Trends in Economic Well-Being in Canada
1981 - 2017

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Thursday, September 12th, 2019
• Well-Being & Economic Well-Being: A Debate
• Overview of the IEWB
• 1981 – 2017: Canadian Trends
  – Consumption Flows Domain
  – Stocks of Wealth Domain
  – Income Distribution Domain
  – Security Domain
• Sensitivity to Values & to Costing of GHG
• Conclusion
Human Well-Being > Economic Well-Being > GDP
Well-Being > Economic Well-Being > GDP
“Social regrettables”
<table>
<thead>
<tr>
<th>Concept</th>
<th>Present</th>
<th>Issues: Market transactions only? leisure &amp; household production? Length of life?</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Typical Citizen” (a.k.a. “Representative Agent”)</td>
<td>Average Flow of Current Income</td>
<td></td>
</tr>
<tr>
<td>Per Capita GDP or “Adjusted” Average Income Flow</td>
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<tr>
<td>Concept</td>
<td>Present</td>
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<td>Diversity of Population</td>
<td>Distribution of Current Income</td>
<td></td>
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<tr>
<td></td>
<td>- Poverty and Inequality</td>
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</tr>
<tr>
<td></td>
<td>Diminishing $\mu_y \Rightarrow$</td>
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<td></td>
<td>Less aggregate well-being if same total income is more unequally distributed</td>
<td></td>
</tr>
<tr>
<td>Concept</td>
<td>Present</td>
<td>Future</td>
</tr>
<tr>
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</tr>
<tr>
<td>“Typical Citizen”</td>
<td>Average Flow of <em>Effective</em> Current Consumption</td>
<td>Aggregate Accumulation of Productive Stocks (broadly defined)</td>
</tr>
</tbody>
</table>

**Issues:**
- Average Income does not reveal savings rate
- assets include environment, Human Capital, R&D, net foreign.
- Aggregate Savings
  - not automatically optimal or sustainable
  - intergenerational altruism & preferences for sustainability differ among individuals
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<td>Aggregate Accumulation of Productive Stocks</td>
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<tr>
<td>Diversity of Population</td>
<td>Distribution of Current Income:</td>
<td>Insecurity of Future Income</td>
</tr>
<tr>
<td></td>
<td>- Poverty and Inequality</td>
<td></td>
</tr>
</tbody>
</table>
• INDEX OF ECONOMIC WELL-BEING (IEWB)
  \[ = \alpha_1 \text{ PER CAPITA CONSUMPTION} \\
  + \alpha_2 \text{ SUSTAINABILITY / ACCUMULATION} \\
  + \alpha_3 \text{ INCOME DISTRIBUTION / POVERTY} \\
  + \alpha_4 \text{ SECURITY} \]

• \( \sum \alpha = 1 \)

– DIFFERING VALUES IMPLY DIFFERENT WEIGHTS
  • \( \alpha = 0 \) is a (strong) value choice
  • GDP per capita sets \( \alpha_3 = \alpha_4 = 0 \) and assumes \( \alpha_2 \) is always optimal
ECONOMIC WELL-BEING =
\[ \alpha_1 \ [\text{CONSUMPTION}] + \alpha_2 \ [\text{TOTAL WEALTH}] + \alpha_3 \ [\text{DISTRIBUTION}] + \alpha_4 \ [\text{SECURITY}] \]

DIFFERENT VALUES IMPLY DIFFERENT WEIGHTS, BUT DOES TREND CHANGE? DO POLICY CHOICES CHANGE?

- How much does economic well-being actually depend on value weightings or on perceptions of fact trends?

