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THE DISTRIBUTION OF ECONOMIC INSECURITY: ITALY AND THE U.S. OVER THE GREAT RECESSION

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We estimate the distribution of economic insecurity in Italy and the U.S. using data from 1994 to 2010. Economic insecurity for each individual is assumed to depend on both current wealth and the changes in wealth that have been experienced in the past. The first element plays the role of the buffer stock that can be relied on in the case of an adverse future event. The second element reflects the individual's confidence in his ability to overcome any losses in the future. With respect to this second element, experiences in the recent past are given greater weight than experiences that occurred in the more distant past. The results confirm that the great recession has had a dramatic effect on the distribution of economic insecurity in both countries with the effect being much stronger in the U.S.

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1. INTRODUCTION

It is a common perception that the level of economic insecurity has been rising since the 1990s, especially since the global crisis in 2008. The fear and anxiety felt by individuals living in an insecure world has negative consequences for quality of life. For example, both well-being and consumption are lower in households that are faced with economic insecurity (Linz and Semykina, 2010) and it is harder for them to invest in housing and children's education (Stiglitz *et al.*, 2009), generating permanent negative effects on the well-being of future generations. Children who are brought up in disadvantaged and stressful circumstances are more likely to have problems in school, drop out, become teen parents, and live in poverty when adults. Greater economic insecurity has also negative effects on individual health (Catalano, 1991) and it is associated with higher obesity levels (Offer *et al.*, 2010).

The term *economic insecurity* is widely used by the general public. Despite this, there is to date no agreement in the social sciences on its exact definition and measurement. Perhaps as a consequence, only a few attempts have been made to

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design and compute measures of economic insecurity. The difficulties with this task might be intrinsic to the term itself. According to the United Nations Department of Economic and Social Affairs (2008, p. vi), "It is not easy to give a precise meaning to the term economic insecurity. Partly because it often draws on comparisons with past experiences and practices, which have a tendency to be viewed through rose-tinted lenses, and also because security has a large subjective or psychological component linked to feelings of anxiety and safety, which draw heavily on personal circumstances."

The measurement of economic insecurity is typically tackled at the aggregate level by estimating the proportion of the population experiencing one or more categories of adverse shocks. This is the case of the Rockefeller Foundation's Economic Security Index (Hacker *et al.*, 2010) which looks at the share of Americans who experience at least a 25 percent drop in their available family income (due to a decline in income or a spike in medical spending or a combination of the two) and who lack an adequate financial safety net to catch them when they fall. The Osberg (1998) and Osberg and Sharpe (2009) index focuses on the inability to obtain protection against significant potential economic losses and is a weighted sum of the scaled values of security from unemployment, illness, single-parent poverty, and poverty in old age. The International Labour Organization measures economic security as a weighted average of the scores of seven forms of security: income, representation, employment, work, skills, labor market, and collective voice. Lastly, the French Conseil d'Analyse Économique and the German Council of Economic Experts, as a response to the Franco-German Ministerial Council to follow-up on the outcome of the Stiglitz Commission, measure economic insecurity as the share of the population facing the risk of poverty.[1]

In this paper, we take a different route and study economic insecurity at the individual level. There are several advantages that individual level measurement has over aggregative approaches. First, once the insecurity index is calculated it is possible to study its distribution over the entire population and analyze changes over time. The method allows for the intensity of insecurity in the tails of the distribution to be assessed (rather than just the prevalence) and as such the changing shape of the distribution provides useful information regarding the challenges that households face. Second, this approach allows us to identify covariates of the index such that persons most exposed to economic insecurity can be identified, a fact which should help in the construction of social safety nets and other aspects of economic policy.

The specific method employed in this paper was developed recently by Bossert and D'Ambrosio (2013), who define economic insecurity as the anxiety produced by the potential exposure to adverse events and by the anticipation of the difficulty to recover from them. The authors characterize an individual measure assuming that economic insecurity depends on the current wealth level that each individual possesses and its past changes. The first component plays the role of a buffer stock that can be turned to in the case of an adverse future event. The second component models the subjective forecast of how well the individual will handle any future loss and

[1]Although these studies represent the few works to explicitly measure insecurity, there is a considerable volume of research on related factors such as job security (Kuhnert and Palmer, 1991), earnings volatility (Gottschalk and Moffitt, 2009; Shin and Solon, 2011), and income mobility (Jarvis and Jenkins, 1998).

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determines his confidence over his abilities. The greater the successes experienced in the past, the more self-confident the individual is in facing his future life. Experiences in the recent past are given greater weight than are experiences which occurred in the more distant past. By combining these components the Bossert and D'Ambrosio index forms a general measure of the sense of economic anxiety faced by the individual.

Our measure thus characterizes insecurity purely in terms of current and previous observations on wealth. However it is clear that economic insecurity is a multi-faceted issue and a comprehensive measure that subsumes all possible aspects of it is likely to remain difficult to agree upon. There are two main aspects of the measure for which a deeper discussion is in order: (1) the choice of wealth as the variable at the basis of insecurity; and (2) the consideration of current wealth and of past changes only.

We fully acknowledge that the use of wealth as the crucial variable represents a simplifying assumption and, as such, is not without its difficulties. However we do not see this as overly problematic as many approaches to related phenomena such as poverty, inequality, and deprivation were originally analyzed in terms of relatively straightforward models based on one dimension only in order to capture the essentials of the issue at hand. Regarding poverty, for example, income is the standard approach both in the U.S. and among EU countries. Only in more recent years have measures of asset poverty (see, for example, Haveman and Wolff, 2004) and of multidimensional poverty (see, among others, Bourguignon and Chakravarty, 2003) been proposed and applied to study the situation of different societies. It may also be argued that insecurity resulting from variations in wealth levels that are due to choices of the agent should be distinguished from those that result from externally imposed shocks. In any case, we believe that it is of importance to start measuring economic insecurity at the individual level even though this inevitably comes at the cost of some simplifications. We leave to future research the analysis of insecurity based on more than one dimension.

Second, the idea that the memories of the past influence an individual's behavior is also central to the work of numerous authors. Our point of view is best expressed by Allais (1966) in describing his theory of money demand where past experiences play a similar role to that of wealth fluctuations on individual insecurity. Allais (1974, p. 323) writes that "Because the new theory grounds its analysis on the hereditary influence of the past, it stands in contrast to those contemporary theories which base their reasoning on anticipation of the future. Of course the new theory does not deny the important role played by anticipation, but it holds that any anticipation of the future is strongly influenced by the hereditary influence of the past, and that, this being so, it is this influence which is the motor force of the dynamic development of the economy, with anticipation of the future acting only as an intermediary factor. In point of fact, men can behave rationally only in terms of their past experience. Without that experience, we leave the realm of science and enter the fields of divination and fortune telling. Be this as it may, the quantities which modern authors label as 'expected' are expected in name only."

