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Approaches to defining and measuring insecurity around the world

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Empirical Methods for Modelling Economic Insecurity

by

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What is economic insecurity?

EI is under-discussed in policy circles, and remains a relatively new concept in academic research.

This is likely due to the concept straddling disciplinary boundaries, sitting somewhere between economics and psychology.

But unlike behavioural economics, which considers the effects of psychological processes on economic outcomes, EI does the reverse, examining the impacts of economic factors on psychology.

Several definitions

United Nations-Department of Economic and Social Affairs
The World Economic and Social Survey 2008 (WESS): Overcoming Economic Insecurity:

"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** (...) and also because security has a large **subjective or psychological component linked to feelings of anxiety and safety** (...).

Still in general terms economic insecurity arises from the exposure (...) to **adverse events**, and from the **inability to cope with and recover from the costly consequences of those events**." (p.vi)

According to Osberg (1998 p.23):

“[A] definition of ‘economic insecurity’ which reflects the common usage meaning of the term ‘insecure’ might be: **“the anxiety produced by the lack of economic safety -** i.e. by an inability to obtain protection against subjectively significant potential economic losses”.”

Jacobs suggested that:

“Economic insecurity is perhaps best understood as the **intersection** between ‘**perceived**’ **and** ‘**actual’ downside risk.”**

from http://www.brookings.edu/papers/2007/09politics_jacobs.aspx

Economic security or financial security is the condition of having **stable income or other resources to support a standard of living now and in the foreseeable future**.

from http://en.wikipedia.org/wiki/Economic_security

For the Stiglitz Commission (2009, p.198)

"Economic insecurity may be defined as **uncertainty about the material conditions that may prevail in the future**.

This insecurity may generate **stress and anxiety** in the people concerned, and make it harder for families to invest in education and housing."

My preferred definition

If we had to summarize in one sentence what we found based on common threads of the above quotations, we could say that

economic insecurity is the anxiety which arises from the anticipation of adverse events and from the fear of difficulties to recover from them.

The prediction and measurement of anxiety is a new field for social scientists.

EI vs. Inequality and Poverty

Very different concepts.

Inequality summarizes the spread of the distribution under analysis (e.g. differences in incomes).

Poverty focuses on the density mass of this distribution under the poverty line.

EI is the current anxiety about the economic future (losses).

The proposed EI indices can be classified according to:

1) **Subjective methods** (Andrew): ask people about their EI.

2) **Aggregate methods**: Osberg (1998) and Osberg and Sharpe (2002, 2009, 2014) index.

3) **Axiomatic methods**: Bossert and D'Ambrosio (2013) and Bossert, Clark, D'Ambrosio and Lepinteur (2019).

4) **Microeconometric methods**: Hacker (2005), Hacker, Huber, Nichols, Rehm, Schlesinger, Valletta and Craig (2011), Romaguera (2020) Bucks (2011), Rohde, Tang, D'Ambrosio, Osberg and Rao (2020).

Aggregate Methods

Osberg (1998) and Osberg and Sharpe (2002, 2009, 2014) design and produce a **suite of aggregate or country-level risk measures**.

The idea in these papers is to combine differing **macroeconomic indicators of risk exposure** as a way of capturing the EI as a latent variable.

Osberg and Sharpe (2014) provide some guidance for producing such indices in rich countries (where high-quality data are available, and risks are more relative in nature) and poor countries (with limited data and absolute risks are more important).

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The same basic framework can be employed for poorer countries, considering **(i) differences in data, (ii) changes in the nature and implications of various risks, and (iii) direct deprivation becoming more important as living standards decline.**

For example developing countries may have no social insurance related to unemployment, but **informal safety nets via social networks and subsistence agriculture.**

OS construct risk markers for **economic loss due to unemployment, sickness, family breakup and poverty in old age.**

The index is an average across dimensions of these losses, where each dimension is weighted by the fraction of the population affected.

Axiomatic Methods

If researchers want to study the interplay between EI and **individual-level** characteristics, microeconomic approaches are needed.

Here we turn our attention to two methods derived from theory from Bossert and D'Ambrosio (2013) and Bossert, Clark, D'Ambrosio and Lepinteur (2019). These approaches produce a numerical outcome for each person within a data set summarizing their insecurity at time t.

Axiomatic Methods

Our proposed individual economic-insecurity measure reflects the **confidence with which individuals face the future**: will they be able to **recover when hit** by an economic shock tomorrow?

This is argued to be based what has happened to them in then **past regarding gains and losses** in resources.

The index satisfies two key properties:

1) A gain (a loss) in income from one period to the next is associated with a lower (higher) level of insecurity, as compared to a situation in which no such change occurs.

Gain-Loss monotonicity.

