5. KSWD

Beyond GDP and Back: What is the Value-Added by Additional Components of Welfare Measurement?

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Starting Point

- Growing interest of researchers in measuring welfare apart from material well-being (GDP), especially in light of the current economic crisis
- Stiglitz Report: Call for additional welfare measures such as health, education, personal activities including work, political voice and governance, social connections and relationships, environment, insecurity, subjective well-being and aggregate measure of well-being
- Can alternative indicators indeed offer additional information over and above GDP? How high is the covariance?
- Factor Analysis is used at the macro and micro level to investigate how much of the variation can also simply be explained by GDP

Summary

Research Question:

- How interrelated are hard indicators like GDP and alternative indicators of well-being?
- Are there differences at the micro to the macro level?
- What are the most important variables explaining most of the variation in the data?

Contribution:

- Create comprehensive dataset 1991-2008 with the variables suggested by the literature to measure welfare and find underlying patterns
- Identify the variables that are most important for reproducing these patterns
- Use factor anaylsis and compare macro to micro level

Main Result:

- Macro level: almost 76% of the variation in the data can be explained by three variables: GDP, unemployment rate and satisfaction with health; GDP most important one: explains 38% of the variance.
- Micro level: 4 equally important variables can be extracted which are satisfaction with health,labour income, worried about own economic situation and worried about environment

Previous Literature

- Macro level:
  - Modifying GDP: i.e. index of sustainable economic welfare (ISEW – subtracts the unsustainable components from consumption), such as Diefenbacher (1994) for Germany
  - Subjective Well-being, such as Easterlin (1974), Osberg and Sharp(2000) or Layard (2005)
  - Composite indices, including and excluding GDP, such as National Footprints Accounts and Human Development Index
- Micro level:
  - Identification of the determinants of life satisfaction (such as Kassenboehmer and Haisken-DeNew, 2009, EJ Winkelmann and Winkelmann, 1998, Economica)

Empirical Strategy

- Factor Analysis to detect patterns in the data (underlying constructs)

$$Y_1 = \alpha_{11}F_1 + \alpha_{12}F_2 + ... + \alpha_{1m}F_{m'}$$

$$Y_2 = \alpha_{21}F_1 + \alpha_{22}F_2 + ... + \alpha_{2m}F_{m'}$$

$$Y_n = \alpha_{n1}F_1 + \alpha_{n2}F_2 + ... + \alpha_{nm}F_{m'}$$

- Y = Variable with known data
- F = Factor (Function of unknown variables)
- α = Factor loading

Data

- At the macro level we want to detect correlation patters over different years
- At the micro level we want to detect correlation patterns within a cross-section

Macro Data

- Germany, 1991-2008, N=18 (years), K=15
  Federal Statistical Office, World Bank, aggregated SOEP data (design weights)

Micro Data

- Germany, 2008, N=8840 (individuals), K=12
  SOEP data, person-level
  Data extracted with PanelWhiz (www.panelwhiz.eu)

Data

- Variables used at the macro level:

Objective Material Living Standards

Real GDP/capita, life expectancy, labour income (SOEP)

Job insecurity

Unemployment rate, average overtime hours, worries about job security (SOEP), worries about own situation (SOEP)

Subjective satisfaction measures (SOEP)

Health satisfaction, job satisfaction, life satisfaction

General insecurity and environmental conditions

military spending, worries about world peace (SOEP), worries about economic development (SOEP), pollution, worries about env. Protection (SOEP)

Data

- Variables used at the micro level (SOEP):

Objective Material Living Standards

Real GDP/capita, life expectancy, labour income (SOEP), education level

Job insecurity

Unemployment rate, unemployed dummy, average overtime hours, worries about job security (SOEP), worries about own situation (SOEP)

Subjective satisfaction measures

Health satisfaction, job satisfaction, life satisfaction

General insecurity and environmental conditions

military spending, worries about world peace, worries about economic development, pollution, worries about env. protection

Results: Macro level
Eigenvalues

Factors	Eigenvalue	Difference	Proportion	Cumulative
Factor1	5.663	2.619	0.378	0.378
Factor2	3.045	0.245	0.203	0.581
Factor3	2.800	1.128	0.187	0.767
Factor4	1.671	–	0.111	0.879

Results: Macro level
Objective Material Living Standards

Variables	Factor1	Factor2	Factor3	Factor4	Uniqueness
GDP	<u>0.945</u>	0.044	0.067	0.184	0.067
Labour Income	0.885	-0.146	-0.025	-0.164	0.168
Life expectancy	0.943	-0.124	0.014	0.169	0.066

Results: Macro level
Job Insecurity

Variables	Factor1	Factor2	Factor3	Factor4	Uniqueness
Unemployment Rate	0.158	-0.925	0.061	0.128	0.100
Overtime	0.393	-0.069	0.203	0.750	0.237
Worry: Job Security	-0.489	0.733	0.040	-0.008	0.222
Worry: Own Economic Situation	-0.411	0.772	0.293	0.055	0.146

Results: Macro level
Subjective Satisfaction

Variables	Factor1	Factor2	Factor3	Factor4	Uniqueness
Satisfaction: Health	0.082	0.007	<u>0.970</u>	0.028	0.052
Satisfaction: Job	-0.073	0.114	0.932	-0.002	0.112
Satisfaction: Life	0.253	0.202	0.846	0.137	0.160