- WHERE is the disagreement if assessment of trends differs?
How to “Add Up” across Dimensions of Well-Being? 
Linear Scaling Procedure

- Normalized to Unit Interval - Linear Scaling
  - \( \frac{(1.05 \times \text{Max} - \text{value})}{(\text{Max} - \text{Min})} \times 1.1 \)
Schematic of the Index of Economic Well-Being

Index of Economic Well-Being

- Consumption Flows
  - Per Capita Market Consumption Adjusted for Household Size
    - Life Expectancy (Constant $)
    - Unpaid Work Per Capita (Constant $)
    - Government Spending Per Capita (Constant $)
    - Less: Regrettable Expenditure Per Capita (Constant $)
  - Capital Stock Per Capita (Constant $)
    - R&D Per Capita (Constant $)
    - Natural Resources Per Capita (Constant $)
    - Human Capital Per Capita (Constant $)
    - Net International Investment Position Per Capita (Constant $)
    - Less: Social Cost of Environmental Degradation (Constant $)
  - Income Inequality
    - Poverty Rate and Gap (Poverty Intensity)
  - Equality
    - Risk from Unemployment
      - Financial Risk from Illness
        - Risk from Single-Parent Poverty
        - Risk from Poverty in Old Age

Source: CSLS

- Consumption per capita
- Stocks of Wealth per capita
- Index of Economic Equality
- Index of Economic Security
- Index of Economic Wellbeing (Equal Weighting)
Trends in The Index of Economic Well-Being and its Domains, 1981 - 2017

Index of Consumption Flows per Capita
Index of Stocks of Wealth per Capita
Index of Economic Equality
Index of Economic Security
Overall Index of Economic Well-Being
GDP per Capita, 1981 - 2017

Source: IEWB Database
Canada

GDP per capita ≈ linear - recessions

GDP per capita – (2015 $)

1946 - $ 15,400
1981 - $ 36,400
2016 - $ 56,100

Real GDP per capita
Canada 1946-2016
CANSIM Table 383-0027, Series B

Linear Trend
\[ y = 652.05x + 11554 \]
\[ R^2 = 0.9822 \]
Compound Annual Growth Rates
IEWB (Base Case) & GDP per Capita

<table>
<thead>
<tr>
<th>Period</th>
<th>IEWB</th>
<th>GDP per Capita</th>
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</thead>
<tbody>
<tr>
<td>1981-2000</td>
<td>1.56</td>
<td>0.75</td>
</tr>
<tr>
<td>2000-2008</td>
<td>0.92</td>
<td>0.69</td>
</tr>
<tr>
<td>2008-2017</td>
<td>0.59</td>
<td>0.60</td>
</tr>
<tr>
<td>2014-2017</td>
<td>0.55</td>
<td></td>
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</tbody>
</table>

-0.22, -0.15, -0.38

1981 - 2017
2000 - 2017
2000 - 2008
2008 - 2017
2008 - 2014
2014 - 2017
## Ranking by IEWB (Base Case) & GDP per Capita: Canada and the Provinces

<table>
<thead>
<tr>
<th>Rank</th>
<th>Index of Economic Well –Being</th>
<th>GDP per Capita</th>
<th>Index of Economic Well –Being</th>
<th>GDP per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>British Columbia</td>
<td>Alberta</td>
<td>Quebec</td>
<td>Newfoundland</td>
</tr>
<tr>
<td>2</td>
<td>Alberta</td>
<td>Saskatchewan</td>
<td>Newfoundland</td>
<td>Prince Edward Island</td>
</tr>
<tr>
<td>3</td>
<td>Ontario</td>
<td>Newfoundland</td>
<td>New Brunswick</td>
<td>New Brunswick</td>
</tr>
<tr>
<td>4</td>
<td>Quebec</td>
<td>Canada</td>
<td>British Columbia</td>
<td>Saskatchewan</td>
</tr>
<tr>
<td>5</td>
<td>Canada</td>
<td>Ontario</td>
<td>Ontario</td>
<td>Nova Scotia</td>
</tr>
<tr>
<td>6</td>
<td>Manitoba</td>
<td>British Columbia</td>
<td>Manitoba</td>
<td>Manitoba</td>
</tr>
<tr>
<td>7</td>
<td>Newfoundland</td>
<td>Manitoba</td>
<td>Nova Scotia</td>
<td>Canada</td>
</tr>
<tr>
<td>8</td>
<td>New Brunswick</td>
<td>Quebec</td>
<td>Prince Edward Island</td>
<td>Ontario</td>
</tr>
<tr>
<td>9</td>
<td>Nova Scotia</td>
<td>New Brunswick</td>
<td>Canada</td>
<td>Quebec</td>
</tr>
<tr>
<td>10</td>
<td>Prince Edward Island</td>
<td>Nova Scotia</td>
<td>Alberta</td>
<td>Alberta</td>
</tr>
<tr>
<td>11</td>
<td>Saskatchewan</td>
<td>Prince Edward Island</td>
<td>Saskatchewan</td>
<td>British Columbia</td>
</tr>
</tbody>
</table>

