Personality as an Emergent Process: Some Metaphors/Speculation

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In this talk, I will propose some metaphors for “personality” which may be relevant to measurement issues.

I have neither formal models to present nor empirical evidence, hence use of words metaphor and speculation.

Emergence

No single meaning.

One idea: property that occurs at a higher order of aggregation that description of components of system.

Examples: ice, ferromagnet, ghetto

Sometimes conflated with path dependence

Basic idea in what I will say: personality types are properties of interactions

Empirical Metaphor 1:

Social determinants of personality type

Code of the Street, Elijah Anderson

Oppositional Identity Theory, John Ogbu

Courtesy of West Side Story (Officer Krupke Song)

My father's a bastard, my ma's an S.O.B.
My grandpa's always plastered, my grandma pushes tea.
My sister wears a mustache, my brother wears a dress.
Goodness gracious, that's why I'm a mess.

Yes, Officer Krupke you're really a slob.
This boy don't need a doctor just a good honest job.
Society's played him a terrible trick. And sociologically he's sick.

Personality trait emerges as regularity in a population.

Social Interactions Approach

Suppose that personality is binary, $\omega_i \in \{-1,1\}$

Private observable influences: h_i

Social influences: m^e_{-i} perceived average personality type of others

Unobserved heterogeneity: ε_i

Personality type 1 occurs if

$$u_i(1) - u_i(-1) = 2h_i + 2Jm^e_{i,g} + 2\alpha_g - \varepsilon_i > 0$$

If unobserved heterogeneity is logit, then self-consistent personality type of group has average value

$$m = \int \tanh\left(\beta_i h_i + \beta_i J_i m + \beta_i \alpha_g\right) dh$$

where dh is empirical density of h within g.

If all heterogeneity except in ε is eliminated, then

$$m = \tanh\left(\beta h + \beta J m + \beta \alpha_g\right)$$

Standard results:

For fixed h, α, β there exists a threshold function $\bar{J}\left(\beta h + \beta\alpha_g\right)$ such that

If $\bar{J}\left(\beta h + \beta\alpha_g\right) > J$ then one average personality type

If $\bar{J}\left(\beta h + \beta\alpha_g\right) < J$ there exist 3 average personality types.

Analogous results for size of h and α.

Relevance for Personality

1. Personality distribution is “emergent” i.e. not pinned down by knowledge of fundamentals h_i

2. Nonlinearities may be important in cost-benefit. Phase transition.

3. Different notion of parental investment. Parents invest via social interactions.

Econometrics: Issues for Identification

1. Simultaneity (reflection problem). Not generic.

2. Endogeneity of social structure. Solution via richer economics: Model expansion

3. Unobserved group effects. Hardest since only have “statistical” solutions available.

Unexplored Idea: Evolution of Social Structure Encodes Information on Personality.

Within econometrics, the deepest analyses of self-selection are based on explicitly modeling the self-selection and including it as part of the statistical analysis.

Unlike the instrumental variables approach, this has interesting implications for identification.

Consider linear model

$$\omega_i = cX_i + dY_g + Jm_g + E\left(\varepsilon_i \middle| X_i, Y_g, F_{X|g}\right) + \xi_i .$$

where X and Y denote individual and group level heterogeneity (capturing difference between parental education and distribution of education among adults in a neighborhood.

This expression exploits Heckman's classic idea that in the presence of self-selection, the regression residual ε_i no longer has a conditional mean of zero.

Following the logic behind Heckman's selection correction, can be consistently estimated if one adds a term proportional to $E\left(\varepsilon_i \middle| X_i, Y_g, F_{X|g}\right)$ prior to estimation; denote this estimate as $\widehat{\kappa E\left(\varepsilon_i \middle| X_i, Y_g, F_{X|g}\right)}$. Hence, from this perspective, controlling for endogenous social structure amounts to estimating

$$\omega_i = cX_i + dY_g + Jm_g + \rho\widehat{\kappa E\left(\varepsilon_i \middle| X_i, Y_g, F_{X|g}\right)} + \xi_i$$

This is a nonlinear model, and may be identified when identification fails under random assignment.

Parent Investment as Location

Model parents as making choices of group memberships, $g \in \{0,...G-1\}$, and offspring behaviors, $l \in \{0,...L-1\}$. Group choices are denoted as δ_i while ω_i continues to denote the behavioral choice.