Once the method is established, this paper empirically studies insecurity in two countries, Italy and the U.S. using data from 1994 to 2010. Specifically we are interested in seeing how the new technique performs in practice (this is the first paper to apply such an index) and how it may shed light on insecurity within the selected countries, both of which experienced macroeconomic downturns over the

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course of our data. While it would have been ideal to study insecurity using a larger range of countries, our choice was mainly dictated by data availability as the Survey of Household Income and Wealth (SHIW) and the Panel Study of Income Dynamics (PSID) are among the few longitudinal datasets that regularly sample household wealth. For the SHIW we focus on the panel component. Italy and the U.S. represent two interesting and diverse cases. Perhaps the most important difference in the context of economic insecurity between the two countries is the protection offered by the welfare states. In Italy the health, education, and pension systems are public while in the U.S. these are private.[2] Americans may then need to save more and be richer to obtain the same level of security as their Italian counterparts (on this issue, see the results of Osberg and Sharpe, 2009). Any comparison between the distributions of economic insecurity of the two countries has to take this fact into account. The changes within each country over time, their determinants, and consequences in terms of the population subgroups most affected are less influenced by these considerations.

To preface our findings we observe that in both countries the great recession produced a dramatic change in the insecurity levels of our samples. There was a notable distributional shift from security to insecurity (on average) and a substantial increase in the dispersion of our index. Both countries developed a heavy tail indicating an increased proportion of very insecure households, however there was little evidence of change in the proportion of very secure households.

The remainder of the paper is organized as follows. Section 2 presents the formal framework of the wealth-based measure of economic insecurity. The results are contained in Section 3. Section 4 concludes.

2. The Measure of Individual Insecurity

The class of measures characterized by Bossert and D'Ambrosio (2013) is inspired by the *single-series Gini* measures of inequality. The Gini index is one of the most established and well-known measures of income inequality. There are many alternative representations of it (see, on this issue, Yitzhaki and Schechtman, 2013) and some generalizations of one specific formulation have been proposed. The generalized Gini measures retain the linear structure of the Gini index in rank ordered subspaces of the space of income distributions but allow for alternative degrees of inequality aversion by generalizing the coefficients to any rank-ordered sequence of parameters.

To illustrate the notion of a rank-ordered set, let us consider the two-person case. The distributions on or below the 45-degree line form a rank-ordered set, namely, the set of distributions such that the first component is greater than or equal to the second. Analogously, the distributions on or above the 45-degree line also form a rank-ordered set, the set of distributions such that the second component is greater than or equal to the first.

A subclass of the generalized Ginis is given by the single series Ginis, characterized in Bossert (1990). They are generalized Ginis such that the sequence of

[2]The Italian welfare state is however less generous than the welfare states in continental Europe and in the Nordic countries, especially with regard to income support in case of negative income shocks.

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coefficients is the same for all population sizes. See, for instance, Donaldson and Weymark (1980), Weymark (1981), and Bossert (1990) for a discussion of the generalized and the single-series Ginis.

The class of individual insecurity measures proposed by Bossert and D'Ambrosio (2013) involves two sequences of parameters—one, the members of which are applied to past losses in wealth; one that is used for those period pairs in which there are gains.

Before the formal introduction of the measure we give a description of the notation we adopt in this paper. For any $T \in \mathbb{N}_0$, let $\mathbb{R}^{(T)}$ be the $(T + 1)$-dimensional Euclidean space with components labeled $(-T, \ldots, 0)$. Zero is interpreted as the current period and T is the number of past periods taken into consideration. A measure of individual insecurity is a sequence of functions $V = \langle V^T \rangle_{T \in \mathbb{N}_0}$ where, for each $T \in \mathbb{N}_0$, V^T: $\mathbb{R}^{(T)} \to \mathbb{R}$. This index assigns a degree of insecurity to each individual (net) wealth stream $w = (w_{-T}, \ldots, w_0) \in \bigcup_{T \in \mathbb{N}_0} \mathbb{R}^{(T)}$.

Specifically, the proposed measure is

$$V^T_{(\alpha,\beta)}(w) = \sum_{\substack{t \in \{1,\ldots,T\}: \\ w_{-t} > w_{-(t-1)}}} \alpha_{-t}\left(w_{-t} - w_{-(t-1)}\right) + \sum_{\substack{t \in \{1,\ldots,T\}: \\ w_{-t} < w_{-(t-1)}}} \beta_{-t}\left(w_{-t} - w_{-(t-1)}\right) - w_0$$

where the two sequences of parameters are such that

$$(1) \qquad \left[\alpha_{-t} > \alpha_{-(t+1)} > 0 \quad \text{and} \quad \beta_{-t} > \beta_{-(t+1)} > 0\right] \quad \text{for all } t \in \mathbb{N}.$$

A subclass of measures satisfies the requirement that *ceteris paribus* losses of a certain magnitude in a given period have at least as strong an impact on insecurity as *ceteris paribus* gains of the same magnitude in the same period. In this situation, the parameter values must be such that losses carry a weight that is at least as high as that for gains in each period.

An example of loss averse measures is obtained by choosing the sequences α and β so that

$$(2) \qquad \alpha_{-t} = \frac{1}{2t-1} \quad \text{and} \quad \beta_{-t} = \frac{\alpha_{-t}}{2}$$

for all $t \in \mathbb{N}$. The coefficients according to the sequence α are the inverses of the coefficients corresponding to the Gini social evaluation function.

Bossert and D'Ambrosio (2013) proposed two basic properties that they thought a measure of economic insecurity should possess. These, together with very standard axioms for social index numbers, allowed them to characterize the above illustrated classes.

The first defining property is difference monotonicity which requires a decrease in insecurity as a consequence of the *ceteris paribus* addition of another period $-T$ which introduces a gain between periods $-T$ and $-(T - 1)$, thus allowing past gains to work against insecurity. Analogously, the measure of insecurity is assumed to increase if a period $-T$ is added in a way such that wealth decreases, *ceteris paribus*, when moving from $-T$ to $-(T - 1)$. Finally, if the addition of period $-T$ involves a wealth level identical to that of period $-(T - 1)$, insecurity is

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unchanged. This is a monotonicity requirement that appears to be essential in capturing the notion of increased (decreased, unchanged, respectively) insecurity as a response to additional losses (additional gains, no changes, respectively) in past wealth levels.

The second defining property is proximity monotonicity which ensures that a gain (loss) of a given magnitude reduces (increases) insecurity, *ceteris paribus*, to a higher extent the closer to the present this gain (loss) occurs. That is, changes in wealth from one period to the next have a more severe impact the closer they are to the present period.

