for the entire population, but these patterns may be radically different depending on the individuals' position in the income or wealth distribution. Figure 4 shows the relative relevance of each income source by income deciles. As expected, labour income is the most important for all decile groups, while capital income is only relevant for households at the top. Up to the third decile, public transfers represent a relevant source of income, especially for those individuals positioned at the first decile (approximately 40% of total income). Therefore, the evolution of household income for those at the bottom part of the distribution is determined by labour market conditions and the cushioning effects of public transfers. Middle-class households will suffer the effects of the business cycle, while top-income households will also be affected by the progress of stock and rental markets.

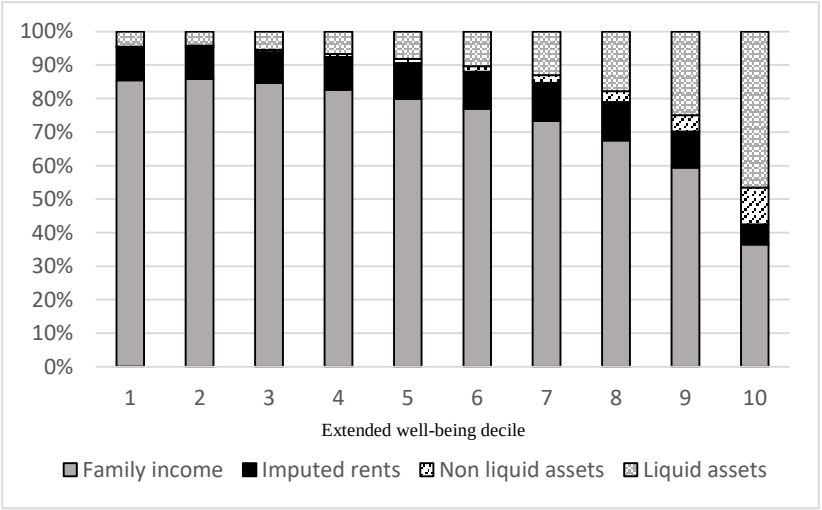
Net worth is extremely concentrated at the top of the wealth distribution. The average value of net wealth in first decile group is negative and is a consequence of high mortgage debts and short-term debts. Furthermore, we can observe a gradual increase of mortgage debt among those in the middle and top of the distribution, indicating a high degree of leverage (see Figure A3). The composition of household wealth for those at the bottom 50% is dominated by current and savings accounts as well as the main residence. The wealth portfolio for those in the middle and upper-middle is slightly different as main residence plays a more important role. The top 10% have a more diversified portfolio, as stocks replace main residence as the most important asset.

When analysing extended well-being deciles, we observe that net wealth becomes more relevant from the fourth decile group onwards and especially for those at the top of the distribution. Extended well-being is mainly determined by family income for the bottom 50%. The weight of annuitized wealth is higher for those individuals positioned from the fourth to the ninth decile even though family income is still the most important source of well-being. Conversely, the flow from wealth components is the most relevant source for the extended well-being of those at the top.

FIGURE 4. Composition of income, wealth and extended well-being by decile.





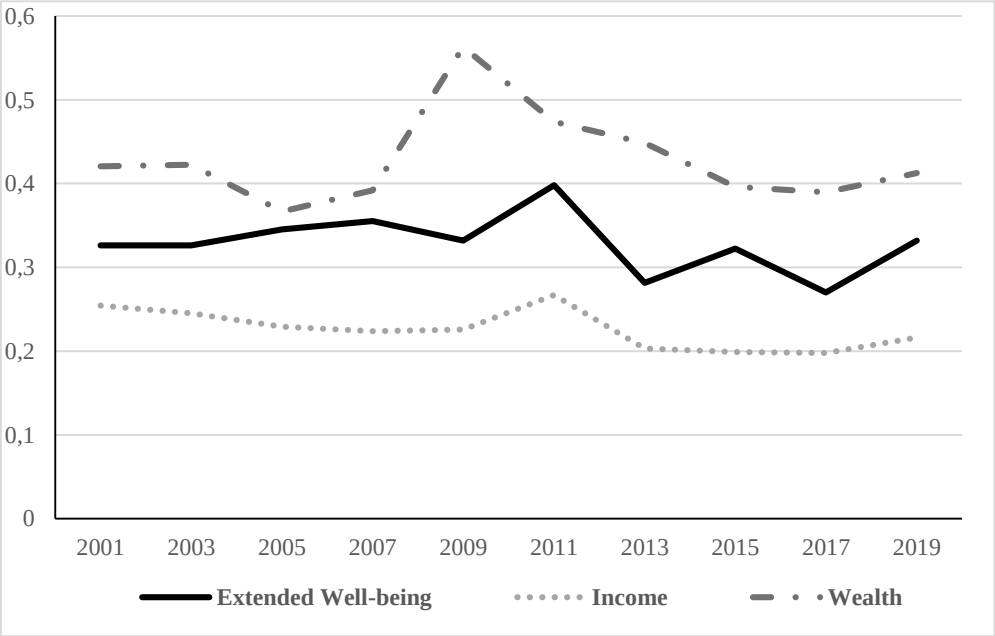


Source: Author's calculations based on PSID data set using cross-sectional weights.

4.2. Economic insecurity results

We analyse the degree of economic insecurity in the US by considering the probability of suffering large short-term drops in income, wealth and extended well-being (Figure 5). In general, the average probability of being economically insecure is approximately 22% when considering income only, whereas that probability increases to 43% when we take into account wealth. These differences could be explained by price movements of certain asset classes, such as real estate, business assets or stocks that change households' wealth composition affecting their probability of being insecure. The average probability of extended well-being losses is 33%, which shows that adding the flow from wealth to household income implies more risk of being insecure. The use of wealth to cope with an economic shock could lead households to a situation in which they lose an important amount of their economic resources with the inability to recover from them in the short-term. Moreover, households could suffer a loss from the downward volatility in the financial or real estate markets. Our extended measure can capture the risk associated with both situations, explaining the differences when analysing income and wealth separately.

FIGURE 5. Average probability of economic insecurity by year.



Source: Author's calculations based on PSID data set using cross-sectional weights.