Source: IEWB Database
Actual Total Consumption Flows per Capita, 1981 – 2017, 2007 Dollars

Source: IEWB Database
Personal Consumption per Capita (SNA)
1981 - 2017

Source: IEBW Database
Government Expenditure per Capita & Components, 1981 – 2017

2007 Dollars

- Total Government Expenditure per capita
- Current Government Expenditure per capita
- Capital Consumption Allowance per capita
- Gross Fixed Capital Formation per capita
The Value of Unpaid Work per Working-Age Person
1981 - 2017

2007 Dollars

- The graph shows the value of unpaid work per working-age person from 1981 to 2017.
- The value has generally increased over time, with a peak around 2007.
- There are fluctuations in the value, particularly noticeable around 1990 and 2000.
- The data is presented in 2007 dollars for consistent comparison.

Years:
- 1981
- 1982
- 1983
- 1984
- 1985
- 1986
- 1987
- 1988
- 1989
- 1990
- 1991
- 1992
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
Regrettable Expenditures per Capita
1981 - 2017

2007 Dollars


0 500 1,000 1,500 2,000 2,500 3,000 3,500 4,000 4,500 5,000

2007 Dollars

- Per Capita Net Capital Stock
- R&D Stock per Capita
- Natural Stock per Capita
- Net International Investment Position per Capita
- Human Capital Stock per Capita
- Social Cost of Greenhouse Gas Emissions per Capita
- Total Stocks of Wealth per Capita


2007 Dollars

Net Capital Stock per capita
Fixed Non-Residential Capital per capita
Residential Capital per capita
R&D Stock per Capita, 1981 – 2017
Levelling Off since 2008
Volatility in Natural Resources Stock per Capita, 1981 – 2017 - Largely Driven by Energy Sector Volatility

2007 Dollars

- Total Natural Resources per capita
- Energy Resources Stocks per capita
- Timber Stocks per capita
- Mineral Stocks per capita
Net International Investment Position per Capita, 1981 – 2017
Increase to 2008, Decline since 2009

2007 Dollars

Steady Increase in Human Capital Stock per Capita
1981 - 2017

2007 Dollars
Stock Pollutant: The Social Cost of Greenhouse Gas Emissions per Capita @ Baseline Carbon Cost ($125) 1981 – 2017

2007 Dollars

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000

$^{0}\text{C} \leq (\text{ECS})*\left(\frac{\text{GHG/GDP}}{\text{GDP/pop}}\right)*(\text{pop})$

Uncertainty exists in all major drivers
Non-linear interactions, accumulating stocks & varying GHG half-lives

- **ECS** = equilibrium climate sensitivity
  - = increase in surface temperature if CO$_2$ concentration doubled

- **GHG/GDP** = carbon intensity per $ future GDP
  - Accumulated GHG stock Influenced by policy decided now
  - = ONLY policy influenceable variable available

- **GDP/pop** = future $ output per capita
  - <= productivity growth & unknowable future technologies
    - Higher incomes => greater current consumption & implied GHG
    - Higher incomes make future mitigation & coping more affordable

- **Pop** = Future Population (long time scales => cumulative impacts, but rapid changes seen)
Monte Carlo Simulations of [ECS, Pop, GDP/Pop] – randomly choose from each parameter distribution, run model, repeat 1,000,000 times