3. The Empirical Application

This section presents an empirical illustration of the insecurity index described above, however for simplicity in interpretation the negative of the measure is used and is interpreted as an indicator of economic security.

Data from the U.S. and Italy are used from the Panel Study of Income Dynamics (PSID) and the Survey of Household Income and Wealth (SHIW). Results are generated for the last three waves of each sample; for the U.S. this is 2009, 2007, and 2005, while for Italy the years are 2010, 2008, and 2006. These estimates are based upon waves that go back to 1994 for the U.S. and 1998 for Italy.[3]

The wealth variables employed for both countries are the sum of financial assets (including homeowner's equity) less total liabilities. This constitutes the total wealth of the household and ignores the proportion that is in highly liquid forms such as savings. While there are some advantages to considering insecurity in terms of highly accessible funds (which are useful in emergency situations) it is felt that the overall buffer provided by substantial illiquid assets such as housing equity plays too strong a role to be neglected.[4] As Haveman and Wolff (2004) neatly put it, net worth is an indicator of the long-run economic security of households.

Once our variable of choice is defined, a panel is created by merging household heads over waves. Due to wealth accumulation over time, a balanced panel is required, so any household with missing observations is dropped, while zero and negative observations are included. The wealth variables are then discounted to remove inflation, equivalized in proportion to the number of people in the household for each wave and standardized in terms of 2009 U.S. dollars using PPP exchange rates. The top and bottom 1 percent of the wealth distribution are then dropped as such observations were often dramatically different to the rest of the sample and had the effect of dominating results. By restricting the central 98 percent of households we are thus producing results that are representative of the

[3]The full set of waves for the U.S. is: 2009, 2007, 2005, 2003, 2001, 1999, and 1994; while for Italy: 2010, 2008, 2006, 2004, 2002, 2000, and 1998. Although there are wealth observations available prior to 1994 and 1998 respectively, these are relatively sparse and as a balanced panel is desired their inclusion substantially reduces the number of households available for the study. The uneven spacing between waves at the earlier part of the sample makes the estimates slightly asymmetrical between the two countries and over time.

[4]Note that households with large net wealth but low liquid assets are likely to be able to borrow to meet short term obligations.

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majority of the respective populations, but are neglecting movements in the extreme tails of the distributions (although some estimates determined without this truncation are also provided). Lastly we employ longitudinal weights throughout the analysis and each household is also weighted by size. Hence the unit of our analysis is the individual.

The index specified above is applied to the wealth streams of individuals in both countries. We use the following functions to define the weighting series:

$$\alpha_{-t} = \frac{\gamma}{2t-1} \quad \beta_{-t} = \frac{\alpha_{-t}}{2}$$

which represent a generalization (in terms of the alpha series) of the inverse of the Gini social evaluation function. Here the parameter $\gamma \geq 0$ weighs the importance of the current wealth W_0 against historical fluctuations in wealth for establishing an insecurity level. Setting $\gamma = 0$ causes the index to collapse so that security is simply equal to current wealth, while setting $\gamma = 1$ gives the weightings specified in (2). As the "correct" weighting is unknown we use all three specifications to add robustness, where the higher values place a greater importance on past fluctuations rather than the current level of household wealth. While these parametric settings are somewhat arbitrary, the index is a linear sum where γ is simply a weighting parameter, and as such it is possible to determine averaged values of the index based upon any weighting from the results presented. We note however that results based upon $\gamma = 0$ are descriptive only of current wealth and do not satisfy the axiomatic structure required for $-V$. For this reason they are best interpreted as a benchmark for comparison against rather than a direct indicator of economic security.

The index is calculated for each individual based upon a uniform four lags, giving us estimates for the last $p = 3$ periods. For example, the U.S. results calculated in 2009 employ observations from 2009, 2007, 2005, 2003 and 2001. Although it would be possible to include a greater number of lags for more recent time periods the use of a uniform number keeps the method consistent through time. Such a truncation can be justified with an appeal to the proximity monotonicity property which discounts the importance of fluctuation a long way in the past. Once a result is generated for each individual they are weighted and averaged across individuals for each year; the results are given in Table 1.[5] In addition to the means, the medians, standard errors, variances, and proportions of negative mass are also reported.

Comparing the levels of the index we see that U.S. individuals had higher mean security scores than Italians in the mid 2000s (i.e., the earliest two results for each country) and that this is consistent over both non-zero weighting

[5]If the means are determined without the truncation of the top and bottom 1 percent we get the following for the United States. Using $\gamma = 5{:}\, -\bar{V}_{2005} = 191{,}445$, $-\bar{V}_{2007} = 234{,}157$, $-\bar{V}_{2009} = -132{,}806$. Using $\gamma = 1{:}\, -\bar{V}_{2005} = 201{,}176$, $-\bar{V}_{2007} = 247{,}857$, $-\bar{V}_{2009} = 168{,}399$. Using $\gamma = 0{:}\, -\bar{V}_{2005} = 203{,}609$, $-\bar{V}_{2007} = 251{,}282$, $-\bar{V}_{2009} = 243{,}701$. For Italy using $\gamma = 5{:}\, -\bar{V}_{2006} = 123{,}247$, $-\bar{V}_{2008} = 117{,}868$, $-\bar{V}_{2010} = 90{,}945$. Using $\gamma = 1{:}\, -\bar{V}_{2006} = 126{,}801$, $-\bar{V}_{2008} = 133{,}152$, $-\bar{V}_{2010} = 132{,}917$. Using $\gamma = 0{:}\, -\bar{V}_{2005} = 127{,}690$, $-\bar{V}_{2007} = 136{,}973$, $-\bar{V}_{2009} = 143{,}409$.