Regarding the evolution of economic insecurity, we can observe that our extended measure follows its own trend for several years, which makes more relevant the inclusion of this joint distribution in insecurity analysis. The dotcom crisis implied a decrease in the value of capital income and stock market assets increasing the probability of being insecure in 2003 in income and wealth. However, the extended measure displays a small decline given that the macroeconomic aggregates in 2003 indicated a positive change in the business cycle (see table A2 in Appendix) which maintained the amounts of liquid and non-liquid assets. The expansionary period that preceded the financial crisis in 2008 did not lead into a significant lower probability of being insecure compared with 2001 for all variables. The collapse of home equity values in 2009 increased the probability of being insecure up to 56% if we look at wealth, although this did not affect the average probability of our extended measure as the average values of imputed rents were stable in part helped by the reduction in mortgage payments. The effects of the Great Recession increase the probability of being insecure regarding income up to 27% and to 40% considering our extended measure later in 2011. The change in the business cycle implied a slow reduction in the probability of being insecure for income and wealth until 2019. However, our extended well-being measure shows an increase in the probability in 2015 following the uncertainty in stock markets in that year and also a steeper increase in insecurity in 2019 due to the drop in household income and the decline in current accounts and savings.[7]

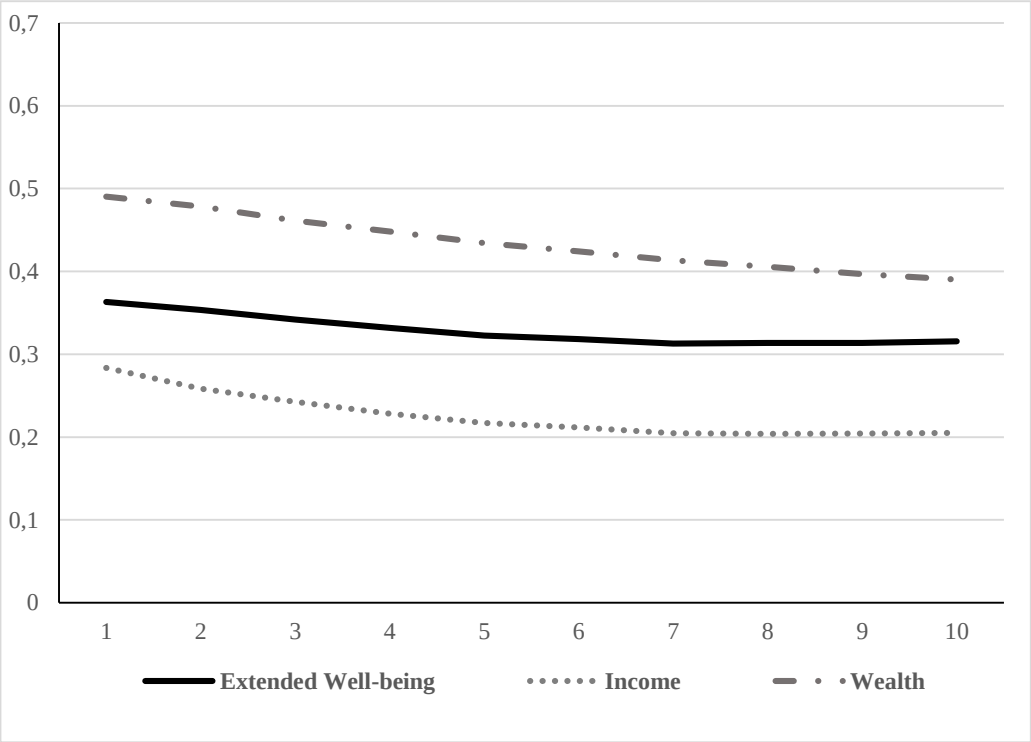
Therefore, the characteristics of the crisis matter for the level of household economic insecurity, which is negative and strongly correlated with the business cycle: if there is a decline (rise) in assets' value or an increase (decrease) in debt of households along the entire distribution, economic insecurity levels measured with our extended well-being indicator will increase (decrease).

Figure 6 presents the average probability of economic insecurity by extended well-being deciles. As expected, we can observe a general negative trend: the individual propensity of insecurity is lower as we move up the extended well-being ladder, although the difference between the bottom and the top deciles is approximately 5%. The estimation of the joint distribution together with the inclusion of a variety of

[7] The uncertainty we refer to was associated with the doubts in the rise of interest rates by the FED, and also the Greek debt among others. This reduced the rate of returns as can be seen in the macro aggregates which implied lower amounts in liquid assets in 2015.

sociodemographic characteristics when we estimate the probabilities, lead to a reordering process that compress the differences in the likelihood to be insecure across deciles. The income-based insecurity distribution describes a similar shape to that of extended well-being, in part as household income is still the major source of well-being across the distribution except for those at the top, with a difference in the probability between the top and the bottom of 8%. This reduction in the propensity of insecurity is steeper when we analyse the likelihood of wealth losses, probably because the greater accumulation of different type of assets in the top of the distribution allow them to diversify the risk.

FIGURE 6. Average probability of economic insecurity by year.



Source: Author's calculations based on PSID data set using cross-sectional weights.

Table 1 displays the probability of suffering an economic loss by socioeconomic groups. In general, we observe that this probability is lower when focussing only on income, while is the highest when analysing wealth drops. As we expect, the probabilities of our extended measure are balanced between the income and wealth results. Households headed by young individuals (those between 16 and 34) are more exposed whatever approach we use to measure economic insecurity. Households whose head is between 35 and 54 face lower levels of risk exposure when measuring income-based and extended well-being insecurity, probably due to more stable and less precarious conditions in the labour market. Households headed by old individuals (all above 55) are the most secure

if we focus on the probability of wealth losses but those above 65 years are the second most vulnerable group when considering extended well-being. This result highlights the larger accumulation of assets at the end of the lifecycle, which may act as a consumption smoothing mechanism. Nonetheless, when transforming this wealth stock into a flow of income, old-age insecurity is mainly driven by large short-term income drops. Furthermore, older individuals may be affected by the fluctuation in the value of their private pensions plan (IRAs). Despite the dimension used to measure economic insecurity, we find that households with female heads are always more insecure than those headed by men.

On the other hand, black and American Indian households also suffer more from the exposure to objective risk. White individuals have the lowest probability of wealth drops, but income losses are higher than that of Asian households, who are the most secure in terms of income and wealth. On average, married individuals are the less vulnerable to risk, whereas those who never married are in a worse position than those divorced, separated or widowed. This could be a result of the pooling of monetary resources of all household members: single individuals only rely on their income and accumulated assets which will probably be lower than those of married people. Divorced and widowed persons may suffer from income or wealth losses in the specific period when family breakup is produced, but results suggest that they are more capable to avoid well-being losses than single individuals. In line with these results, when looking into insecurity by household typology, we find that single-parent families suffer from the highest levels of insecurity followed by individuals who live alone.

Economic insecurity probability decreases as years of completed education grow and its reduction is larger when individuals have at least 16 years of education. Regarding labour market situation, the unemployed are the most insecure whatever method we use, followed by inactive households. This result evinces the lack of public benefits that prevent people for experiencing large well-being drops when they are not able to work or suffer from job loss. The self-employed are the most protected group when measuring the probability of wealth losses, what suggest that they own wealth to be protected from income volatility, which in part is suggested in our extended measure although the most secure group are those that are employed. In line with the degree of insecurity by age groups, retired individuals would suffer less from wealth drops as they own a higher stock of wealth.

