Measuring Economic Insecurity

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Preliminaries

Research project with Walter: well-being of an individual at time t depends on past, present and future. It is not atemporal.

This paper is an attempt to include considerations an individual may have on his future in measuring individual well-being.

Vulnerability to poverty $\Longrightarrow$ segment of the population

vs

Economic insecurity $\Longrightarrow$ all population

Motivation

The perception that the level of **economic insecurity** has risen since the 1990s and especially since the 2008 global crisis is all around us.

Economic insecurity is a term very much used by all of us to describe specific situations of high economic uncertainty we find ourselves in.

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"**Insecurity** is a source of **fears and anxieties that negatively affects the quality of life** of the people concerned. **Insecurity** also implies **uncertainty about the future, which decreases [quality of life] for risk-averse individuals**." (Stiglitz Commission, 2009, p.194).

But what is economic insecurity?

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The New Palgrave Dictionary of Economics, the International Encyclopedia of Social and Behavioural Sciences and the Social Science Encyclopedia contain no entry on it.

And there is more to this absence. To the best of our knowledge, there are very few papers in the social sciences literature that have dealt with defining and measuring it.

Towards a definition

United Nations-Department of Economic and Social Affairs

The World Economic and Social Survey (WESS)

"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."

Our 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.

To the best of our knowledge 3 indices are available in the social sciences literature:

1) Osberg (1998) and Sharpe (2009) index

2) the Economic Security Index (2010)

3) ours

The three indices are very different and focus on various aspects of the economy which could generate insecurity.

Our index

The complete consideration of losses and gains is at the basis of our index of insecurity.

Bossert and D'Ambrosio

We aim to capture the **anxiety** of an individual produced by the **anticipation** of the exposure to adverse events and the **fear of difficulties** to recover from them.

Past, present and future are all involved.

An individual is insecure about the future, since the future is all that matters for generating anxiety.

The resources of today are important: the wealthier an individual is, the bigger the buffer stock he can rely on in case of an adverse future event.

An individual **past experiences** play a role in **shaping his self-confidence** on **how well we can do in case of an adverse event**.

We remember gains and losses in our resources that we experienced over time.

Of course, the more recent these variations are, the more vivid our memories.

Evidence from psychology and economics support this view.

"**[A]ll reasoning rests on the principle of analogy**. We know the absent from the present, the future from the now, by assuming that connections or associations among phenomena which have been valid will be so; **we judge the future by the past**." writes Knight (1921, p.199).

We assume that an individual's sentiment of insecurity today depends on the **current wealth** level and **variations** in wealth experienced in the **past**.

Now & Confidence

This is one aspect of economic insecurity, more is left to be done.

We think of wealth as a **comprehensive variable** that encompasses **anything that may help an individual in coping with adverse occurrences**.

It includes **claims on government, family, friends** that **Sen** (1976) has called '**entitlements**'.

First, we propose two basic properties that we think a measure of economic insecurity should possess.

They then move on to more specific classes of measures.

According to these measures, insecurity is given by the current wealth level multiplied by minus one plus weighted sums of the wealth gains (losses) experienced in the past.

Two sequences of coefficients are employed:

• one to gains, one to losses,
• recent experiences are given higher weight.

A subclass.
• higher weights to the absolute values of **past losses** than **past gains**, reflecting an attitude analogous to **risk aversion** in models of individual decision making under uncertainty.

Both are characterized with sets of plausible and intuitive axioms.

Notation

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 (which may vary depending on the data available). A *measure of individual insecurity* is a sequence of functions $V = \langle V^T \rangle_{T \subset \mathbb{N}_0}$, where, for each $T \in \mathbb{N}_0$, $V^T : \mathbb{R}^{(T)} \to \mathbb{R}$. The measure assigns a degree of insecurity to each individual *wealth stream* $w \in \bigcup_{T \in \mathbb{N}_0} \mathbb{R}^{(T)}$. We allow (net) wealth to be negative.