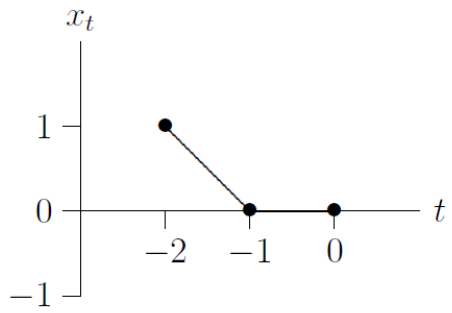

Figure 1: The resource stream $x^1 = (1, 0, 0)$.

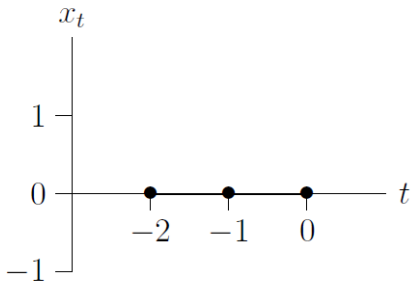

Figure 2: The resource stream $x^2 = (0, 0, 0)$.

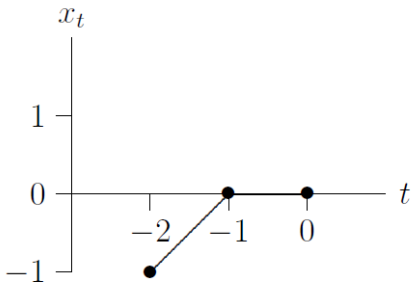

Figure 3: The resource stream $x^3 = (-1, 0, 0)$.

The index satisfies two key properties:

1) A gain (a loss) in income from one period to the next is associated with a lower (higher level) of insecurity, as compared to a situation in which no such change occurs.

2) The closer to today this change the larger the effect.

Proximity monotonicity.

According to this index, the income streams in the following figures are listed in decreasing order of insecurity:

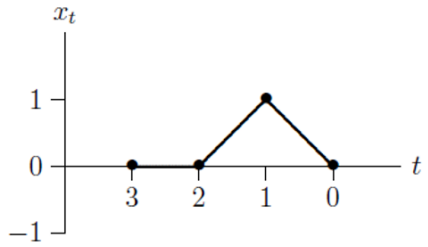

Figure 1: The resource stream $x^1 = (0, 0, 1, 0)$.

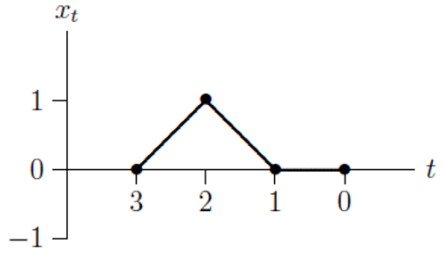

Figure 2: The resource stream $x^2 = (0, 1, 0, 0)$.

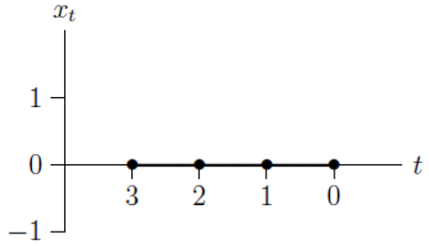

Figure 3: The resource stream $x^3 = (0, 0, 0, 0)$.

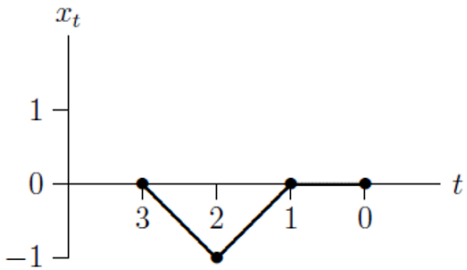

Figure 4: The resource stream $x^4 = (0, -1, 0, 0)$.

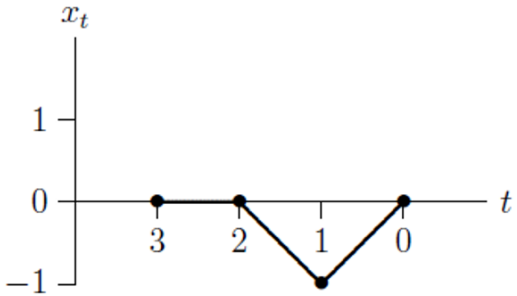

Figure 5: The resource stream $x^5 = (0, 0, -1, 0)$.

The least-insecure stream of income is permanently-rising; the most-insecure stream of income is permanently-falling. Any constant stream of income produces an insecurity score of zero.