The sequential logit structure ensures that choice probabilities at both stages have a multinomial logit probability structure. Defining $h_{i,l,g} = k_l + c_l x_i + d_l y_g$, the behavioral choices conditional on a group choice $\bar{g}$ will be defined by the probabilities

$$\mu\left(\omega_{i,g} = \bar{l} \,\middle|\, h_{i,l,\bar{g}}, p^e_{i,l,\bar{g}} \forall l\right) = \frac{\exp \beta\left(h_{i,\bar{l},\bar{g}} + J p^e_{i,\bar{l},\bar{g}}\right)}{\sum_l \exp \beta\left(h_{i,l,\bar{g}} + J p^e_{i,l,\bar{g}}\right)}.$$

Group choices reflect the fact that choices in the stage stage will produce utility in the fashion of our original multinomial choice model.

Group choice probabilities depend on the expected utility of the choice ω_i will produce in the second stage. Letting $\delta_i = g$ code the choice of group by individual i, these choices are also assumed to be logit

$$\mu\left(\delta_i = \bar{g} \middle| h_{i,l,g}, p^e_{i,l,g} \forall l, g\right) = \frac{\exp\left(\beta_G Z_{i,\bar{g}}\right)}{\sum_g \exp\left(\beta_G Z_{i,g}\right)}$$

β_G denotes the heterogeneity parameter for group choices and

$Z_{i,g} = E\left(\max_l h_{i,l,g} + J p^e_{i,l,g} + \varepsilon_{i,l,g} \middle| h_{i,l,g}, p^e_{i,l,g} \forall l\right)$.

A joint probability description of group memberships and personality

$$\mu\left(\omega_{i,\bar{g}}=\bar{I},\delta_i=\bar{g}\,\middle|\,h_{i,I,g},p^e_{i,I,g}\,\forall I,g\right)=$$

$$\frac{\exp\left(\beta_G\beta^{-1}\log\left(\sum_I\exp\beta\left(h_{i,I,\bar{g}}+Jp^e_{i,I,\bar{g}}\right)\right)\right)}{\sum_g\exp\left(\beta_G\beta^{-1}\log\left(\sum_I\exp\beta\left(h_{i,I,g}+Jp^e_{i,I,g}\right)\right)\right)}\cdot\frac{\exp\beta\left(h_{i,\bar{I},\bar{g}}+Jp^e_{i,\bar{I},\bar{g}}\right)}{\sum_I\exp\beta\left(h_{i,I,\bar{g}}+Jp^e_{i,I,\bar{g}}\right)}$$

This model has not been studied.

Personality as Emergent from Many Specific Traits:

Kurt Gerstein

Oskar Schindler

“Men in Dark Times”-Hannah Arendt.

Why were they different? Are these examples of types?

Dear kindly, social worker, they say go earn a buck. Like be a soda jerker which means like be a schmuck.

It's not I'm antisocial, I'm only anti-work. Gloryosky, that's why I'm a jerk!

Officer Krupke, you've done it again. This boy don't need a job, he needs a year in the pen. It ain't just a question of misunderstood. Deep down inside him he's no good.

Suppose that there the personality type “moral hero” is modelled via the threshold approach

$$\omega_i = 1 \text{ if } x_i\gamma + \varepsilon_i > 0$$

Explanation of the type is due to unusual heterogeneity. With reference to observable heterogeneity, my assertion is that in additive world, hard to understand these cases.

Other way to think?

$$u_i(1) - u_i(-1) = 2\sum_j h_j x_{ij} + 2\sum_{j \neq k} h_{ij} x_{ij} x_{ik} - \varepsilon_i > 0$$

One can add higher order terms, of course.

Properties: multiple configurations of traits can produce same type. Supervenience.

Analogy to SNP and disease, IQ, etc?

Fisherian argument for additivity is not, I think persuasive.

Can This Link to Binary Choice Model?