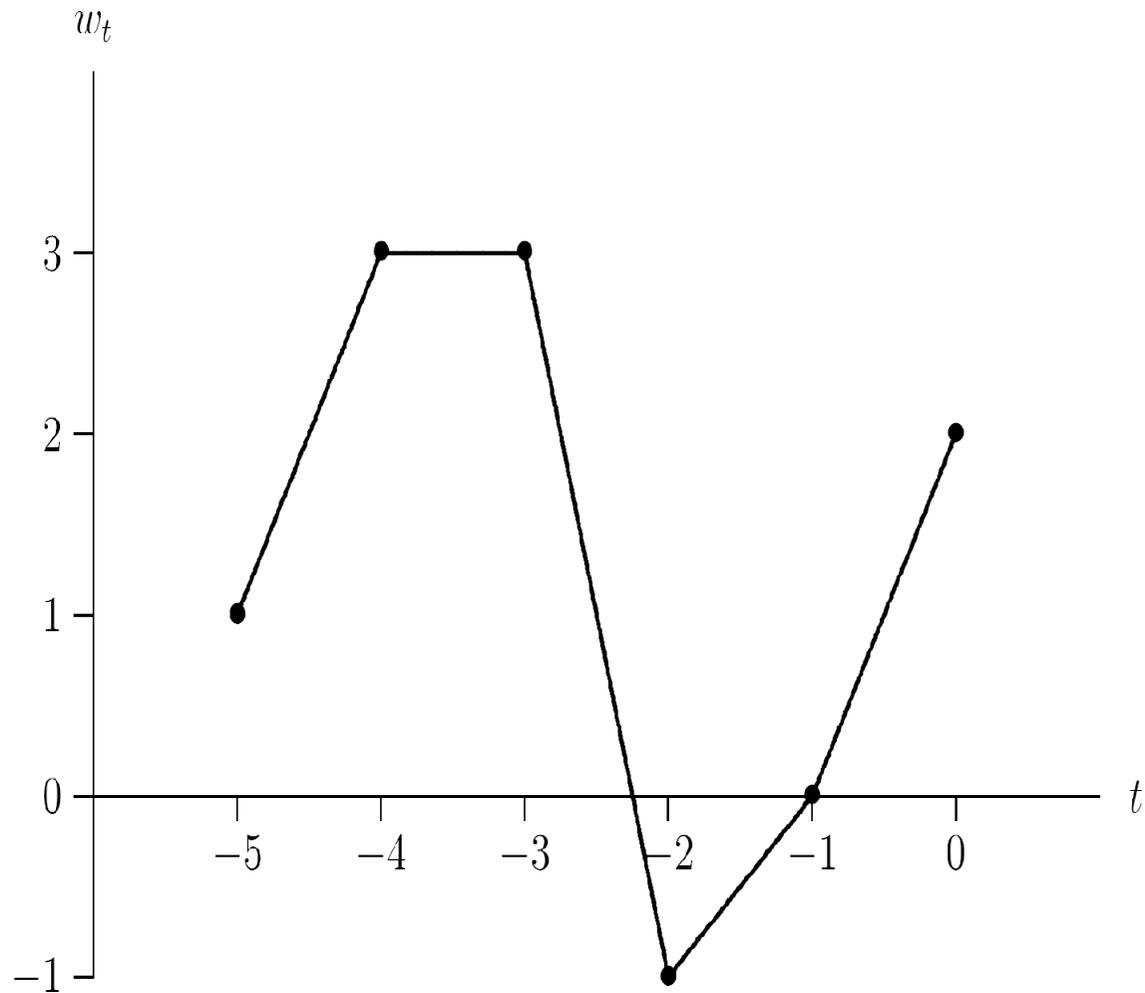The wealth stream $w = (1, 3, 3, -1, 0, 2) \in \mathbb{R}^{(5)}$ is illustrated in Figure 1.

Figure 1: The Wealth Stream $w = (1, 3, 3, -1, 0, 2)$.

We want to design a class of measures the members of which capture the dependence of a sentiment of insecurity on past wealth movements in addition to today's wealth level.

Loosely speaking, the basic hypothesis is that insecurity:

• **increases**, ceteris paribus, with a **drop** in wealth experienced in the past;

• **decreases**, ceteris paribus, with an **increase** in wealth experienced in the past;

• **higher weight** are given to the changes in recent past.

Thus, we propose to use the following two axioms as the defining properties:

Difference monotonicity. For all $T \in \mathbb{N}$, for all $w \in \mathbb{R}^{(T-1)}$ and for all $\gamma \in \mathbb{R}$,

$$V^T(w_{-(T-1)} + \gamma, w) \geq V^{T-1}(w) \iff \gamma \geq 0.$$

Difference monotonicity 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).

- an **increase** if a period −T is added in a way such that wealth **decreases**, ceteris paribus, when moving from −T to −(T − 1).