Table 1. Average probability of economic insecurity by population groups

	Extended wellbeing	Income	Wealth
Age			
16-24	0.42	0.34	0.46
25-34	0.33	0.23	0.46
35-44	0.31	0.20	0.43
45-54	0.31	0.19	0.42
55-64	0.31	0.22	0.42
65+	0.36	0.24	0.39
Gender			
Female	0.36	0.26	0.47
Male	0.31	0.21	0.41
Race			
White	0.32	0.22	0.42
Black	0.36	0.27	0.47
American Indican	0.36	0.28	0.42
Asian	0.33	0.21	0.39
Other	0.33	0.22	0.43
Years of education			
Less than 12 years	0.37	0.26	0.58
12 to 15 years	0.35	0.23	0.53
16 years or more	0.31	0.20	0.45
Employment status			
Employee	0.29	0.19	0.40
Self-employed	0.38	0.30	0.45
Unemployed	0.43	0.38	0.49
Retired	0.37	0.24	0.46
Other inactive	0.37	0.27	0.48
Family type			
One adult, no children	0.32	0.22	0.43
One adult with children	0.35	0.25	0.44
Several adults, no children	0.34	0.24	0.42
Several adults with children	0.31	0.20	0.43

Source: Author's calculations based on PSID data set using cross-sectional weights.

4.3. Drivers of economic insecurity

Thus far, we have focused on the probability of suffering an economic loss that entails the insecurity situation. To the extent that the drop (increase) in extended well-being components implies a higher (lower) likelihood being insecure, we look into the changes of these resources to expose the drivers that determine why there are households less exposed to objective risk whereas others are more likely to face an economic insecurity situation. To address this goal, we estimate the fixed effects models from equations 5, 6, 7 and 8 since 1999 for both groups, accounting for observed and unobserved heterogeneity to disentangle the ownership effect and changes in the amount of these

resources in insecurity terms. After that, we compare the coefficients of both groups to compute the change in the resources of those with higher probability of being insecure compared with those with lower probability with respect our baseline year.

According to the estimates of Table 2 (column 1), the likelihood of having a positive amount of extended well-being only increased in 2001 for those with higher probability of being insecure, while for those with lower probability only increased in 2013 and 2017. We expect these results as most of the population have positive values of extended well-being measure. More interestingly, the results in the change of the amount of the extended well-being measure (Table 3 column 1) reveal that those more exposed to risk have been losing their economic resources for all years of analysis except for 2003, when the change in extended well-being was not significant. Fixed effects estimates indicate that since 2003 up to 2009 their extended well-being declined around 10% with respect to 1999, while the Great Recession caused a drop by 23% in 2011. We find a slight recovery of 2% between 2011 and 2013 (-22% vs -20%) and around 6% between 2015 and 2017 (-21% vs -15%) given the improvement in the business cycle. However, at the end of this period the loss in total resources with respect to 1999 increased by 18%. On the other hand, those with lower likelihood of suffering an economic loss did not experience significant changes in their amount of well-being until the last years of analysis, when it increased by 13% in 2017 and 16% in 2019 compared to its value in 1999.

Regarding the differences in the coefficients between both groups, in Table 3 (column 1) we can observe that those with higher probability of being insecure have been losing economic resources compared with those with lower probability for almost every year. From 1999 to 2001, the most insecure group lost approximately 5% of well-being compared with those more protected. We can see that the Great Recession led to a higher gap between both groups, which has been spreading in the most recent years, especially in 2019 when the less protected group lost 33% of well-being compared with those more protected. In general, the group less likely to be insecure was able to manage its income and wealth components to avoid significant losses, with a meaningful increase in their resources in the most recent years, being therefore less exposed to objective economic risk.

Table 2. Trends in asset ownership (flow) of those with higher/lower probability of being insecure

	P(EW>0) (1)			P(Imputed>0) (2)			P(Mortgage>0) (3)			P(Non-liquid>0) (4)			P(Liquid Assets>0) (5)		
	Higher prob.	Lower prob.	Low/High insecurity	Higher prob.	Lower prob.	Low/High insecurity	Higher prob.	Lower prob.	Low/High insecurity	Higher prob.	Lower prob.	Low/High insecurity	Higher prob.	Lower prob.	Low/High insecurity
Year 1999		Ref.			Ref.			Ref.			Ref.			Ref.	
Year 2001	0.007**	0.002	0.004	0.001	-0.008	0.009	0.005	0.007	-0.008	0.015	0.034**	-0.018	-0.019**	-0.009	-0.01
	(0.003)	(0.003)	(0.004)	(0.01)	(0.013)	(0.016)	(0.024)	(0.011)	(0.014)	(0.011)	(0.013)	(0.017)	(0.009)	(0.01)	(0.014)
Year 2003	0.004	0.001	0.002	0.003	-0.014	0.016	-0.014	-0.004	-0.002	0.025**	0.050***	-0.024	-0.003	-0.008	0.005
	(0.003)	(0.003)	(0.005)	(0.012)	(0.017)	(0.021)	(0.038)	(0.016)	(0.019)	(0.012)	(0.016)	(0.02)	(0.011)	(0.014)	(0.018)
Year 2005	0.006*	0	0.004	-0.004	-0.033	0.029	-0.022	-0.011	0	0.031**	0.058***	-0.027	-0.016	-0.006	-0.011
	(0.004)	(0.003)	(0.005)	(0.014)	(0.022)	(0.026)	(0.055)	(0.02)	(0.024)	(0.014)	(0.018)	(0.023)	(0.013)	(0.017)	(0.022)
Year 2007	0.003	-0.001	0.003	-0.013	-0.048*	0.035	0	-0.024	0.001	0.025	0.054**	-0.029	0.005	-0.011	0.016
	(0.004)	(0.004)	(0.005)	(0.016)	(0.026)	(0.031)	(0.068)	(0.026)	(0.029)	(0.016)	(0.021)	(0.026)	(0.016)	(0.022)	(0.027)
Year 2009	0.004	-0.003	0.004	-0.003	-0.046	0.043	-0.038	-0.027	-0.007	0.007	0.050**	-0.043	0.006	-0.022	0.027
	(0.005)	(0.004)	(0.006)	(0.019)	(0.032)	(0.037)	(0.078)	(0.031)	(0.035)	(0.018)	(0.024)	(0.03)	(0.017)	(0.026)	(0.032)
Year 2011	0.003	0.004	-0.003	0.004	-0.038	0.042	-0.142	-0.038	-0.007	-0.021	0.035	-0.056	-0.057***	-0.060*	0.004
	(0.005)	(0.004)	(0.006)	(0.022)	(0.037)	(0.043)	(0.096)	(0.036)	(0.04)	(0.02)	(0.028)	(0.035)	(0.02)	(0.031)	(0.037)
Year 2013	-0.001	0.007*	-0.011*	0.021	-0.016	0.038	-0.221**	-0.054	-0.013	-0.033	0.033	-0.065*	-0.060**	-0.05	-0.01
	(0.006)	(0.004)	(0.007)	(0.024)	(0.042)	(0.048)	(0.105)	(0.041)	(0.046)	(0.022)	(0.032)	(0.039)	(0.024)	(0.035)	(0.043)
Year 2015	0.003	0.004	-0.004	0.034	-0.02	0.054	-0.290**	-0.064	-0.006	-0.043*	0.028	-0.071*	-0.054**	-0.047	-0.008
	(0.007)	(0.005)	(0.008)	(0.027)	(0.047)	(0.054)	(0.132)	(0.046)	(0.051)	(0.025)	(0.035)	(0.043)	(0.026)	(0.041)	(0.048)
Year 2017	0.004	0.007	-0.007	0.04	0.021	0.02	-0.285**	-0.073	-0.01	-0.053*	0.03	-0.083*	0.082***	0.041	0.04
	(0.007)	(0.005)	(0.008)	(0.03)	(0.053)	(0.061)	(0.129)	(0.052)	(0.057)	(0.027)	(0.039)	(0.048)	(0.029)	(0.045)	(0.054)
Year 2019	0	0.005	-0.007	0.038	0.059	-0.021	-0.310**	-0.08	-0.009	-0.036	0.053	-0.090*	0.031	0	0.031
	(0.008)	(0.005)	(0.009)	(0.033)	(0.058)	(0.067)	(0.147)	(0.057)	(0.063)	(0.03)	(0.043)	(0.052)	(0.032)	(0.05)	(0.059)
Obs.	35146	29339	64485	35146	29339	64485	7464	29339	64485	35146	29339	64485	35146	29339	64485