**Table 4. Distribution of temperature change in the Base case, 2100, °C**
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>$51.25 (CDN) in 2016</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.85</td>
<td>0.96</td>
<td>0.72</td>
<td>2.20</td>
<td>-0.59</td>
<td>-0.67</td>
<td>-0.42</td>
</tr>
<tr>
<td><strong>$125 (CDN) in 2016 (Baseline)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.24</td>
<td>0.24</td>
<td>0.25</td>
<td>1.86</td>
<td>-1.16</td>
<td>-1.26</td>
<td>-0.97</td>
</tr>
<tr>
<td><strong>$250 (CDN) in 2016</strong></td>
<td>-1.18</td>
<td>-1.24</td>
<td>-1.12</td>
<td>1.07</td>
<td>-3.03</td>
<td>-3.11</td>
<td>-2.86</td>
</tr>
</tbody>
</table>
The Index of Economic Equality & Components, 1981 – 2017
Declining until 2000, thereafter stagnant
The Index of the GINI Coefficient, 1981 - 2017

Source: IEWB Database
The Poverty Rate and the Poverty Gap Ratio, 1981 - 2017

Source: IEWB Database

[Bar chart showing the levels of the Index of Economic Security and its components for different years.]
Economic (In)Security: reasons to study

1. Worrying about the future subtracts from enjoyment of the present
   - Economic (in)security = part of economic well-being
     • Security enables stability & the maintenance of social relationships
     • Economic Insecurity is bad for the health (more mental illness, obesity)

2. Risk averse individuals insure &/or change behaviour to mitigate costs
   - Economic (in)security predicts public & private behaviour
   - Welfare State Spending + Labour Market Regulation is largely about reducing insecurity

3. Economic Security = Human Right
   “security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond control”
   - Article 25: UN Universal Declaration of Human Rights

4. Political Economy Implications – the Nativism of the Insecure
   - Note: Public & Private Risk Mitigation least available for citizens of poor nations – i.e. Most of humanity: Poorer and More Insecure lives
Security spending as % of GDP in OECD (+ regulation & other costs to decrease insecurity)


Figure 1
SOCIAL AND OTHER GOVERNMENT EXPENDITURES AS % GDP, 2009

[Bar chart showing social and other government expenditures as % of GDP for various countries in 2009, with categories for old age, survivors, disability, health, unemployment, and other social and other government expenditures.]
Index of Security From Unemployment, 1981 – 2017

= 0.2*(cost unemp = \text{Prob}(\text{Ben}) * \text{Ben/W}) + 0.8*\text{Prob (Unemp)}
Index of Security From Out of Pocket Medical, 1981 – 2017
Cost of Pharmaceuticals Increasingly Important

[Graph showing the index of security from out of pocket medical costs from 1981 to 2017.]
Positive Trend
Index of Security From Old-Age Poverty, 1981 – 2017
Strong gains to 1995 + slow decline since then

Source: IEWB Database
Range of Value weightings is clear, but central tendency = roughly equal weights

<table>
<thead>
<tr>
<th></th>
<th>Consume</th>
<th>Wealth</th>
<th>Distribute</th>
<th>Secure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.26</td>
<td>0.21</td>
<td>0.26</td>
<td>0.27</td>
</tr>
<tr>
<td>Median</td>
<td>0.25</td>
<td>0.2</td>
<td>0.2</td>
<td>0.25</td>
</tr>
<tr>
<td>Max</td>
<td>0.5</td>
<td>0.4</td>
<td>0.8</td>
<td>0.6</td>
</tr>
<tr>
<td>Min</td>
<td>0.02</td>
<td>0.1</td>
<td>0.1</td>
<td>0.03</td>
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- Small Nfld sample
  - N = 21
Uncertain Facts & Differing Values  

<table>
<thead>
<tr>
<th>Weighting</th>
<th>$51.25 in 2016</th>
<th>$125 in 2016 (Baseline)</th>
<th>$250 in 2016</th>
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<tr>
<td>Equal Weighting = .25C+.25W+.25E+.25S</td>
<td>0.61</td>
<td><strong>0.49</strong></td>
<td>0.19</td>
</tr>
<tr>
<td>Consumptionist Weighting = .7C+.1W+.1E+.1S</td>
<td>1.83</td>
<td>1.83</td>
<td>1.70</td>
</tr>
<tr>
<td>Consumption Weighted More Heavily Than Wealth = .4C+.1W+.25E+.25S</td>
<td>0.88</td>
<td>0.84</td>
<td>0.72</td>
</tr>
<tr>
<td>Anti-Egalitarian Weighting = .33C+.33W+.0E+.33S</td>
<td>1.01</td>
<td>0.85</td>
<td>0.42</td>
</tr>
<tr>
<td>Equality &amp; Security = .2C+.1W+.4E+.3S</td>
<td>0.29</td>
<td>0.24</td>
<td>0.13</td>
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## Uncertain Facts & Differing Values