- **no change** if the addition of period −T involves a wealth level identical to that of period −(T − 1), insecurity is unchanged.

$$V^5(w) < V^4(w')$$

Figure 2: Difference Monotonicity.
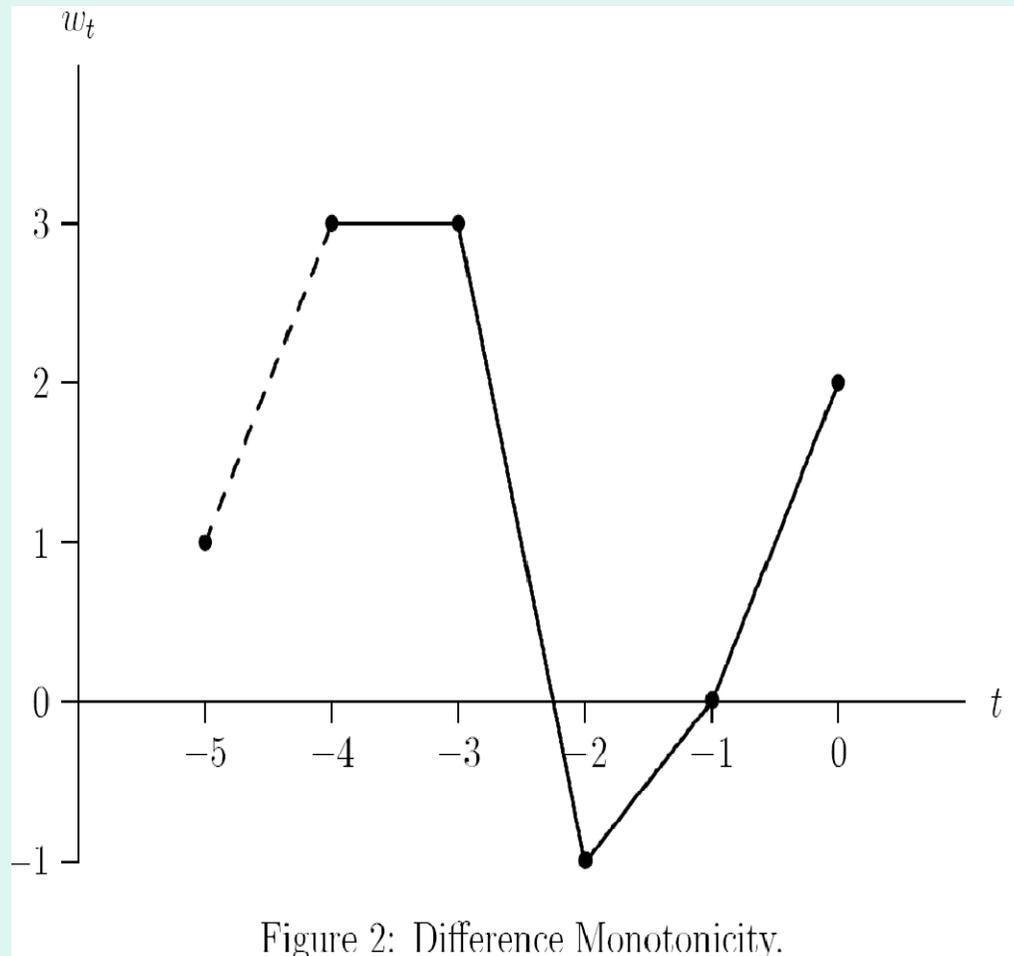
Proximity property. For all $T \in \mathbb{N} \setminus \{1\}$, for all $w \in \mathbb{R}^{(T)}$ and for all $\tau \in \{1, \ldots, T-1\}$,

$$V^T\left(w_{-T}, \ldots, w_{-(\tau+1)}, w_{-(\tau+1)}, w_{-(\tau-1)}, \ldots, w_0\right) \geq$$

$$V^T\left(w_{-T}, \ldots, w_{-(\tau+1)}, w_{-(\tau-1)}, w_{-(\tau-1)}, \ldots, w_0\right)$$

