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The implication of subsistence consumption for economic welfare

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HIGHLIGHTS

- The welfare consequences of subsistence consumption are studied using an RBC model.
- The welfare cost of business cycles increases in the level of subsistence consumption.
- Consumption volatility increases in subsistence consumption.
- Disutility from working becomes higher as subsistence level increases.
- Subsistence makes consumption more responsive to shocks.

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ABSTRACT

Using a subsistence consumption-augmented real business cycle model, we show that, for any given exogenous growth rates or parameter values, high initial subsistence levels increase the welfare cost of business cycles. This happens because subsistence consumption increases consumption volatility. Our finding suggests that eliminating economic fluctuations can be more beneficial to less-developed economies in which subsistence consumption is a high fraction of aggregate consumption. However, fast-growing economies exhibit a lower discrepancy of welfare costs between rich and poor countries, a result that also highlights the importance of growth-enhancing policies.

1. Introduction

Subsistence consumption, which refers to a minimum level of consumption required to sustain life, is usually determined by the poverty line. In particular, lower and upper bounds of the international poverty lines employed by the World Bank are \$694 and \$1,132 (in 2011 PPP prices).[1] This implies that the poverty line over GNI per capita ranges from 2% for high income economies to 44% for low income economies, as reported in Table 1.1.

Incorporation of subsistence consumption into macroeconomic models is crucial to study the performance of less-developed countries. While the effects of subsistence consumption on growth have been extensively studied in the growth/development literature,[2] the attempts to analyze implications of subsistence consumption for business cycles are rare (Ravn et al., 2008; Achury et al., 2012). Our paper adds to the literature by studying the effects of subsistence consumption on the welfare cost of business cycles.

In doing so, we incorporate subsistence consumption in an otherwise standard real business cycle (RBC, henceforth) model and compute the welfare cost of business cycles à-la (Lucas, 1987). Our main finding is that the welfare cost is increasing in the initial subsistence consumption, and the result is robust to a wide range of parameter values and exogenous growth rates. A positive relationship between consumption volatility and subsistence consumption attributes to the consequence. The model's prediction is consistent with findings on less-developed economies (Aguiar and

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1 This corresponds to \$1.90 and \$3.1 a day, respectively.

2 Steger (2000); and Herrendorf et al. (2014) provides an extensive of the literature.

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Table 1.1
Poverty line over per capita income.

Group of countries[a] (number of countries)	GNI per capita[b]	Ratio I[c]	Ratio II[d]
Low income economies (31)	1,571	0.44	0.72
Lower middle income economies (51)	6,002	0.12	0.19
Upper middle income economies (53)	14,225	0.05	0.08
High income economies: OECD (32)	43,588	0.02	0.03

Note: Data are taken from the Word Bank.
[a] Country grouping according to the World Bank.
[b] In 2014 dollars.
[c] Ratio between the lower poverty line ($694) and GNI per capita.
[d] Ratio between the upper poverty line ($1132) and GNI per capita.

Gopinath, 2007; Bick et al., 2016), which suggests that eliminating business cycles can be more beneficial in such economies.

2. The model

A standard RBC model is extended in the simplest way to make our analysis comparable with that in the existing literature.[3]

2.1. Setup

A social planner solves the following utility maximization problem in which the preference of a representative household takes Stone–Geary form[4]:

$$\max_{c_t,k_{t+1},h_t} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left[\ln(c_t - \bar{c}_t) - \psi \frac{h_t^{1+\phi}}{1+\phi} \right], \tag{2.1}$$