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TABLE 1

Descriptive Statistics of Security Measurements, United States and Italy

	United States $\gamma = 0$			United States $\gamma = 1$			United States $\gamma = 5$		
	2005	2007	2009	2005	2007	2009	2005	2007	2009
$-\bar{V}$	161,990	182,006	168,063	160,755	178,740	128,484	155,814	165,674	–29,831
$-\hat{V}_M$	78,102	88,284	74,500	76,464	82,140	41,334	47,174	54,110	–3,512
$\hat{\sigma}/\sqrt{n}$	7,603	7,411	7,370	7,835	7,721	9,146	9,034	9,973	24,468
$\hat{\sigma}^2$	$1.45 \cdot 10^{11}$	$1.38 \cdot 10^{11}$	$1.36 \cdot 10^{11}$	$1.8 \cdot 10^{11}$	$1.5 \cdot 10^{11}$	$2.9 \cdot 10^{11}$	$2.4 \cdot 10^{11}$	$2.5 \cdot 10^{11}$	$1.8 \cdot 10^{12}$
η	5.5%	5.3%	8.3%	10.7%	12.2%	27.0%	17.9%	22.7%	53.5%
	Italy $\gamma = 0$			Italy $\gamma = 1$			Italy $\gamma = 5$		
	2006	2008	2010	2006	2008	2010	2006	2008	2010
$-\bar{V}$	122,051	129,198	133,899	121,413	125,563	122,644	118,865	111,022	77,622
$-\hat{V}_M$	95,443	101,456	107,139	93,623	97,512	88,615	74,356	66,713	46,722
$\hat{\sigma}/\sqrt{n}$	14,614	15,612	15,383	14,879	16,022	17,792	16,255	18,869	39,996
$\hat{\sigma}^2$	$2.3 \cdot 10^{11}$	$2.6 \cdot 10^{11}$	$2.5 \cdot 10^{11}$	$4.5 \cdot 10^{10}$	$3.3 \cdot 10^{10}$	$4.5 \cdot 10^{10}$	$5.6 \cdot 10^{10}$	$5.2 \cdot 10^{10}$	$4.5 \cdot 10^{11}$
η	1.9%	2.8%	1.5%	7.8%	8.9%	14.2%	14.9%	20.4%	33.4%

Notes: The first row gives the averaged security index across individuals while the second gives the median of the distribution. The third gives the standard error of the estimate and the fourth the variance. The fifth row shows the proportion of the distribution to be given a negative score.

Source: Authors' own calculations from PSID and SHIW datasets.

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specifications. Such a result is expected as U.S. individuals had greater financial assets than their Italian counterparts. However the lowest security score was obtained by U.S. individuals in 2009 using $\gamma = 5$. This appears to be a result of the sudden drop in asset prices and associated financial crisis of the time, although the result is much stronger for the U.S. than for Italy. Indeed unlike for the U.S., a recent report from the Bank of Italy (Banca d'Italia, 2011) indicates that Italian household wealth barely declined from 2008 to 2010.

In terms of trends, results from Table 1 generally show security increasing in the first set of changes and decreasing thereafter. For the U.S. these results are consistent across all specifications for γ and are in line with expectations, with household wealth increasing prior to the recession and decreasing thereafter. Conversely, deciding whether security increased or decreased in Italy from 2006 to 2008 depends upon the preferred weighting parameter of the observer. If one places a low weighting on changes relative to levels ($\gamma = 1$) security increased slightly, or if the alternative weighting is employed a slight decline is evident, although both these movements are insignificant relative to the standard errors of the estimates. Like for the U.S., point estimates of average Italian security declined in the last period, with the drop being very small under the first weighting but large under the second.

The Distribution of $-V$

One factor not evident from the results in Table 1 is the distributional shifts in security that occurred over the three periods for which we estimate the index. Given that the measure is heavily influenced by household wealth which is normally heavy tailed and right skewed, there is the possibility that the index may be similarly distributed, making the descriptive statistics from Table 1 insufficient for summarizing changes. For example, the decline in U.S. security from 2007 to 2009 may have been driven by a sharp reduction in the wealth of a small number of highly affluent households, or alternatively it may have been the result of uniformly volatile and/or declining wealth over the entire distribution. Given that these two cases would have different economic consequences there is a desire to differentiate between them.

To illustrate the distributional changes in the index we take the security estimates and fit adaptive kernel densities for each of our selected years. The results are shown in Figure 1 for the U.S. and Figure 2 for Italy. To model the distributions, a pilot kernel of the form $\hat{f}_h(-V) = \frac{1}{n}\sum_{i=1}^{n} K_h(-V + V_i)$ is used initially where $-V$ is the security index, K is a Gaussian Probability Density Function (PDF), and h is a selected bandwidth. There is a considerable literature on optimal bandwidth selection and the choice is generally seen as critical in determining the performance of the technique. The widely employed Silverman rule of thumb (Silverman, 1986) is to use $\hat{h} = 1.06 n^{-\frac{1}{n}} \hat{\sigma}$ where $\hat{\sigma}$ is the standard deviation of the sample. This approach is optimal when the underlying distribution is known to be Gaussian, however if the data is heavy tailed it tends to over-smooth. The alternative we use is to (under certain circumstances) replace the standard deviation with a rescaled

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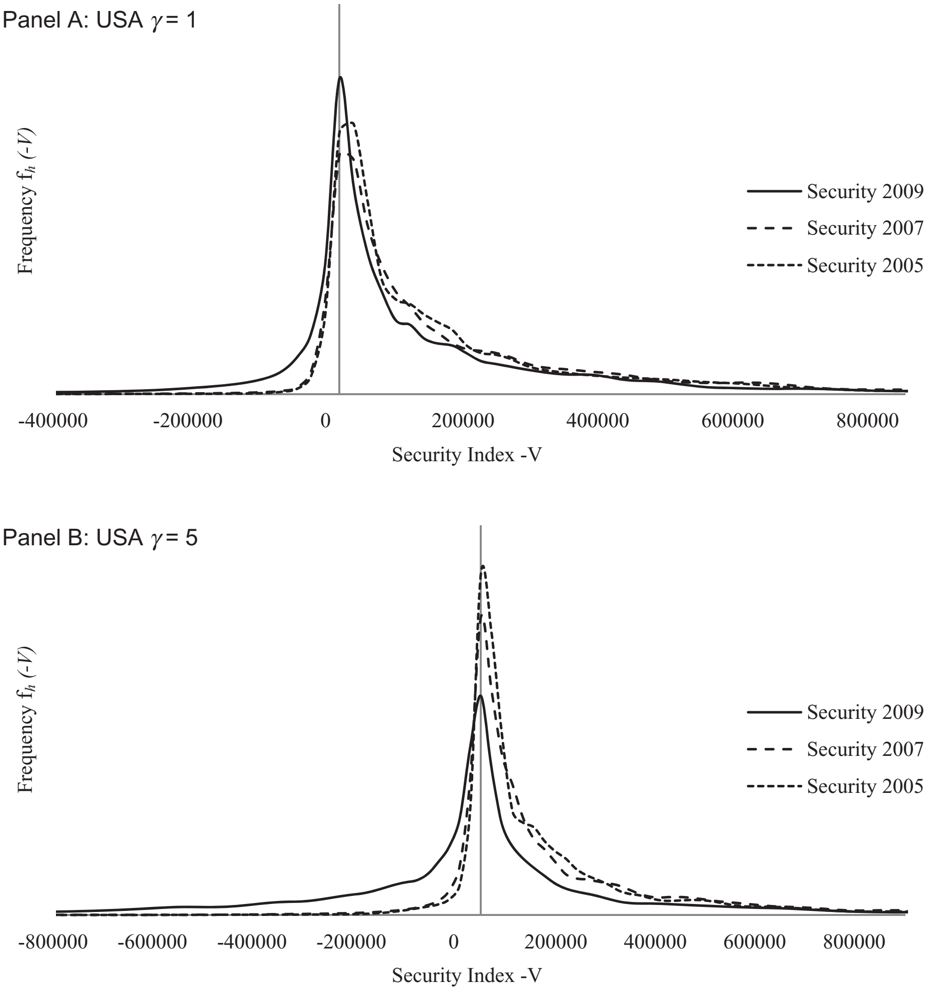