Results: Macro level
General Insecurity and environment

Variables	Factor1	Factor2	Factor3	Factor4	Uniqueness
Military Expenditures	-0.914	0.276	-0.003	-0.218	0.040
Worry: World Peace	0.153	0.140	-0.016	0.885	0.174
Worry: Economic Development	-0.065	0.836	0.275	0.341	0.105
Air Pollution	-0.922	0.286	-0.092	-0.173	0.030
Worry: Environment	0.849	-0.286	0.227	0.056	0.142

Summary: Macro level

- **Factor 1** is dominated by hard indicators: **GDP** (ρ =0.96) and life expectancy (ρ =0.94) →37.8%
- **Factor 2** is dominated by the **unemployment rate** (ρ =-0.93) and other subjective job situation variables → 20.3%
- **Factor 3** is dominated by the subjective measures, especially **health satisfaction** (ρ =0.97) → 18.7%
- **Factor 4** is dominated by the subjective general insecurity measure, **worries of world peace** → 11.11%

Results: Macro level
Combination of the most important factors

Factors	Eigenvalue	Difference	Proportion	Cumulative
Factor1	1.346	0.304	0.337	0.337
Factor2	1.042	–	0.261	0.597

Variables	Factor1	Factor2	Uniqueness
GDP	0.784	0.218	0.339
Unemployment Rate	-0.033	0.870	0.241
Satisfaction: Health	0.349	0.427	0.695
Worry: World Peace	0.780	-0.234	0.336

Use the predictions of these factors and check for correlation with the results of principal component analysis, explaining the maximal variance, regardless of underlying patterns:

PC1 (45% variance) is sig. correlated with F1 ($\rho = 0.6$)
PC2 (68% variance) is sig. correlated with F1 ($\rho = 0.6$)
PC3 (89% variance) is sig. correlated with F2 ($\rho = 0.7$)

Results: Micro level
Eigenvalues

Factors	Eigenvalue	Difference	Proportion	Cumulative
Factor1	1.919	0.076	0.160	0.160
Factor2	1.843	0.207	0.154	0.314
Factor3	1.636	0.053	0.136	0.450
Factor4	1.582	–	0.132	0.582

Results: Micro level
Objective material living standards

Variables	Factor1	Factor2	Factor3	Factor4	Uniqueness
Labour Income	0.033	0.164	0.000	<u>0.788</u>	0.351
Education	-0.008	0.330	-0.162	0.593	0.514

Results: Micro level
Job insecurity

Variables	Factor1	Factor2	Factor3	Factor4	Uniqueness
Unemployed	-0.170	-0.018	-0.119	-0.329	0.849
Overtime	-0.007	-0.169	0.112	0.679	0.498
Worry: Job Security	0.137	0.756	0.010	0.050	0.407
Worry: Own Economic Situation	0.228	<u>0.777</u>	0.104	0.160	0.308

Results: Micro level
Subjective satisfaction measures

Variables	Factor1	Factor2	Factor3	Factor4	Uniqueness
Satisfaction: Health	0.799	0.009	0.098	0.004	0.352
Satisfaction: Job	0.749	0.149	-0.006	-0.013	0.416
Satisfaction: Life	0.783	0.249	-0.035	0.047	0.321

Results: Micro level
General insecurity and environment

Variables	Factor1	Factor2	Factor3	Factor4	Uniqueness
Worry: World Peace	-0.001	0.160	0.829	0.074	0.282
Worry: Economic Development	0.055	0.627	0.356	-0.045	0.475
Worry: Environment	0.039	0.018	<u>0.865</u>	-0.051	0.247

Summary: Micro level

- **Factor 1** is dominated by subjective satisfaction measures: health satisfaction → 16.0%
- **Factor 2** is dominated by worries about own economic situation and worries about economic development → 15.4%
- **Factor 3** is dominated by worries about the environment and world peace → 13.6%
- **Factor 4** is dominated by labour income, overtime, unemployment and education → 13.2%

Results: Micro level
Combining the most important variables

Factors	Eigenvalue	Difference	Proportion	Cumulative
Factor1	1.225	0.057	0.306	0.306
Factor2	1.168	–	0.292	0.598

Variables	Factor1	Factor2	Uniqueness
Satisfaction: Health	0.188	0.650	0.542
Worry: Own Economic Situation	0.677	0.411	0.374
Labour Income	<u>0.843</u>	-0.153	0.266
Worry: Environment	-0.146	<u>0.744</u>	0.425

Use the predictions of these factors and plot the correlation with the results of principal component analysis, explaining the maximal variance, regardless of underlying patterns:

PC1 (23% variance) is sig. correlated with F1 (ρ =0.8)

PC2 (36% variance) is sig. correlated with F2 (ρ =0.2)

PC3 (49% variance) is sig. Correlated with F2 (ρ =0.3)

Conclusions

- We have examined the role of alternative well-being indicators over and above standard indicators such as income and unemployment
- Alternative measures also include satisfaction measures and worries in different domains and environmental factors
- We find evidence for additional information since GDP and unemployment are not perfectly correlated with the other variables
- However within groups of variables, we find a lot of correlation, so that we can reduce the number of variables significantly
- Comparing macro to micro: Similar pattern over time and within a cross-section of variables explaining overall variation with more room for subjective variables at the micro level
- Not everything can be explained by GDP and unemployment, but one must ask how costly it is to gather more information and what the real value-added is, especially if we are unsure what the additional variables actually capture.