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<tr>
<td>Equal Weighting (=0.25C+0.25W+0.25E+0.25S)</td>
<td>0.60</td>
<td>0.46</td>
<td>0.10</td>
</tr>
<tr>
<td>Consumptionist Weighting (=0.7C+0.1W+0.1E+0.1S)</td>
<td>2.30</td>
<td>2.24</td>
<td>2.06</td>
</tr>
<tr>
<td>Consumption Weighted More Heavily Than Wealth (=0.4C+0.1W+0.25E+0.25S)</td>
<td>0.93</td>
<td>0.88</td>
<td>0.73</td>
</tr>
<tr>
<td>Anti-Egalitarian Weighting (=0.33C+0.33W+0.0E+0.33S)</td>
<td>1.28</td>
<td>1.08</td>
<td>0.56</td>
</tr>
<tr>
<td>Equality &amp; Security (=0.2C+0.1W+0.4E+0.3S)</td>
<td>0.14</td>
<td>0.09</td>
<td>-0.04</td>
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### Uncertain Facts & Differing Values


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<tr>
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<td>1.43</td>
<td><strong>1.39</strong></td>
<td>1.21</td>
</tr>
<tr>
<td>Consumptionist Weighting (=0.7C+0.1W+0.1E+0.1S)</td>
<td>2.93</td>
<td>2.92</td>
<td>2.87</td>
</tr>
<tr>
<td>Consumption Weighted More Heavily Than Wealth (=0.4C+0.1W+0.25E+0.25S)</td>
<td>1.74</td>
<td>1.73</td>
<td>1.66</td>
</tr>
<tr>
<td>Anti-Egalitarian Weighting (=0.33C+0.33W+0.0E+0.33S)</td>
<td>1.87</td>
<td>1.83</td>
<td>1.61</td>
</tr>
<tr>
<td>Equality &amp; Security (=0.2C+0.1W+0.4E+0.3S)</td>
<td>0.92</td>
<td>0.90</td>
<td>0.83</td>
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## Uncertain Facts & Differing Values
- **Sensitivity of Compound Annual Growth Rates of IEWB to Alternative Weightings and Carbon Costings: 2008 - 2017**

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<th>$250 in 2016</th>
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</thead>
<tbody>
<tr>
<td>Equal Weighting .25C+.25W+.25E+.25S</td>
<td>-0.10</td>
<td>-0.22</td>
<td>-0.52</td>
</tr>
<tr>
<td>Consumptionist Weighting .7C+.1W+.1E+.1S</td>
<td>1.41</td>
<td>1.38</td>
<td>1.31</td>
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<tr>
<td>Consumption Weighted More Heavily Than Wealth .4C+.1W+.25E+.25S</td>
<td>0.82</td>
<td>0.79</td>
<td>0.71</td>
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<tr>
<td>Anti-Egalitarian Weighting .33C+.33W+.0E+.33S</td>
<td>0.70</td>
<td>0.59</td>
<td>0.26</td>
</tr>
<tr>
<td>Equality and Security Weighting .2C+.1W+.4E+.3S</td>
<td>0.45</td>
<td>0.41</td>
<td>0.32</td>
</tr>
</tbody>
</table>
Conclusions:

• Growth rate of IEWB < Growth GDP per capita
  – Slower growth of IEWB has been driven by Stagnant/Adverse changes in Equality & Security Domains (good news items outnumbered)

• IEWB wealth Domain - Accounting for GHG stock makes a significant negative difference
  • GHG is Stock Pollutant: Increasing Impact over time
  • Huge uncertainty in Marginal Carbon Cost, large enough to affect aggregate wealth trends

• 2008-2017 slowing of growth (sometime to negative) is clear in all cost & value scenarios