Figure 1. Kernel Density Estimates for Security in the U.S. 2009, 2007, and 2005

Notes: The horizontal axis gives the security index while the vertical axis depicts the relative frequency. The solid line shows results for 2009, the dashed line for 2007, and the dotted line 2005.

interquartile range. The rule of thumb then becomes $\hat{h} = 1.06 n^{-\frac{1}{n}} \min\left(\hat{\sigma}, \frac{R}{1.34}\right)$, where R is the interquartile range of the underlying data.

Once $\hat{h}$ is determined the pilot density can be estimated which is then used to guide the adaptive kernel. A standard approach (see Abramson, 1982) is to define a scaling vector $\lambda_i = \lambda(V_i) = \left(G / \hat{f}_h(-V_i)\right)^{0.5}$ which is used to allow $\hat{h}_i = \hat{h} \cdot \lambda_i$. The kernel is then re-estimated allowing for greater bandwidth in the tails of the distribution where observations are sparse, while keeping a low bandwidth in the center to ensure important features are not smoothed away.

Figure 1 highlights the changes in $-V$ in the U.S. over the period. For Panel 1 of Figure 1 we see positive means and highly right-skewed distributions in all

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cases. The estimated densities for 2005 and 2007 are broadly similar, with both plots depicting narrow left tails and heavy right tails. The heavy right tails indicates that very secure individuals exist while the narrow left tail shows that highly insecure individuals (scoring below around –50,000) were rare over these years. In contrast the PDF for 2009 appears to have undergone a sharpe negative translation. In addition it is highly leptokurtic and there has been an increase in variance with security now more spread out over the domain. Most notable however is the increase in heaviness of the left tail, indicating the development of a substantial frequency of very low security individuals. The leftward translation of the 2009 PDF is expected given the dramatic decreases in asset prices that occurred from 2007 to 2009, and the changes in shape indicate that the increase in the frequency of highly insecure individuals has come at the expense of mass around the mean of the distribution.

Results for the U.S. depicted in Panel B of Figure 1 have lower means and are much more symmetrical than the previous case obtained where $\gamma = 1$. Again the distributions for 2005 and 2007 are similar, with the development of a very heavy left tail and narrowing right tail evident for 2009. A leftward shift is evident and the variances depicted based on the weights in Panel A of Figure 1 are much lower than the corresponding variances from Panel B of the same figure.

Similar results for Italy can be seen in Figure 2. For Panel A of Figure 2 the first two years (2006 and 2008) PDFs are right-skewed and show the bulk of individuals exhibiting low but positive security scores. Again these distributions show a thick right tail and thin left tail. However for 2010 there is a reduction in the mean (although as expected this is much less dramatic than for the U.S.) which is the result of a lessening of scores congregated around and just above the mode, and an increase in the number of highly insecure individuals. It is of interest to observe that for both the U.S. and Italy there is little evidence of change in the far upper tail of the distributions (above 500,000), which suggests that the proportion of highly secure individuals has been relatively unchanged over time, although the individuals that comprise this group may have changed.

Estimates based on the increased weight depicted in Panel B of Figure 2 show a similar change for Italy to the one observed for the U.S. There is a leftward translation of the distributions and a sharp increase in the number of very insecure individuals, particularly in 2010. Again there is little evidence of a reduction in the security levels of the wealthiest individuals; in fact there appears to be slightly *more* mass in the upper tail relative to previous years.

Cross-Sectional Correlates

In addition to examining the distribution of $-V$ we are also interested in identifying various demographic and labor market determinants of the index. We are somewhat limited for choice due to the need for similarly defined explanatory variables over the two countries, however we settle on (i) the age of the household head to which the individual belongs, (ii) the equivalized household income level, (iii) the employment status (employed or not employed), (iv) the marital status (married, single, separated/divorced, widowed), and (v) the education level (less

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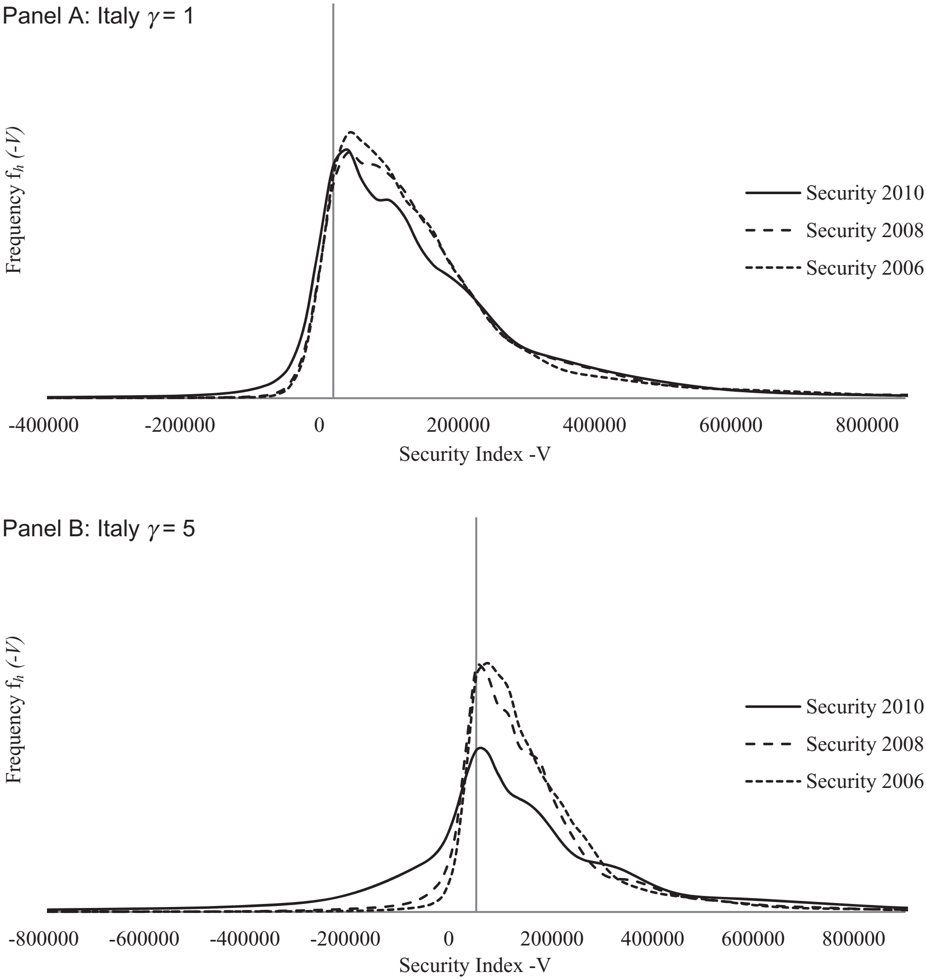