Notes: *** 99%, ** 95%, * 90% significance level. Each column comes from a different fixed-effects regression. Each regression contains a constant term. The sample includes all panel individuals. Controls for marital status, household size, number of children, type of household, region of residence, race, years of education, an indicator for bad or very bad perceived health of household head, and a quadratic in household head's age are included. Robust standard errors, clustered at the individual level, are in parentheses.
Source: longitudinal PSID data

Table 3. Trends in the flow from asset values and family income of those with higher/lower probability of being insecure

	Log of positive EW (1)			Log of positive imputed rents (2)			Log of positive Mortgage (3)			Log of positive non-liquid assets (4)			Log of positive liquid assets (5)			Log of positive income (6)		
	Higher prob	Lower prob	Low/High insec.	Higher prob	Lower prob	Low/High insecurity	Higher prob.	Lower prob.	Low/High insecurity	Higher prob.	Lower prob.	Low/High insecurity	Higher prob.	Lower prob.	Low/High insecurity	Higher prob.	Lower prob.	Low/High insecurity
Year 1999		Ref.			Ref.			Ref.			Ref.			Ref.			Ref.	
Year 2001	-0.035*	0.011	-0.045	-0.023	-0.043	0.02	0.005	0.053**	-0.047	-0.037	0.234**	-0.271**	-0.314***	-0.263***	-0.051	-0.006	0.063***	-0.069***
	(0.02)	(0.018)	(0.028)	(0.035)	(0.067)	(0.076)	(0.024)	(0.022)	(0.033)	(0.07)	(0.092)	(0.116)	(0.054)	(0.055)	(0.077)	(0.019)	(0.017)	(0.026)
Year 2003	-0.021	0.021	-0.042	-0.059	-0.11	0.05	-0.014	0.025	-0.039	0.019	0.379***	-0.361**	-0.005	0.105	-0.111	-0.113***	-0.007	-0.106***
	(0.023)	(0.023)	(0.033)	(0.047)	(0.1)	(0.111)	(0.038)	(0.03)	(0.048)	(0.086)	(0.138)	(0.163)	(0.068)	(0.069)	(0.097)	(0.025)	(0.025)	(0.035)
Year 2005	-0.071***	0.032	-0.105**	-0.075	-0.092	0.017	-0.022	0.067*	-0.089	0.094	0.548***	-0.454**	-0.093	0.071	-0.164	-0.160***	0.006	-0.166***
	(0.027)	(0.029)	(0.041)	(0.064)	(0.141)	(0.155)	(0.055)	(0.037)	(0.066)	(0.109)	(0.188)	(0.218)	(0.089)	(0.085)	(0.123)	(0.031)	(0.029)	(0.042)
Year 2007	-0.094***	-0.016	-0.073	-0.048	-0.047	-0.001	0	0.094*	-0.094	-0.503***	0.161	-0.664**	-0.003	0.071	-0.074	-0.192***	-0.028	-0.164***
	(0.033)	(0.034)	(0.048)	(0.076)	(0.182)	(0.198)	(0.068)	(0.049)	(0.084)	(0.134)	(0.236)	(0.272)	(0.108)	(0.101)	(0.148)	(0.038)	(0.036)	(0.052)
Year 2009	-0.095**	0.041	-0.129**	0.087	-0.099	0.186	-0.038	0.100*	-0.138	-1.426***	-0.469	-0.957***	-0.059	0.115	-0.174	-0.182***	0.024	-0.205***
	(0.039)	(0.04)	(0.057)	(0.095)	(0.222)	(0.242)	(0.078)	(0.059)	(0.098)	(0.172)	(0.291)	(0.338)	(0.133)	(0.122)	(0.18)	(0.045)	(0.043)	(0.062)
Year 2011	-0.228***	-0.032	-0.185***	0.077	-0.139	0.216	-0.142	0.076	-0.218*	-0.813***	0.236	-1.049***	-0.212	0.015	-0.227	-0.310***	-0.042	-0.267***
	(0.043)	(0.046)	(0.065)	(0.11)	(0.265)	(0.287)	(0.096)	(0.069)	(0.119)	(0.185)	(0.341)	(0.388)	(0.155)	(0.142)	(0.21)	(0.051)	(0.049)	(0.07)
Year 2013	-0.207***	0.037	-0.239***	0.066	-0.127	0.193	-0.221**	0.024	-0.245*	-0.301	0.794**	-1.095**	-0.196	0.196	-0.393	-0.338***	-0.013	-0.324***
	(0.049)	(0.051)	(0.072)	(0.125)	(0.304)	(0.328)	(0.105)	(0.079)	(0.132)	(0.211)	(0.392)	(0.445)	(0.179)	(0.16)	(0.24)	(0.059)	(0.055)	(0.081)
Year 2015	-0.215***	0.032	-0.239***	0.057	-0.174	0.231	-0.290**	0.029	-0.319**	-0.582**	0.652	-1.234**	-0.302	0.13	-0.432	-0.342***	0.016	-0.358***
	(0.055)	(0.058)	(0.082)	(0.144)	(0.347)	(0.376)	(0.132)	(0.091)	(0.16)	(0.245)	(0.452)	(0.514)	(0.205)	(0.183)	(0.275)	(0.065)	(0.062)	(0.09)
Year 2017	-0.155**	0.135**	-0.285***	0.051	-0.112	0.163	-0.285**	0.061	-0.345**	-0.544**	0.983*	-1.527***	-0.241	0.394*	-0.635**	-0.344***	0.045	-0.389***
	(0.061)	(0.064)	(0.09)	-0.158	(0.387)	(0.418)	(0.129)	(0.101)	(0.164)	(0.273)	(0.505)	(0.574)	(0.224)	(0.202)	(0.302)	(0.073)	(0.069)	(0.1)
Year 2019	-0.176***	0.163**	-0.337***	0.17	0.141	0.03	-0.310**	0.052	-0.362**	-0.634**	1.005*	-1.638***	-0.069	0.494**	-0.563*	-0.390***	0.05	-0.441***
	(0.067)	(0.071)	(0.099)	(0.176)	(0.428)	(0.463)	(0.147)	(0.111)	(0.184)	(0.294)	(0.558)	(0.631)	(0.248)	(0.223)	(0.334)	(0.08)	(0.076)	(0.11)
Obs.	34377	29066	63443	13262	10611	23873	7464	11359	18823	8734	9451	18185	22181	24246	46427	34568	29163	63731

