Jones and Klenow (2016 AER)

Building on the [Nordhaus.Tobin-1972-NBER] Measure of Economic Welfare (MEW), JK seek a better summary statistic for welfare than GDP. They do this for a small set (13) of countries for which they have detailed household survey data. They then extend it to a large set (152) of countries using coarser data.

For each country, JK would like to construct a consumption-equivalent measure of the standard of living, λ_i. This metric answers a peculiar question: if you faced an equal probability of being born in any situation in a given country, what proportion of US consumption would leave you indifferent (in an expected-utility sense) to facing the same lottery but for the US? Expected lifetime utility is

$$U = E \sum_{a==1}^{100} \beta^a u[C_a, \ell_a]\, S[a]$$

where a is age and $S[a]$ gives the probability of surviving to that age. Base on this, compute scaled lifetime utility in country i as

$$U_i[\lambda] = E \sum_{a==1}^{100} \beta^a u\left[\lambda C_{a,i}, \ell_{a,i}\right] S_i[a]$$

The JK welfare metric λ_i satisfies

$$U_{US}[\lambda_i] == U_i[1]$$

Worked Example

For a simple example, let leisure be exogenously given and let mean consumption grow at rate $g == 0$. Adopt the following simple utility function: $U[C, l] = \overline{u} + \text{Log}[C] + v[l]$. For this example, JK assume $E\,\text{Log}[C] = \text{Log}[c] - \sigma^2/2$, for given constants c and σ.

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cdist = LogNormalDistribution[μ, σ]; (* consumption distribution *)
c == Mean@cdist (* c is the mean of consumption *)
Simplify[Solve[c == Mean@cdist, μ, Reals], c > 0]
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Out[ ]= $c == e^{\mu+\frac{\sigma^2}{2}}$

Out[ ]= $\left\{\left\{\mu \to -\frac{\sigma^2}{2} + \text{Log}[c]\right\}\right\}$

Recalling that in this simple worked example $g == 0$,

$$U = \left(\overline{u} + \text{Log}[c] - \sigma^2 / 2 + v[\ell]\right) E \sum_{a==1}^{100} \beta^a S[a]$$

Simplify further by letting $\beta = 1$, so that the last term is just the life expectancy, $E \sum_{a==1}^{100} S[a]$. For notational simplicity, letting e be this life expectancy.

$$U = e\left(\overline{u} + \text{Log}[c] - \sigma^2 / 2 + v[\ell]\right)$$

With this simple example, it is trivial to compute the "simple version" of the JK relative welfare metric.

$$U_{US}[\lambda_i] == U_i[1]$$

$$e_{US}\left(\left(\text{Log}[\lambda]+\overline{u}+\text{Log}[c_{US}]-\sigma_{US}^2/2\right)+v[\ell_{US}]\right)==e\left(\overline{u}+\text{Log}[c]-\sigma^2/2+v[\ell]\right)$$

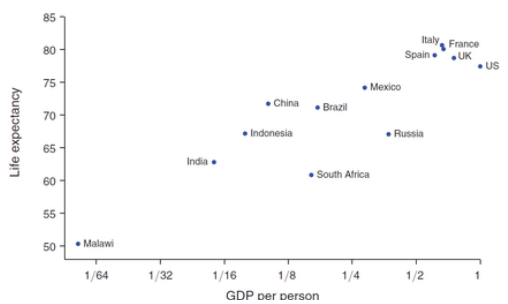
$$\text{Log}[\lambda]==\frac{e}{e_{US}}\left(\overline{u}+\text{Log}[c]-\sigma^2/2+v[\ell]\right)-\left(\overline{u}+\text{Log}[c_{US}]-\sigma_{US}^2/2+v[\ell_{US}]\right)$$

For convenience in interpretation, and and subtract the first expression in parentheses—a “well-chosen zero”.

$$\text{Log}[\lambda]==\left(\frac{e}{e_{US}}-1\right)\left(\overline{u}+\text{Log}[c]-\sigma^2/2+v[\ell]\right)$$
$$+\left(\text{Log}[c]-\text{Log}[c_{US}]\right)$$
$$+\left(\sigma^2-\sigma_{US}^2\right)/2$$
$$+\left(v[\ell]-v[\ell_{US}]\right)$$

JK interpret this as an additive decomposition of λ into the contributions of differences in life expectancy, consumption, inequality, and leisure. (See the following figures.) Eventually JK use this decomposition to compute their relative welfare metric for a large sample of countries.