Figure 2. Kernel Density Estimates for Security in Italy 2010, 2008, and 2006

Notes: The horizontal axis gives the security index in PPP dollars while the vertical axis depicts the relative frequency. The solid line shows results for 2010, the dashed line for 2008, and the dotted line 2006.

than high school, high school, degree) of the head.[6] Initially we present simple pooled correlations between the security index and the various explanatory variables in Table 2.

Table 2 shows that older heads with high incomes and smaller households are associated with higher degrees of security as measured by the index across both countries and weightings. Similarly female, divorced, and separated heads, and heads with less than high school educations had lower security while widowed and degree holding heads had higher security scores. The high security of widowed

[6]Age is measured in years, household income is measured as total net income of all members divided by the square root of household size, and gender, marital status, and education are captured as dummy variables.

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TABLE 2
Correlations between Security Index $-V$ and Explanatory Variables

	U.S.		Italy	
Variable	$\gamma = 1$	$\gamma = 5$	$\gamma = 1$	$\gamma = 5$
Age	0.1463***	0.0312***	0.1452***	0.0456***
Income	0.3100***	0.1737***	0.4545***	0.2615***
Household size	–0.1231***	–0.0512***	–0.2197***	–0.1044***
Not employed	0.0025**	0.0071	0.0967***	0.0410***
Female	–0.0914***	–0.0363***	–0.0025	–0.0036
Single	–0.0452***	–0.0082	0.0777***	0.0099**
Sep/div	–0.0323***	–0.0067	–0.0587***	–0.0481***
Widowed	0.0286***	0.0048	0.0894***	0.0577***
<HS education	–0.1001***	–0.0329***	–0.1757***	–0.1018***
Degree	0.1627***	0.0650	0.1769***	0.1016***

Notes: Significance denoted ***1%, **5%, *10%.
Positive coefficients indicate greater security.
Correlations for variables "Not employed," "Female," "Single", "Separated/divorced," "Widowed," "<HS Education," and "Degree" correlations are point-biserial.

heads is unexpected but likely to be the result of aged heads being more likely to be widowed, and having accumulated significant assets over their lifetimes. These results are generally consistent across countries and weighting parameters. In other cases, results appear inconsistent across the two countries, with single status associated with *greater* security in Italy but lower security in the United States.

The correlations in Table 2 of course are merely raw associations and no attempt is made to control for the effects of other related variables. To model the effects of the explanatory variables simultaneously in the two countries a regression model employing annual dummies is selected. The model for the estimated security of individual i in period p based upon regressors $k = 1 \ldots l$ can be specified as

$$-V_{ip} = \delta_p + \sum_{k=1}^{l} \xi_k x_{ipk} + e_{ip}, \tag{3}$$

where the yearly dummies δ_p and slope parameters ξ_k are estimated by Weighted Least Squares (WLS). Although we retain the linear specification we added a squared term for the age of the head to capture the humped shape of wealth over the life-cycle. Due to potential endogeneity problems the parameter estimates are best interpreted as descriptive rather than causal and are presented for the two non-zero specifications of γ below.

In most cases the results from Table 3 are expected given the correlations in Table 2, however this is by no means always the case. Income and household size are still significant determinants of security across both countries when other variables are accounted for. Further education status seems to be important and all three variables exhibit the expected signs for both countries. Female heads again have lower security in the U.S. with insignificant differences between female and male heads in Italy. A surprising result is that those who are not employed, along with single, widowed, separated, and divorced heads are now in some cases

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TABLE 3
Household Correlates of $-V$ in the United States and Italy

Variable	U.S. $\gamma = 1$	U.S. $\gamma = 5$	Italy $\gamma = 1$	Italy $\gamma = 5$
Year 2004/2005	–205,914.5***	–471,772.3***	–27,535.41	–7,961.648
Year 2006/2007	–134,651.7*	–253,950.2*	–33,581.59	–24,796.53
Year 2008/2009	–129,321.4	–242,503.7*	–47,037.36	–67,222.03
Age	4,240.835	9,427.504**	2,670.999	4,270.940
Age^2	1.412410	–67.26611	–15.31745	–39.85533
Income	2.216106***	2.542115***	6.434575***	6.257086***
Household size	–22,097.46***	–18,624.80***	–22,900.04***	–31,799.13***
Not employed	45,798.97***	50,549.99**	23,190.44***	29,160.75**
Female	–77,324.36***	–59,013.03	7,998.893	13,424.27
Single	92,009.87***	105,760.1*	21,717.01	–45,058.14
Separated/divorced	50,131.90**	68,999.84	–39,220.91***	–66,115.29**
Widowed	46,395.24*	101,134.9**	–10,606.49*	–10,587.25
<HS education	–42,279.98***	14,465.80	–28,259.15***	–25,769.17*
Degree	54,700.32***	30,669.86	5,305.023**	1,026.803
n	7,521	7,521	3,210	3,210
R^2	14.3%	4.7%	30.1%	10.0%

Notes: Significance denoted ***1%, **5%, *10%.
Regressions employ household weightings from the PSID and SHIW data sets and robust standard errors are used.
Binary variables are given relative to an employed married male household head with a high school education while the autonomous intercept has been eliminated.

associated with higher security. Although the signs on the coefficients are mixed, it is unclear if the unexpected results are a genuine phenomenon or the result of some form of functional misspecification. One potential explanation is that these variables are co-linear with age (employment status) or household size (marital status) which are both strong determinant of the index.

A Decomposition of ξ_k

The coefficients estimated in Table 3 are open to a novel form of decomposition that can further highlight their relationships with individual security. Consider that the security index can be written as

$$-V_p(w) = w_p + c_p, \qquad (4)$$

where w_p is current wealth and c_p is the summed weighted changes up until this period. That is, the index is the sum of two distinct components, a *level* component which measures the buffer of wealth the individual has to weather adverse shocks, and a *change* component which captures recent time trends in the wealth variable. Although these two factors are combined to give the overall measurement, the sense of security felt by a individual that has the comfort of a large level component may potentially be different from the sense of security felt due to large change component. That is, some individuals might be secure as a result of having substantial wealth, while a second individual may be just as secure where the state is driven predominantly by increases. Thus regressions of the form conducted in equation (3) will estimate the marginal effects of certain variables on the security of an individual, but will not distinguish between these two effects. Indeed an

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insignificant coefficient may obscure important relationships where level-security and trend-security move in opposite (and hence offsetting) directions.