Notes: *** 99%, ** 95%, * 90% significance level. Each column comes from a different fixed-effects regression. Each regression contains a constant term. The sample includes all panel individuals with positive values for each component obtained from the flow of wealth. Controls for marital status, household size, number of children, type of household, region of residence, race, years of education, an indicator for bad or very bad perceived health of household head, and a quadratic in household head's age are included. Robust standard errors, clustered at the individual level, are in parentheses.
Source: longitudinal PSID data

By sources, according to Table 2 (column 2), the probability of having a positive amount of imputed rents (and therefore a main residence) remained unchanged for those with higher probability to be insecure. On the other hand, for the most protected group the probability of owning the main residence declined in 2005 and 2007, which could increase their probability of being insecure.

Similarly, the results for amounts of imputed rents remained unchanged with respect to 1999 for both groups, indicating that imputed rents did not have an important influence in the insecurity results (Table 3, column 2). The results indicate that the gap between both groups was not significant.

Regarding annual mortgage payments (Table 2, column 3), the most vulnerable group experienced a decrease in the probability of having a mortgage just before the financial crisis in 2008, with a constant decrease since that year given the credit restrictions that prevailed after the collapse of financial markets. This decline in the ownership of a mortgage was associated with a decrease in the value of the mortgage payments since 2013 up to 2019, when the mortgage payments were 30% lower than in 1999 (Table 3 column 3). Therefore, despite the decline in mortgage payments, the constraints to own the main residence could imply a higher insecurity. Conversely, those with lower probability experienced an increase in their annual mortgage payments up to 2009, except in 2003, that is why the probability of having positive values of imputed rents in 2005 and 2007 were lower than in 1999. Thus, mortgage payments increased the probability of being insecure for the less vulnerable group.

Table 3 (column 3) displays these differences in the amount of mortgage payments between the two groups, especially since 2011, when the less vulnerable group spent 21% less on mortgage than the more protected group compared with their amounts in 1999. The increase in the gap between both groups and the lower probability of having a mortgage of the most vulnerable group in the most recent years reveal that the credit restrictions after the collapse of financial markets in 2008 limited the access to home ownership, which could lead to a higher insecurity situation.

The flow from non-liquid assets explains one of the main differences between the two groups. We can observe that the probability of owning this type of assets for the most vulnerable group increased during the expansionary period after the dotcom crisis and

before the financial crisis (Table 2, column 4). However, the flow from these assets, that they purchased in the previous period, dropped by astonishing percentages since 2007, falling by 146% after the collapse of financial markets in 2009 compared with 1999 (Table 3, column 4). The flow from non-liquid assets recovered slightly in 2015 and 2017 considering the amounts during the Great Recession although they suffer again loss in this flow in 2019. Similarly, the less vulnerable group also had a higher probability of owning non-liquid assets before the financial crisis in 2008, although this group experienced an increase in the amounts non-liquid assets flows compared to the values in 1999, especially after the Great Recession.

Table 3 (column 4) shows the huge gap between the amounts of the two groups, which widened dramatically after the Great Recession with a difference of 169% in 2019 compared to their values in 1999. Thus, those with lower probability to be insecure were able to manage the risk associated with this type of assets over this highly volatile period, which implied a lower exposure to objective risk.

Considering the flow of liquid assets, the most vulnerable group suffer from the dotcom crisis in 2001 reducing the probability of having positive amounts of savings (Table 2, column 5) and flow from stocks and at the same time they suffered a drop of 28% (Table 3, column 5). Moreover, their probability of having positive amounts of these assets decreased between 2011 and 2015, with a slight recovery in 2017. The less vulnerable group also suffered the dotcom crisis with a loss of 26% in their liquid assets in 2001. Moreover, their probability of having positive savings and flow from stocks declined during the Great Recession in 2011. However, their amounts of this type of assets increased in 2017, and more importantly in 2019, what protected them from increase in the probability of being insecure in that year. When we compare the coefficients of both groups, we can observe that there are no significant differences between groups in the probability of holding positive amounts of these assets nor in the amounts except in the last two years of analysis.

Finally, Table 3 (column 6) shows the fixed effects estimates for family income (without capital income). For this source we exclude the estimations with the likelihood of holding positive amounts as most of the households have positive income. Family income explains in part the difference in probability of being insecure between both groups. We can observe that family income for the most vulnerable group decreased before the financial crisis between 12 and 20% depending on the year, although the fall

was even more pronounced in 2011, around 32%, compared to the amounts in 1999. It was also dramatic that they suffered a stepper loss in income since 2011. On the other hand, the most protected group only experienced a significant increase of 6% in 2001, while for the rest of the years remained virtually unchanged. The comparison of the coefficients reveals one of the key results that explains the difference in the probability of being insecure given the importance of family income in the total well-being. We can observe that the gap between both groups has been increasing since 2001, although the Great Recession created a higher distance in their income compared to the values in 1999, reaching the greatest gap in 2019 (44%).

To sum up, household income and non-liquid assets are the sources that most affected to the less protected group, and therefore, the main drivers that cause them have higher probability of being insecure. The imputed rents remained virtually unchanged while the decrease in the amounts of mortgage payments could have a positive effect in their well-being although the lower probability of holding a mortgage could restrict their access to the ownership of the main residence. On the other hand, the most protected group was able to manage the risk associated with non-liquid assets and enjoyed an increase in the flow from these assets, while household income did not change significantly until the last years of analysis, when they experienced an increase in household income. Therefore, the gap between both groups in household income and non-liquid assets has been spreading, especially after the Great Recession.