subject to

$$c_t + k_{t+1} = Z_t k_t^{1-\alpha} h_t^{\alpha} + (1-\delta)k_t \tag{2.2}$$

where $\beta \in (0, 1)$ is the discount factor, h_t represents hours worked at period t, c_t is period t consumption,[5] and $\bar{c}_t \equiv \frac{\bar{c}}{X_t}$ denotes period t subsistence consumption, with $\bar{c} \geq 0$ and $X_t = (1+g_x)X_{t-1}$ being a growing variable. This setup captures the fact that the relevance of a subsistence consumption to an aggregate economy becomes lower as the economy grows (see Table 1.1). In addition, $\phi > 0$ is the inverse of Frisch labor elasticity,[6] $\psi > 0$ is the preference parameter, $\delta \in (0, 1)$ is the rate of depreciation, $\alpha \in (0, 1)$ is the labor share, k_t denotes period t capital stock, and Z_t denotes a total factor productivity, following an AR (1) process:

$$\ln Z_t = \rho \ln Z_{t-1} + \varepsilon_t, \tag{2.3}$$

where $\rho \in (0, 1)$ and $\varepsilon_t \sim N(-\frac{\sigma_z^2}{2}, \sigma_z^2)$.[7]

We compute the equilibrium transition path by backward solving the policy functions and forward simulating the economy (see Appendix A for details).

2.2. Welfare cost

The welfare cost can be computed by comparing the value of living in a non-fluctuating economy with value of living in an economy that fluctuates around the non-fluctuating economy.

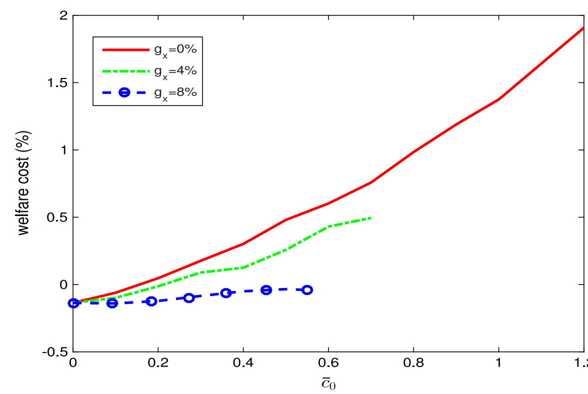

Fig. 3.1. Welfare cost of business cycles (%): Benchmark economy.

We first define the value of the non-fluctuating economy as V^{NF}:

$$V^{NF} = \sum_{t=0}^{\infty} \beta^t U(c_t^{NF} - \bar{c}_t, h_t^{NF}), \tag{2.4}$$

where superscript NF denotes non-fluctuating economy and U denotes a utility function in a general form.

Similarly the value of the fluctuating economy, V^F, is given by

$$V^F = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t U(c_t^F - \bar{c}_t, h_t^F) \tag{2.5}$$

where superscript F denotes fluctuating economy.

In addition, we define

$$V^{F,\lambda} = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t U((1+\lambda)(c_t^F - \bar{c}_t), h_t^F), \tag{2.6}$$

where λ is the compensating variation of consumption, measuring the fraction of consumption a consumer is willing to pay to live in a stable economy.

$$V^{NF} = V^{F,\lambda}. \tag{2.7}$$

By equating V^{NF} to $V^{F,\lambda}$, using the utility specification in Eq. (2.1), we obtain

$$\lambda = \exp\left((1-\beta)(V^{NF} - V^F)\right) - 1. \tag{2.8}$$

2.3. Parameterization

We calibrate the parameters to match long-run moments of the U.S. economy: β is set as 0.995 to match an annualized real risk-free rate of return of 2%. α is 0.67 in line with the labor income share in the post-war U.S. data and δ is 0.02 to match the investment–capital ratio observed in the data. We further set $\rho = 0.95$ and

[3] Our finding is also robust to introduction of population growth. See Online Appendix B.2.
[4] Stone-Geary form is in the class of Gorman polar form so that aggregation is available as in the standard models. See Acemoglu (2009) for related discussions.
[5] One can interpret variables introduced in our exercise measured as efficiency units, by assuming that X_t is the labor-augmenting technology progress.
[6] We consider log utility in order for the model to exhibit balanced growth property (King et al., 2002).
[7] This ensures $\mathbb{E}(Z_t) = 1$.