To account for the phenomena we take the regression in equation (3)

$$-V_{ip} = \delta_p + \sum_{k=1}^{l} \xi_k x_{ipk} + e_{ip}$$

and write the LHS variable according to equation (4). The equation can then be "unstacked"

$$\text{(5)} \qquad \begin{aligned} w_p &= \delta_p^w + \sum_{k=1}^{l} \xi_k^w x_{ipk} + e_{ip}^w \\ c_p &= \delta_p^c + \sum_{k=1}^{l} \xi_k^c x_{ipk} + e_{ip}^c, \end{aligned}$$

where $\delta_p = \delta_p^w + \delta_p^c$ and $\xi_k = \xi_k^w + \xi_k^c$ for $k = 1 \ldots l$. That is, the estimated marginal effect associated with variable k can be decomposed into a level effect and a change effect. We estimate the two equations by generating the stacked variables $\tilde{y}_p = \begin{bmatrix} w_p \\ -V_p \end{bmatrix}$ and $\tilde{x}_k = \begin{bmatrix} x_k \\ x_k \end{bmatrix}$ employing the dummy variable vector $D = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ corresponding to w_p and $-V_p$. The equation below can then be estimated using WLS and the results appear in Table 4.

$$\text{(6)} \qquad \tilde{y}_p = \delta_p^w + D \cdot \delta_p^c + \sum_{k=1}^{l} \xi_k^w \tilde{x}_{ipk} + \sum_{k=1}^{l} \xi_k^c \left(D \cdot \tilde{x}_{ipk}\right) + e_{ip}.$$

Several results can be drawn from Table 4. We see from the significance of the level effects and change effects regressions that modeling levels of household wealth is much simpler than modeling changes. That is, it is relatively simple to predict wealth based upon the explanatory variables but much harder to identify individuals that are (in)secure based upon past fluctuations. Accordingly there are certain variables that affect individual security, but only do so through the level effect. These variables include income, household size, gender, and marital status.

In some cases it is observed that variables have different signs for the level and change components (although the change components are rarely significant). For example, individuals living in households with heads who lacked a high school education had lower security in the presence of other variables (see Table 3); however this is the result of a strongly negative *level* effect combined with a smaller but significant positive *change* effect. Similarly individuals living in households with degree educated heads were more secure, an effect associated with a high level effect but partially offset by a negative change effect. A possible explanation may be that as more educated heads are generally wealthier, they have a greater appetite for risk and hence a negative change effect in challenging economic times, while heads without high school educations have low wealth, but have positive change security due to a high sense of risk aversion.

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TABLE 4

Decomposition of $-V$ into Level and Change Effects

Variable	U.S. $\hat{\xi}_k^w$	U.S. $\hat{\xi}_k^c$, $\gamma = 1$	U.S. $\hat{\xi}_k^c$, $\gamma = 5$	Italy $\hat{\xi}_k^w$	Italy $\hat{\xi}_k^c$, $\gamma = 1$	Italy $\hat{\xi}_k^c$, $\gamma = 5$
Year 2005/2006	−139,450.1*	−66,464.45	−332,322.2**	−32,428.85	4,893.440	24,467.20
Year 2007/2008	−104,827.1	−29,824.62	−149,123.1	−35,777.86	2,196.265	10,981.32
Year 2009/2010	−101,025.8	−28,295.57	−141,477.9	−41,991.20	−5,046.167	−25,230.83
Age	2,944.168	1,296.667	6,483.336	2,271.014	399.9852	1,999.926
Age^2	18.58204	−17.16963	−85.84814*	−9.182984	−6.134469	−30.67235
Income	2.134604***	0.081502	0.407512	6.478947***	−0.044372	−0.221861
Household size	−22,965.63***	868.1650	4,340.825	−20,675.26***	−2,224.772	−11,123.86
Not employed	44,611.22***	1,187.755	5,938.774	21,697.87***	1,492.577	7,462.887
Female	−81,902.20***	4,577.835	22,889.17	6,642.548	1,356.345	6,781.724
Single	88,572.31***	3,437.563	17,187.81	38,410.80**	−16,693.79	−83,468.93***
Separated/divorced	45,414.91**	4,716.986	23,584.93	−32,497.32***	−6,723.595	−33,617.97
Widowed	32,710.33	13,684.91	68,424.56	−10,611.30	4.809898	24.04949
<HS education	−56,466.42***	14,186.44	70,932.22***	−28,881.64***	622.4934	3,112.467
Degree	60,707.93***	−6,007.616	−30,038.08	6,374.578	−1,069.555	−5,347.775

Notes: Significance denoted ***1%, **5%, *10%.

Regressions employ household weightings from the PSID and SHIW datasets and robust standard errors are used.

Binary variables are given relative to an employed married male household head with a high school education while the autonomous intercept has been eliminated.

As change effects are proportional to γ, parameter estimates for regressions involving $\gamma = 1$ and $\gamma = 5$ differ by a factor of 5. Standard errors on wealth coefficients are reported using $\gamma = 1$. Summing parameter estimates across the rows returns the original estimates reported in Table 3.

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Security and Mobility

Given that we have three years of security estimates for each country it is natural to wonder what the relationship is between an individual's security in one period and its security in a subsequent period. For example, some individuals will have experienced little change (either negative or positive) over the recent recession, while others may have experienced substantial volatility. As individuals with similar levels of turbulence may share other common characteristics, it is possible that there were some segments of the population that were more or less insulated from this turbulence than others. To study this phenomenon we make use of the mobility flux measure proposed by Fields and Ok (1996) which measures the average of all security movements for each segment of the population. The concept of flux is well established for the measurement of income mobility and has been employed for this purpose by Abowd and Card (1989) and Gottschalk and Moffitt (1994). This form of measure is particularly useful for our purpose as it is simple to calculate and interpret and has the capacity to handle negative observations. The Fields and Ok (FO) index is given by $M\left(-V_0;-V_p\right)=\dfrac{1}{n}\sum_{i=1}^{n}\left|-V_{i0}+V_{ip}\right|$ and is simply equal to a cross-sectional average change in the security level from the base period (denoted $p = 0$) to period p. The measure is thus equal to zero when $-V_{i0} = -V_{ip}$ for $i = 1 \ldots n$ and takes on strictly positive values when $-V_{i0} \neq -V_{ip}$ for at least one i. This ensures that higher values for the index indicate a greater degree of volatility. Like the underlying security index M is homogenous of degree one and hence is sensitive to the scale of the underlying variable.