5. Conclusions

In this paper we use the joint distribution of income and wealth to assess economic insecurity and analyse its evolution in the US using the PSID data from 1999 to 2019. This procedure combines the liquid scope of income and considers wealth as a short-term protection mechanism and its loss as a cause of future economic hardship with the intention to capture the capacity to recover from an economic loss. We construct the joint distribution of income and wealth using the Weisbord and Hansen (1968) approach to estimate all available economic resources that individuals have to face unexpected negative shocks. We then evaluate economic insecurity as the propensity to suffering from a sizable well-being loss to capture the individual vulnerability to future hazards and the prospective nature of economic insecurity. Finally, we disentangle the potential

drivers of economic insecurity looking into the changes of each component of extended well-being that could cause an economic loss increasing the likelihood of being insecure.

The average probability to suffering a sizable economic loss is approximately 22% when considering income only, whereas the likelihood to suffer from large wealth variations rises to 46%. We therefore use our extended well-being approach to measure insecurity, obtaining that the average probability of being insecure is 33% when taking into account income and the flow from wealth. Hence, wealth-based economic insecurity shows the highest likelihood, revealing the importance of assets' price fluctuations and debts. The result of our extended measure is balanced between income and wealth, capturing the uncertainty from wealth, which increase the probability of being insecure compared with income-based result.

Nonetheless, the evolution of income and wealth, and our extended well-being measure follow different patterns regarding the characteristics of recession periods. The dotcom crisis in the early 2000s caused a larger increase in economic insecurity in income and wealth, rather than in our joint distribution. This crisis was associated with large drop of stock prices and therefore in capital income, although it did not imply a sharp decrease in the flow of liquid and non-ling assets in our extended measure in 2003 as the macroeconomic trends showed a positive change in the business cycle. However, the collapse in labour and stock markets during the Great Recession affected all households, increasing the likelihood of being insecure taking into account income up to 27% and to 40% considering our extended measure in 2011. The probability of being insecure regarding wealth increased in 2009, following the collapse of home equity values although it did not affect the average values of imputed rents in part due to the reduction in mortgage payments. The economic recovery after the Great Recession led to a slow reduction in the probability of being insecure for income and wealth until 2019. However, our extended well-being measure shows an increase in the probability to suffering an economic loss in 2015 given the uncertainty in stock markets, and also in 2019 due to the drop in household income and the decline in current accounts and savings.

In general, the fixed effects estimates indicate that household income and the flow from non-liquid assets are main drivers that cause the higher probability of being insecure of the less protected group. Their household income falls by 39% in 2019 compared to their amounts in 1999, while the gap in household income between the less protected and those more protected increased up to 44% with respect to its values in 1999. The

differences are more remarkable regarding the flow from non-liquid assets and the less protected group lost 63% of its amounts in 2019 compared with 1999, while the gap between both groups increased to 163%.

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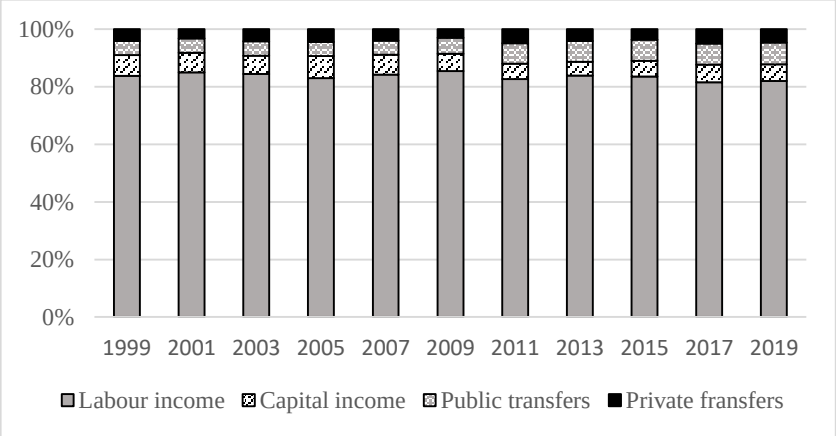
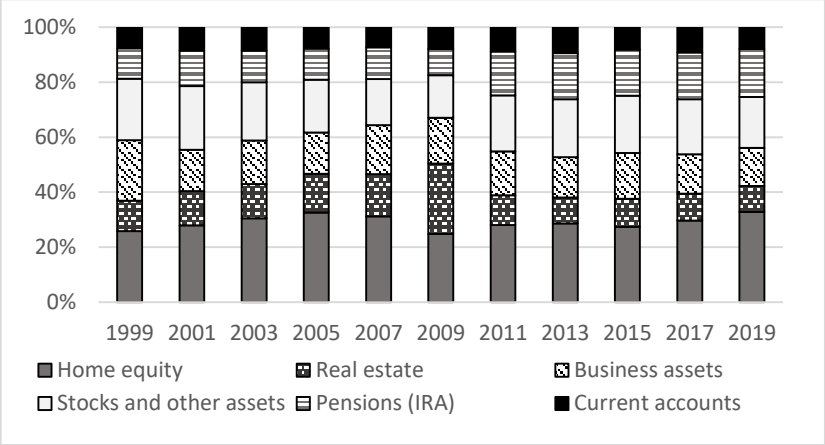
Appendix

Figure A1. Weight of different sources in family income



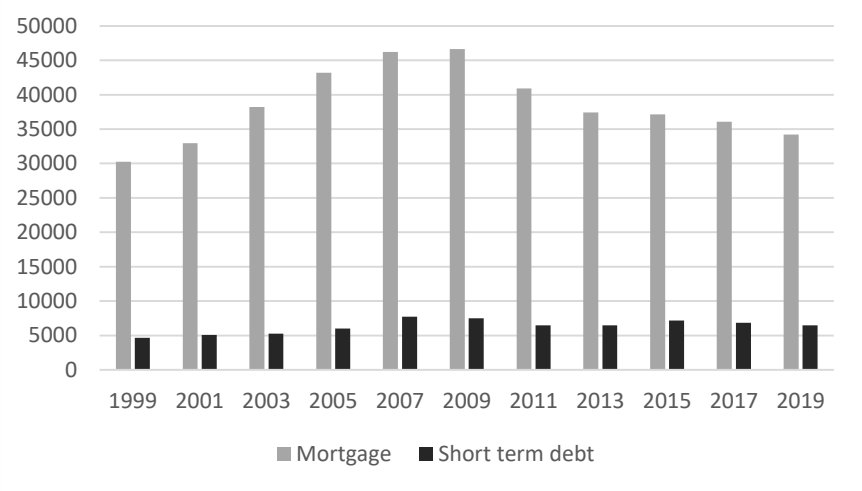
Source: Author's calculations based on PSID data set using cross-sectional weights