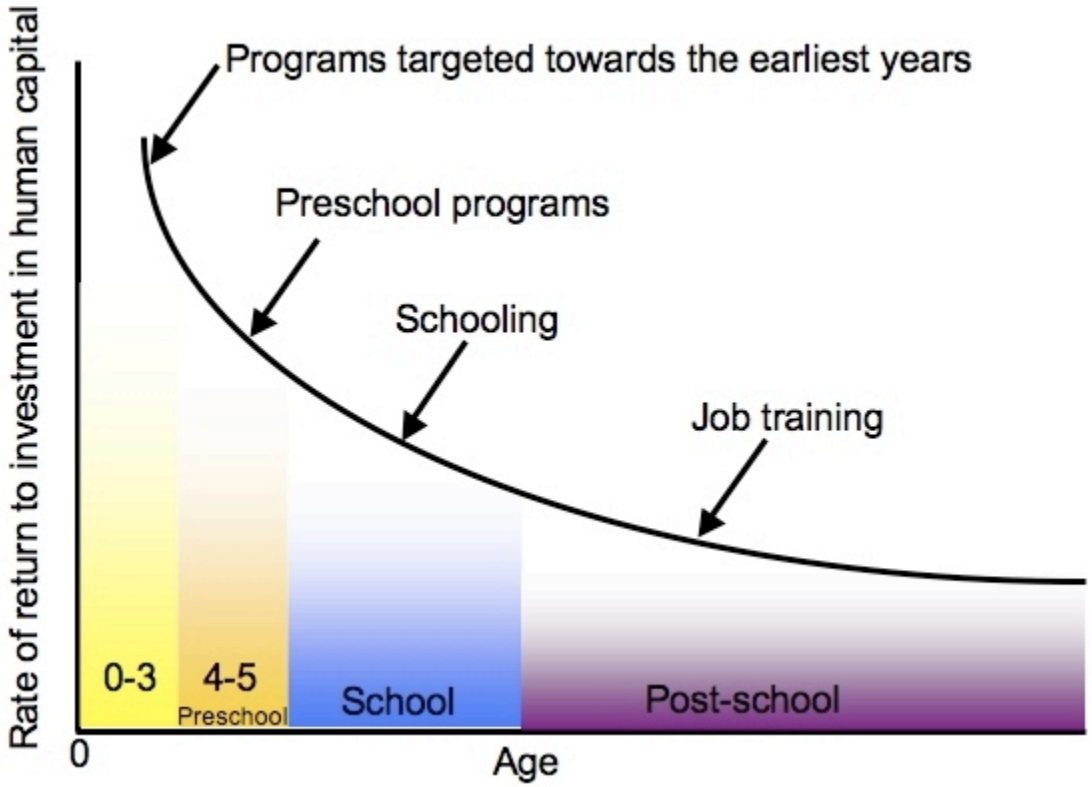
The various characteristics x_i can themselves be interdependent or determined by social interactions.

Personality as Outcome of Reinforcement Process

Dear, dear, dear kindly Sergeant Krupke you gotta understand.
It's just our bringin' up-ke that gets us out of hand.
Our mothers all are junkies, our fathers all are drunks.
Golly Moses, naturally we're punks.

Gee, Officer Krupke we're very upset.
We never had the love that every child oughta get
We ain't no delinquents, we're misunderstood.
Deep down inside us there is good.

Background: Heckman Curve on rates of return to investment at different ages



Dynamic Complementarity

Cunha and Heckman emphasize dynamic complementarities.

$$\theta_{t+1} = f(\theta_t, I_t, X_t, \eta_t)$$

θ denotes skills, I investment, X stock variable (to be explained), η is shock.

To understand the role of the extra stock variable, onsider the dynamics,

$$X_t - X_{t-1} = \left(\frac{\alpha}{S_t}\right)\left(x_t - X_{t-1} + \pi I_t + \sigma e_t\right) + \left(1-\alpha\right)\left(x_t - X_{t-1} + \pi I_t + \sigma e_t,\right)$$

$$S_t - S_{t-1} = s_t$$

where X_0, S_0 are given by history and $0 \le \alpha \le 1$.

If $\alpha = 0$ there are no long lasting "averaging" type effects.

S_t is the sum of non-negative "step sizes" s_t

The variable x_t denotes an effect at date t which could be a function of past $X's$ as well as other variables.

The "shocks" $\{e_t\}$ are given by a mean zero, finite variance, stochastic process.

The simplest version of this system is one where the step size is 1, $\alpha = 1$ and $\sigma = 0$, so dynamics determined by average of past $x's$,

$$X_t = t^{-1} \sum_{i=1}^{t} x_i$$

This gives the model a Polya Urn flavor.

Model Ideas

1. Personality type freezes because of cumulation of experience.

2. Heckman curve is generated.

3. Better model, think of individual transiting across personality types, shifting in response to experience, then there will be trapping states.

Segregation and Personality Variation

A different approach, due to Durlauf and Seshadri and Brock, Durlauf and Seshadri, Can be understood as focusing on how repeated segregation creates reinforcembent of bad and good personality traits.

Basic model, *NK* children. Organized into *K* equal-sized classrooms.

Initial personality trait $\omega_{i,0}$. Transition process:

$$\omega_{it} = \phi_t\left(\omega_{it-1}, \omega_{-it}, \varepsilon_{it}\right)$$

Suppose that ϕ exhibits complementarities with respect to all arguments (positive cross-partials).

What happens is children are segregated by traits?

Note this is the social planner's solution for average trait maximization in a static problem. (Becker).

Properties

1. Heterogeneity in personality maximized.

2. Possible to develop multimodal outcomes.

3. Effects of positive shocks attenuates if low trait groups create decline in classroom quality.

Summary

1. Personality may emerge from interactions of many actors or many traits

2. Personality may emerge due to reinforced experience or social segregation.