Theorem 1. *A measure of individual economic insecurity I satisfies gain-loss monotonicity, proximity monotonicity, linear homogeneity, translation invariance, quasilinearity and stationarity if and only if there exist $\ell_0, g_0 \in \mathbb{R}_{++}$ and $\delta \in (0, \min\{\ell_0/g_0, g_0/\ell_0\})$ such that, for all $T \in \mathbb{N}$ and for all $x \in \mathbb{R}^{(T)}$,*

$$I^T(x) = \ell_0 \sum_{\substack{t\in\{1,\ldots,T\}:\\ x_{-t}>x_{-(t-1)}}} \delta^{t-1}\left(x_{-t} - x_{-(t-1)}\right) + g_0 \sum_{\substack{t\in\{1,\ldots,T\}:\\ x_{-t}<x_{-(t-1)}}} \delta^{t-1}\left(x_{-t} - x_{-(t-1)}\right). \quad (2)$$

It is immediate that if losses are to be given higher weight than equivalent gains, then ℓ_0 (the weight on aggregate discounted losses) must exceed g_0 (that on aggregate discounted gains). This implies that

$$\frac{g_0}{\ell_0} < 1 < \frac{\ell_0}{g_0}$$

and the minimum of the two ratios is g_0/ℓ_0.

The subclass of the measures characterized respects a loss-priority condition when $\delta \in (0, g_0/l_0)$ and $l_0 > g_0$.

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Need panel data on economic resources such as income or wealth.

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Microeconometric Methods

1) Hazard Indicators: Hacker (2005), Hacker, Huber, Nichols, Rehm, Schlesinger, Valletta and Craig (2011)

They focus on downward volatility of income.

In a panel of household income data (where y_{it} is now interpreted as current income), they produce the measure:

$$H_{it} = \begin{cases} 1 \text{ if } y_{it} < 0.75 \times y_{it-1} \text{ and } w_{it}, l_{it} \neq 1 \\ 0 \qquad\qquad\qquad\qquad\qquad\qquad \text{Otherwise} \end{cases}$$

which captures the presence of a decline in income from $t-1$ to t of 25% or more.

As downward volatility in income may not indicate insecurity if the individual is wealthy (denoted with the binary variable w_{it}) or retiring (denoted by l_{it}) these observations are set to zero.

Microeconometric Methods

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One way to convert it into a **prospective** or ex ante metric is to model the probability of an economically stressful event occurring sometime in the future. We could **use the probability of occurrence evaluated using lagged covariates as an index**. For example, estimating a the probit model.

Microeconometric Methods

2) Synthetic Indices: Romaguera (2020) Bucks (2011).

Romaguera (2020): Suppose we have indicators $q_1 \ldots q_k$ all of which capture some aspect of EI but may also contain unrelated information. The first Principal Component represents a summary of these data, extracting the common element and averaging away the unrelated factors.

A second multidimensional approach comes from Romaguera (2020) and Bucks (2011), which applies the Alkire and Foster (2011) counting technique to EI to factors such as (i) being below the poverty rate, (ii) having health insurance, (iii) having ongoing employment etc.

Microeconometric Methods

3) Methods Based on Predictive Densities: Rohde, Tang, myself, Osberg and Rao (2020).

RTOR predict the level of income and its variance based upon lagged covariates:

$$\ln(y_{it}) = \alpha_i + x_{it-1}^{'}\beta + \varepsilon_{it} \qquad \varepsilon_{it} \sim N\left(0, \sigma_{it}^2\right)$$

$$\sigma_{it}^2 = \exp\left(\gamma + z_{it-1}^{'}\theta\right)$$

Given the normality assumption $\varepsilon_{it} \sim N(0, \sigma^2)$ this is analogous to fitting the conditional lognormal distribution for each future incomes with mean $\mu_{it} = \alpha_i + x'_{it-1}\beta$.

Once modelled in this form, income risk can be summarized in any number of ways.

For example an insecurity measure can be obtained as the change in income $\Delta y_{it} = y_{it+1} - y_{it}$ where the future value is replaced by the predictive density estimated along the lines above.

An alternative, if we define a utility function $U(y)$ we can borrow concepts from the inequality literature by comparing utility in this distribution to that of its expected value.

If we make the simplifying assumption $U(y) = \ln(y)$ then this ratio leads us to Dalton's (1920) inequality metric, expressed as:

$$D_{it} = 1 - \frac{\mu_{it}}{\mu_{it} + \frac{1}{2}\sigma_{it}^2}$$

This EI absolute measure has bounds between 0 and 1 and captures the percentage of welfare lost to risk. $D_{it} = 0$ when $\sigma_{it}^2 = 0$, and there is no insecurity, as future incomes are known exactly. D_{it} is increasing in σ_{it}^2 and decreasing in μ_{it} where the latter term captures the protective effect from higher incomes.

Application to Australian HILDA

None of the correlations exceed 0.2 and 8/28 pairwise associations are negative.

Hence there is no strong agreement (and sometimes systematic disagreement) across indices as to who is economically insecure.

It appears that EI may be simply be too complex a concept to boil down to a single representative number.