Figure A2. Weight of different sources in net wealth



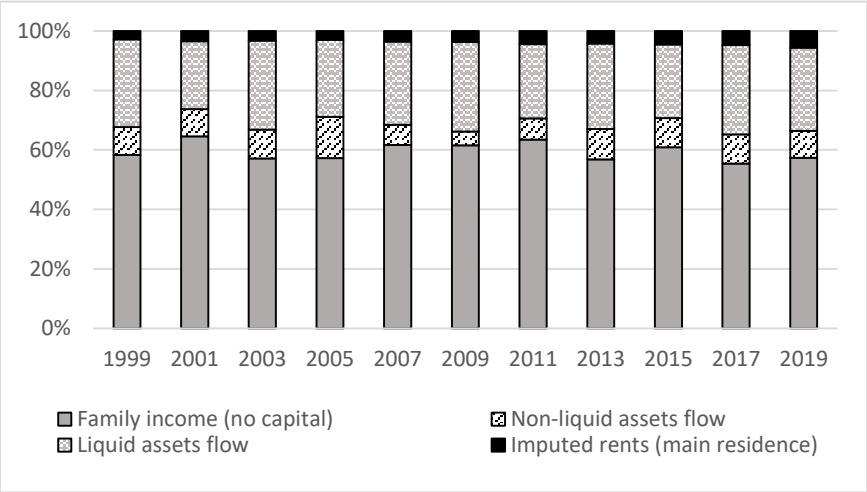
Source: Author's calculations based on PSID data set using cross-sectional weights

Figure A3. Evolution of debt type by year



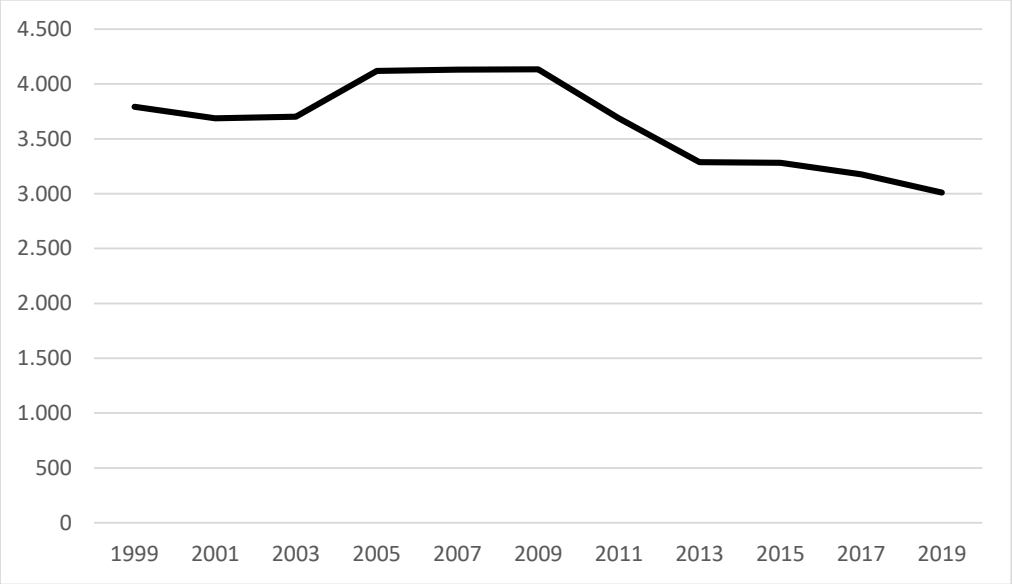
Source: Author's calculations based on PSID data set using cross-sectional weights

Figure A4. Weight of different sources in extended well-being



Source: Author's calculations based on PSID data set using cross-sectional weights

Figure A5. Evolution of average mortgage payments



Source: Author's calculations based on PSID data set using cross-sectional weights

Table A1. Definition of total extended-wellbeing

Definition	Net variables
Total income	Labour income + Public transfers + Private transfers
Liquid assets	Total income + Current and savings accounts + Flow from stocks and other assets - Flow from total debt (other debt + medical debt + student loans + card debt)
Non-liquid assets	Liquid assets + Flow from net Real estate + Flow from net Business assets + Flow from private pension assets (IRA)
Imputed rents	Real estate well-being + Gross imputed rents - Annual mortgage payments
Total extended well-being	Total income + Liquid assets +Non-liquid assets +Imputed rents

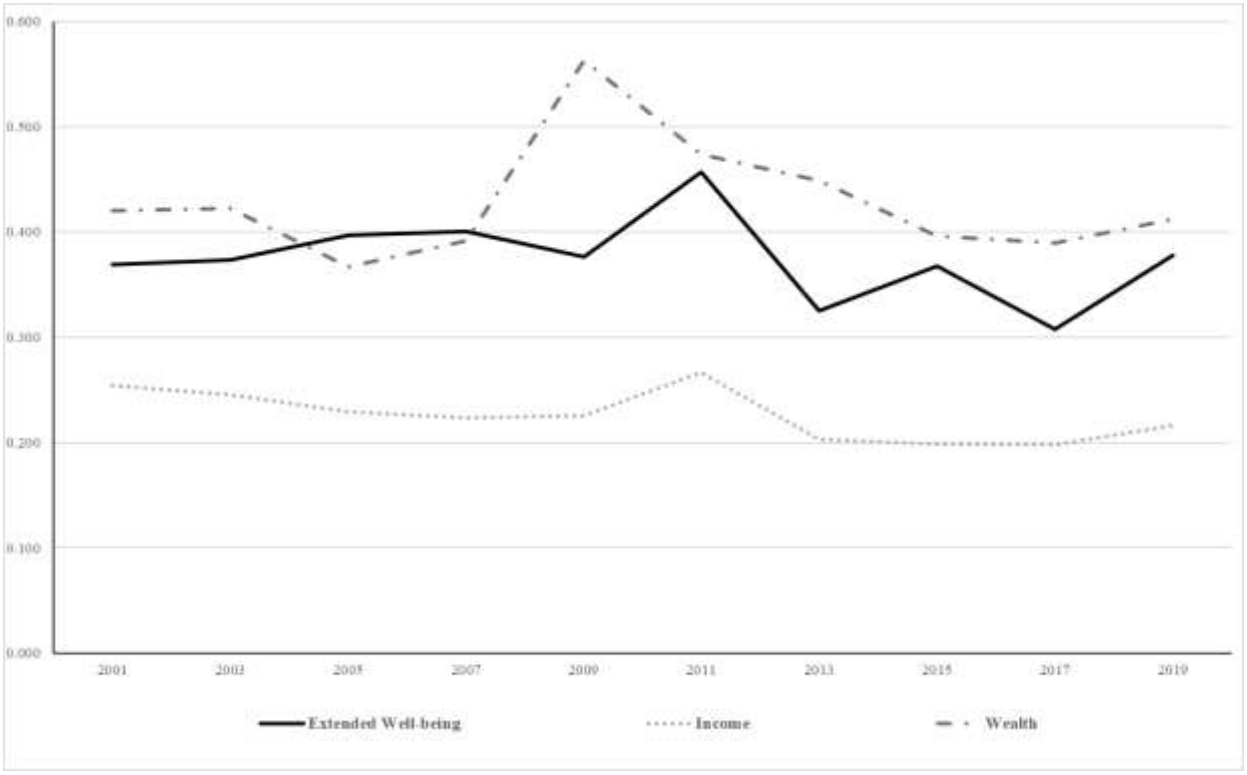
Source: Author's construction using the PSID databe