$$\Leftrightarrow \qquad w_{-(\tau+1)} \geq w_{-(\tau-1)}.$$

The proximity property 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.**
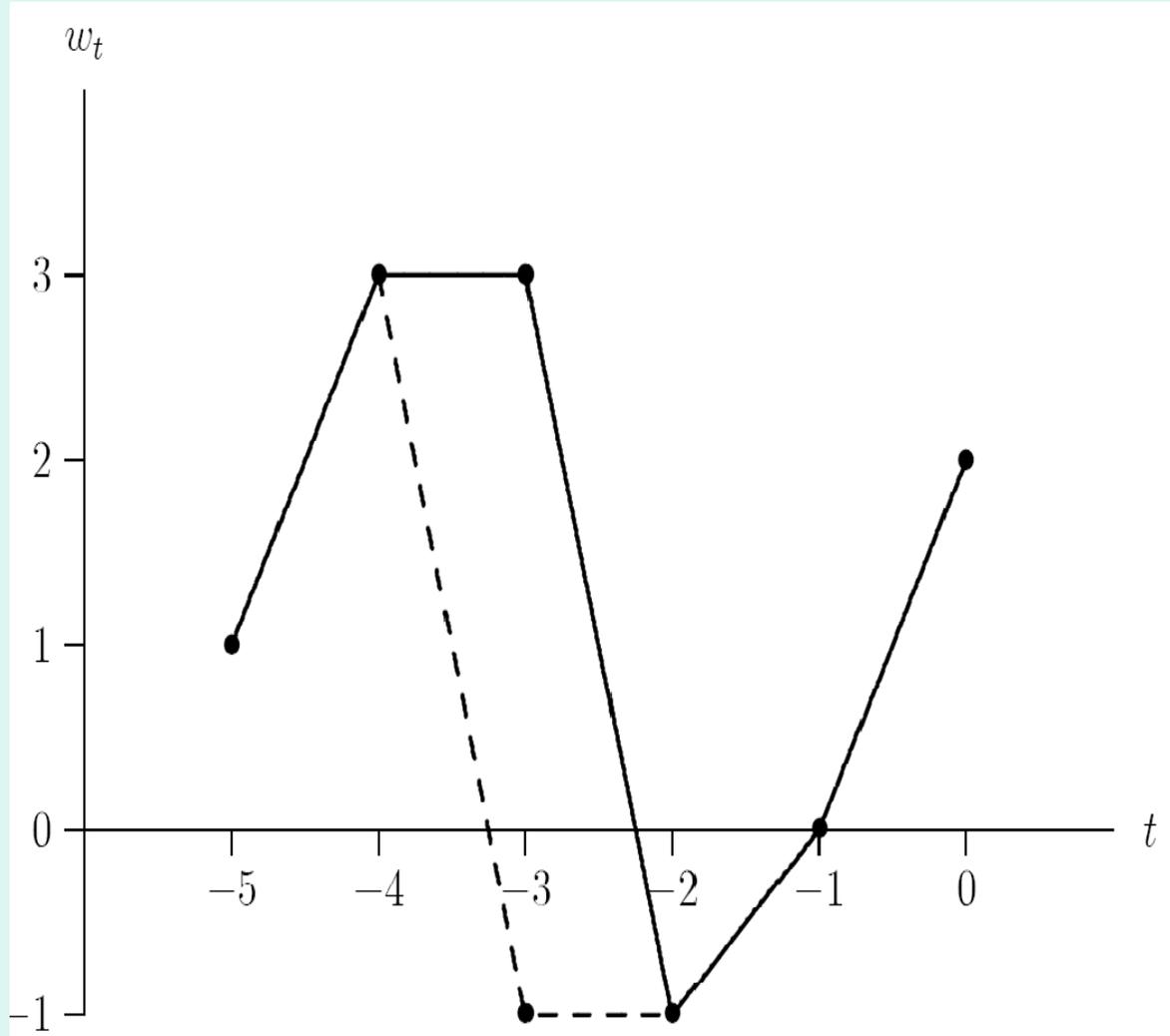
Figure 3: Proximity Property.

We suggest to use the above two axioms as the
fundamental properties of a measure
of individual insecurity.

Our characterization is also based on three other standard
properties related to the proposed specification of the
measure.

Homogeneity. For all $T \in \mathbb{N}_0$, for all $w \in \mathbb{R}^{(T)}$ and for all $\lambda \in \mathbb{R}_{++}$,

$$V^T(\lambda w) = \lambda V^T(w).$$

Translatability. For all $T \in \mathbb{N}_0$, for all $w \in \mathbb{R}^{(T)}$ and for all $\delta \in \mathbb{R}$,

$$V^T(w + \delta \mathbf{1}_{T+1}) = V^T(w) - \delta.$$

Temporal aggregation property. For all $T \in \mathbb{N} \backslash \{1\}$, there exists a function $\Phi^T : \mathbb{R}^2 \to \mathbb{R}$ such that, for all $w \in \mathbb{R}^{(T)}$,

$$V^T(w) = \Phi^T \left(w_{-T} - w_{-(T-1)}, V^{T-1}(w_{-(T-1)}, \ldots, w_0) \right).$$

The temporal aggregation property is a separability condition that allows the measure of insecurity to be calculated by **recursively moving back** from the current period to the earliest relevant period where, in the step involving period −t, the part of insecurity that takes into consideration all periods from −t to the current period is obtained as an aggregate of the insecurity resulting from considering periods −(t −1) to period zero only and the **change experienced in the wealth level** between periods −t and −(t − 1).