The index is calculated for population segments over sequential periods and is defined in terms of the binary variables employed previously. Results are presented in Table 5, with standard errors based upon 1000 bootstrap replications reported below each estimate in parentheses.

Several key features from Table 5 are immediately obvious. First we observe that the degree of flux mobility depends strongly upon the γ weighting employed in the index. Unsurprisingly estimates that emphasize the change component relative to the level component (columns on the right) show substantially greater mobility in security than estimates that focus on the level component (columns on the left). Second, it is clear that in almost all cases, non-directional mobility in security was higher in the United States than Italy, and that mobility was higher for the latter period for both countries (2007–09 for U.S. and 2008–10 for Italy) than the earlier period (2005–07 and 2006–08 respectively). Again this appears consistent with the notion that individuals from both countries experienced increased volatility in wealth as well as a general decline in the latter part of the decade, but that this phenomenon was much stronger in the United States.

Second, there are notable differences in the mobility of security for the different sample stratifications. For example, in all cases male household heads had security estimates that were more volatile than female heads, a result that persists over both countries, weighting specifications, and time periods. Interestingly a similarly strong result exists for the education variables. In all cases the *less* educated the household head, the less mobility present. As mobility in security is a direct function of changes in wealth, the result can only be attributed to relatively static wealth streams for less educated households. This may be a function of the

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TABLE 5

Non-Directional Mobility of $-V$ in the United States and Italy

	United States				Italy			
	2005–07		2007–09		2006–08		2008–10	
Variable	$\gamma = 1$	$\gamma = 5$	$\gamma = 1$	$\gamma = 5$	$\gamma = 1$	$\gamma = 5$	$\gamma = 1$	$\gamma = 5$
All	111,250	167,279	172,203	477,719	62,137	96,958	86,715	231,960
	(8,278)	(13,946)	(10,375)	(27,803)	(3,933)	(6,007)	(6,192)	(16,483)
Employed	110,425	165,567	166,065	457,922	72,473	113,470	96,470	258,070
	(12,007)	(19,001)	(14,289)	(39,078)	(5,771)	(9,045)	(7,826)	(20,657)
Not employed	112,686	170,257	182,888	512,175	49,763	77,192	75,037	200,703
	(10,420)	(16,971)	(13,605)	(40,937)	(5,904)	(8,545)	(9,856)	(27,239)
Male	116,033	173,850	182,114	506,009	64,620	100,735	89,011	238,637
	(9,817)	(14,687)	(11,588)	(31,997)	(5,614)	(8,513)	(8,318)	(23,487)
Female	85,557	131,982	118,965	325,755	57,210	89,467	82,159	218,715
	(14,001)	(22,896)	(14,958)	(39,059)	(4,712)	(7,077)	(7,499)	(20,169)
Married	103,978	154,344	169,574	477,550	58,383	90,575	83,189	221,877
	(8,212)	(12,794)	(11,364)	(33,919)	4,457	(6,629)	(7,165)	(20,913)
Single	88,007	136,577	183,819	481,543	122,685	194,068	133,710	369,285
	(20,602)	(33,646)	(51,750)	(130,023)	(35,963)	(60,682)	(22,836)	(67,397)
Sep/div	136,779	208,841	172,346	462,215	51,703	80,079	87,253	240,161
	(41,478)	(66,404)	(27,738)	(70,708)	(10,999)	(15,631)	(17,409)	(50,394)
Widowed	193,747	305,400	186,654	508,680	70,214	112,542	94,714	251,767
	(45,478)	(71,192)	(28,192)	(75,968)	(8,636)	(13,417)	(11,176)	(29,238)
<HS education	34,963	52,733	66,061	178,716	53,134	82,138	75,965	203,252
	(5,123)	(7,765)	(11,097)	(11,097)	(3,856)	(5,891)	(5,756)	(16,924)
HS education	110,466	168,530	157,102	435,972	74,535	118,617	104,190	277,247
	(14,015)	(21,833)	(14,651)	(40,670)	(10,281)	(16,475)	(15,201)	(41,803)
Degree	141,243	208,094	240,005	667,342	95,211	146,611	115,931	315,296
	(11,146)	(17,352)	(17,711)	(49,983)	(15,628)	(22,540)	(21,970)	(61,896)

Notes: Bootstrap standard errors are reported below each estimate in parentheses. Sample weights are employed from the second period for each estimate. For example, estimates based upon the mobility from 2007 to 2009 were generated using 2009 sample weights.

homogeneity of the index—as education is positively correlated with wealth, low education (and hence low wealth) households are perhaps unlikely to experience large absolute swings in their underlying wealth. Accordingly there may be a greater degree of risk aversion for these households as a lower buffer stock of wealth may discourage households from undertaking activities that may have large upside and/or downside risks.

4. Concluding Remarks

In this paper we have applied the individual level insecurity measure proposed by Bossert and D'Ambrosio (2013) to estimate recent distributions of economic security (as the negative of insecurity) in Italy and in the U.S. The Great Recession appears to have caused major changes in the distribution of our index in both countries, with the case of the U.S. being particularly severe. Over both countries and all weighting parameters we observed individuals becoming more insecure in 2009–10 than in previous years, with the development of a heavy tail depicting a dramatic increase in the very insecure being a notable and persistent feature.

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We also studied correlates of the index and found that older individuals in smaller, higher earning households with male heads that are well educated and either married or widowed were more secure. Most of these results held up in panel regressions, with income, education status, and household size being the clearest examples. We also found that insecure individuals were easy to identify when their insecurity was the result of a low buffer of wealth, but much harder to isolate when their insecurity was caused by recent losses.

Focussing on non-directional mobility in security, we observed that this phenomenon is higher in the United States than Italy, and higher for the latter period for both countries (2007–09 for the U.S. and 2008–10 for Italy) than the earlier period (2005–07 and 2006–08 respectively). This fact appears consistent with the notion that individuals from both countries experienced increased volatility in wealth as well as a general decline in the latter part of the decade. Lastly there are notable differences in the mobility of security for the different subgroups of the population. Male household heads had security estimates that were more volatile than female heads, a result that persists over both countries, weighting specifications, and time periods. In all cases the less educated the household head, the less mobility there is present.

While findings are moderately consistent across both countries, we expect the results to be different from 2011 onwards, with only Italy suffering from a double-dip recession and an associated decline in household wealth. From a policy perspective, an obvious action to increase security of individuals would be a bailout on household debt on housing, as advocated by some in the public debate.

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