Out[∘]=

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Life Expectancy vs GDP per capita
Source: JK2016 Fig4
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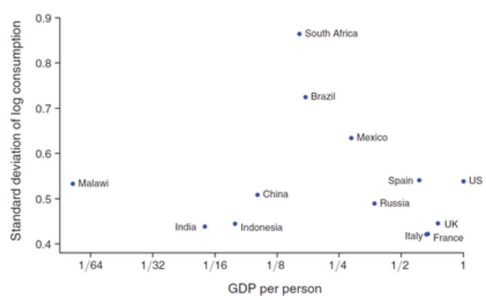
Out[∘]=

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Inequality (sd of log c) vs GDP per capita
Source: JK2016 Fig1
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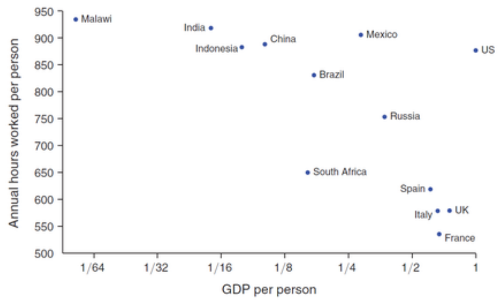
Out[ ]=

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Hours Worked vs GDP per capita
Source: JK2016 Fig 2
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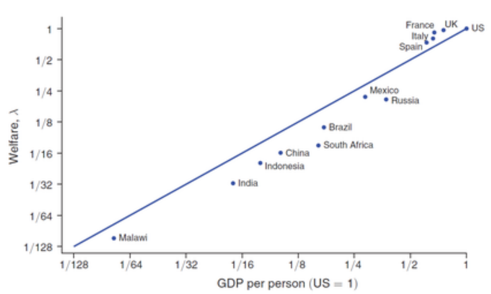
JK Key Point 1: GDP per person is an excellent indicator of welfare across the broad range of countries: the two measures have a correlation of 0.98. Nevertheless, for any given country, the difference between the two measures can be important. Across 13 countries, the median deviation is about 35 percent.
See the following figure.

JK Key Point 2: Western European living standards appear much closer to those in the United States when we take into account Europe’s
longer life expectancy,
additional leisure time, and
lower levels of inequality.

JK Key Point 3: Many developing countries, including all eight of the non-European countries in this sample, are poorer than incomes suggest because of a combination of
shorter lives,
low consumption shares, and
extreme inequality.

Out[ ]=

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Welfare Correlates with p.c. GDP
Source: JK2016 Fig 5A
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Welfare relative to p.c. GDP often looks better in developed countries but worse in developing countries.

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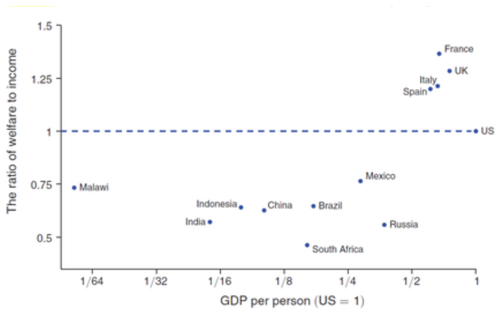


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Welfare Relative to p.c. GDP Varies
Source: JK2016 Fig 5B
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JK Key Point 4: between the 1980s and mid-2000s, welfare growth averaging 3.1 percent beats income growth of 2.1 percent (across their 7 household surveys over this period).
Rising life expectancy of about 1 percentage point per year accounts for the difference.

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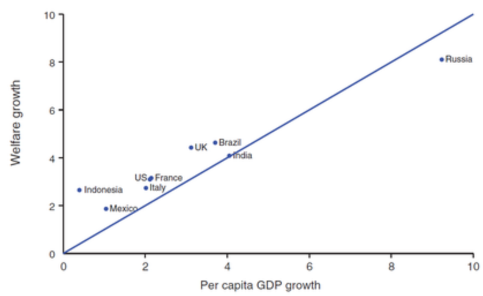


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Welfare Growth Correlates with p.c. GDP Growth
Source: JK2016 Fig 6A
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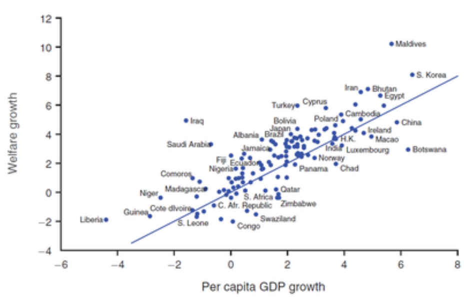


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Welfare Growth Correlates with p.c. GDP Growth
Source: JK2016 Fig 8
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