Furthermore, it expresses the assumption that all that matters about the past are gains and losses experiences.

The class of *measures* 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. The sequences need not be the same but, within each sequence, some natural restrictions apply. Let $\alpha = \langle \alpha_{-t} \rangle_{t \in}$ and $\beta = \langle \beta_{-t} \rangle_{t \in}$ be two sequences of parameters such that

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

The set of all sequences α such that $\alpha_{-t} > \alpha_{-(t+1)} > 0$ for all $t \in \mathbb{N}$ is denoted by $\mathcal{C}$. $\mathcal{C}^2$ is the Cartesian product of $\mathcal{C}$ with itself.

The *measure of insecurity corresponding to a pair of sequences* $(\alpha, \beta) \in \mathcal{C}^2$, $V_{(\alpha,\beta)} = \left\langle V_{(\alpha,\beta)}^T \right\rangle_{T \in \mathbb{N}_0}$, is defined by letting, for all $T \in \mathbb{N}_0$ and for all $w = (w_{-T}, \ldots, w_0) \in \mathbb{R}^{(T)}$,

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

Theorem 1. *A measure of individual insecurity V satisfies difference monotonicity, the proximity property, homogeneity, translatability and the temporal aggregation property if and only if there exists $(\alpha, \beta) \in \mathcal{C}^2$ such that $V = V_{(\alpha,\beta)}$.*

The above theorem does not impose any restrictions on the relationship between the sequences α and β.

A plausible assumption appears to be the requirement that ceteris paribus **losses of a certain magnitude have at least as strong an impact on insecurity as ceteris paribus gains** of the same magnitude.

For instance, a loss in wealth caused by a financial-sector crisis is likely to increase one's sentiment of insecurity to an extent that is, in absolute value, at least as large as the effect of a gain of the same magnitude on insecurity.

Analogously, the effect of a lost health benefit may very well increase one's sense of insecurity by an amount that is at least as high as the decrease in insecurity resulting from gaining this benefit.

This assumption is captured in the following axiom.

Weak loss priority. For all $T \in \mathbb{N}$, for all $w \in \mathbb{R}^{(T-1)}$ and for all $\gamma \in \mathbb{R}_{++}$,

$$V^T(w_{-(T-1)} + \gamma, w) - V^T(w_{-(T-1)}, w) \geq V^T(w_{-(T-1)}, w) - V^T(w_{-(T-1)} - \gamma, w).$$

Weak loss priority requires that a loss has a larger impact on insecurity than an equal-sized gain.

Let $\mathcal{D}$ be the set of all pairs of sequences $(\alpha, \beta) \in \mathcal{C}^2$ such that

$$\alpha_{-t} \geq \beta_{-t} \quad \text{for all } t \in \mathbb{N}. \tag{26}$$

insecurity measure $V_{(\alpha,\beta)}$ is *rank-ordered* if $(\alpha, \beta) \in \mathcal{D}$. Adding weak loss priority to the axioms of Theorem 1 leads to a characterization of the rank-ordered measures.

Theorem 2. *A measure of individual insecurity V satisfies difference monotonicity, the proximity property, homogeneity, translatability, the temporal aggregation property and weak loss priority if and only if there exists $(\alpha, \beta) \in \mathcal{D}$ such that $V = V_{(\alpha,\beta)}$.*

Conclusion

This paper suggests a rigorous and precise way of defining a measure of economic insecurity.

We identify two fundamental properties any insecurity measure should possess.

In addition, we axiomatize a class of measures with some intuitively appealing additional axioms and an important subclass.

Conclusion

Since its presentation to the public in September 2009, the Stiglitz Report has had a major influence in the political debate.

Its recommendations on how to find a more comprehensive approach toward gauging a country's success beyond Gross Domestic Product has been followed by many countries including Australia, France, Germany, Ireland, Italy, Mexico, the Netherlands, Switzerland and the USA.

Recommendation 2 states that "Quality of life also depends on people's objective conditions and opportunities. Steps should be taken to improve measures of people's health, education, personal activities, political voice, social connections, environmental conditions and insecurity." (p.58).

This paper is a step in this direction.