Table A2. Interest rates for each type of assets

	Real estate (including main residence)	Business assets	Stocks	Other assets	Private pensions	Mortgage rates (real estate)	Personal Loans	Credit cards	Student Loans interest
1999	6.80%	7.10%	22.20%	8.70%	0.80%	8.10%	13.50%	14.80%	-
2001	9.70%	4.30%	-7.50%	-2.40%	1.90%	7.20%	12.60%	13.90%	-
2003	7.10%	8.10%	19.50%	7.50%	5.20%	5.90%	12.00%	12.90%	-
2005	10.60%	14.00%	8.30%	5.10%	3.10%	6.20%	12.00%	14.50%	-
2007	-3.90%	-1.00%	7.20%	1.90%	2.30%	6.20%	12.20%	14.40%	-
2009	-9.60%	-17.10%	17.30%	4.00%	4.30%	5.10%	11.20%	14.40%	-
2011	-2.90%	3.90%	-2.30%	0.20%	1.60%	4.00%	10.40%	12.80%	-
2013	8.70%	10.60%	17.60%	7.10%	3.10%	4.50%	10.20%	12.90%	3.90%
2015	6.10%	5.70%	-1.40%	0.00%	1.00%	4.00%	9.70%	13.70%	4.30%
2017	6.40%	7.40%	14.10%	6.80%	3.10%	4.00%	10.60%	15.00%	4.50%
2019	4.70%	6.20%	18.80%	8.90%	1.50%	3.70%	10.20%	16.90%	4.50%

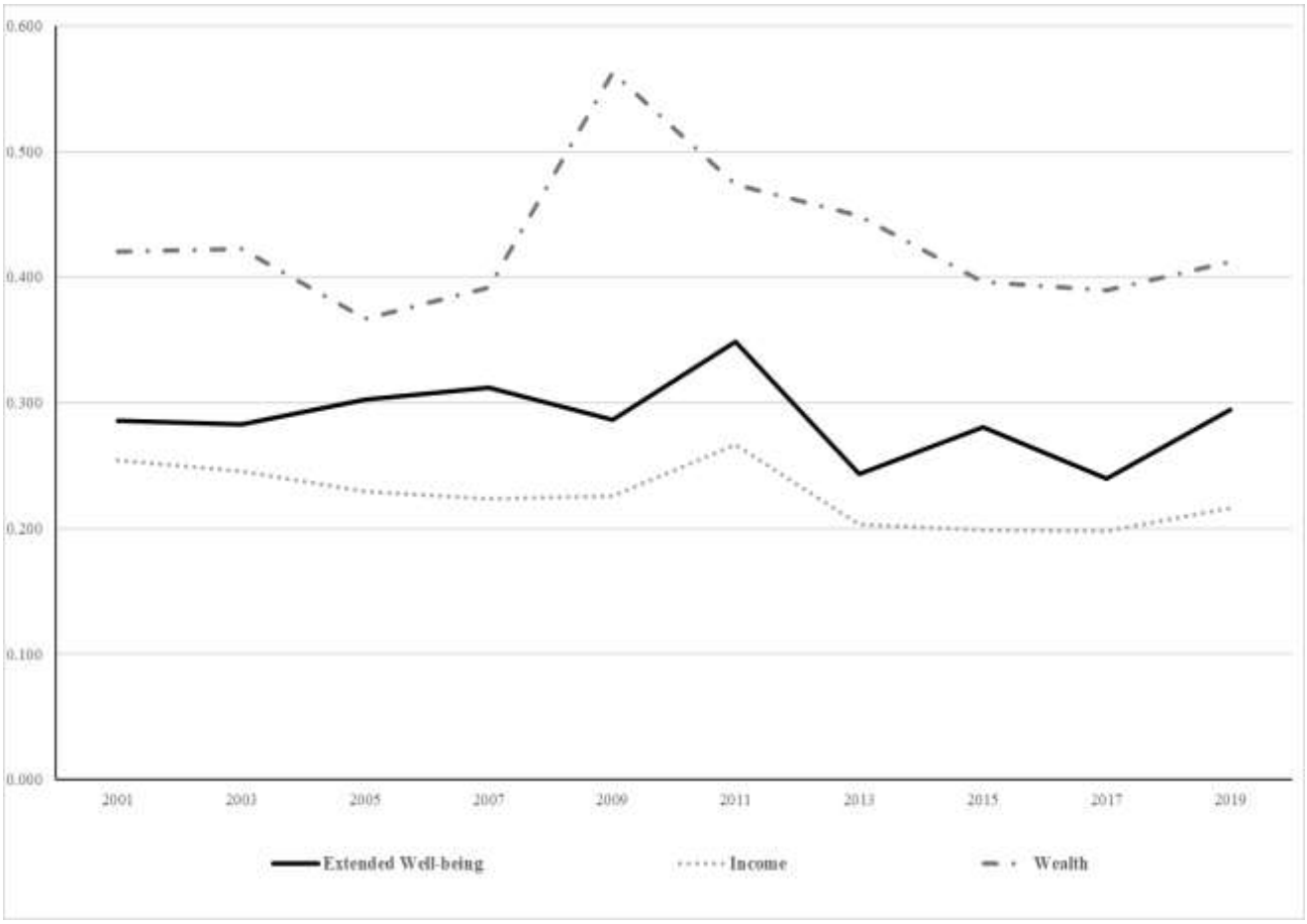
Source: Author's calculations based on Financial Accounts of the United States

Figure A6. Average probability of economic insecurity with a threshold of 10% for extended well-being.



Source: Author's calculations based on PSID data set using cross-sectional weights

Figure A7. Average probability of economic insecurity with a threshold of 20% for extended well-being



Source: Author's calculations based on PSID data set using cross-sectional weights