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Boom, bust, and the human body: Further evidence on the relationship between height and business cycles

Marco Sunder [a,*], Ulrich Woitek [b]

[a] *Department of Economics, University of Munich, Ludwigstr. 33-4, 80539 Munich, Germany*
[b] *University of Zurich, Switzerland*

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Abstract

Historical time series for average human height exhibit short- and medium-term cycles that can be associated with business cycles in the 19th and 20th century. Using spectral analysis, we calculate the proportion of cyclical fluctuations in height series attributable to economic cycles. We also analyze the extent to which these cyclical phenomena change over time. In the U.S., the association between height cycles and business cycles was weaker among richer segments of the society, and weaker among men than among women. Additionally, the relationship diminished over time, probably with the rich preceding the population at large.

JEL Classification: N11; N12; E32; I10

Keywords: Business cycles; Anthropometric history; Height cycles; Spectral analysis

1. Introduction

More than two decades ago, Margo and Steckel (1983) analyzed the physical stature of U.S. born White soldiers and put on the research agenda what later became known as the ''Antebellum puzzle'', resulting in a series of articles (Komlos, 1987, 1996): the average

* Corresponding author. Tel.: +49 8921802754; fax: +49 89339233.
E-mail addresses: marco@econhist.de (M. Sunder), u.woitek@iew.unizh.ch (U. Woitek).

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height of cohorts of free-born men decreased in the decades preceeding Civil War, despite robust economic growth. Similar patterns have been observed among European populations (Komlos, 1989, 1998).[1] Besides these long-term processes, recent research has discovered hitherto unknown shorter cycles in height as well, and examined their relationship to business cycles and sunspots (Woitek, 2003; Jacobs and Tassenaar, 2004; Komlos et al., 2004; Brabec, 2005). We seek to extend this line of research by analyzing additional samples of physical stature in 19th and early 20th centuries, and furthermore extend the methodology used in Woitek (2003) to allow for changes over time in the characteristics of height cycles and their relationship to business cycles.

As our focus is on short-run cycles, we filter the original time series in order to obtain deviations from a long-run growth component. Although we do acknowledge that there are long-run phenomena in average height that have important implications, we disregard those in the present case, as the limited length of the time series on height does not allow us to determine the periodicity of very long cycles with our methodology (Brabec, 2005).[2]

The height data under analysis enable us to address for the first time the question whether height cycles varied by income brackets in the United States. Our hypothesis is that the relationship between business cycles and height cycles should be weaker among members of this group than in the rest of the population. We also hypothesize that this relationship diminishes over time as food consumption has become a smaller share of total expenditures, and that the richer strata precede the average population in this development.

In addition, we also take into account fluctuations in temperature as sources of short-term cycles in human height. Recent anthropometric research has established the notion that long-term changes in climatic conditions can affect the net-nutritional status of a population both directly—by changes in the basal metabolic rate—and indirectly—by changing relative prices of foodstuffs (Baten, 1999; Komlos, 2003).

2. Methodology

2.1. Spectral analysis

The multivariate spectrum of two stationary time series X_t (height) and Y_t (business cycle measure) is defined as the Fourier transform of the covariance function $\Gamma_{xy}(\tau), \tau = 0, \pm 1, \pm 2, \ldots$ (Harvey, 1993; Granger and Newbold, 1986; Brockwell and Davis, 1991; Priestley, 1981; Koopmans, 1974):

$$\mathbf{F}_{xy}(\omega) = \frac{1}{2\pi} \sum_{\tau=-\infty}^{\infty} \Gamma_{xy}(\tau)\, \mathrm{e}^{-i\omega\tau};\ \omega \in [-\pi, \pi]. \tag{1}$$

[1] For a general overview on anthropometric history, see Fogel (1994); Steckel (1995); Komlos and Baten (2004).

[2] To avoid confusion, we use the term "business cycle" in its current usage, whereas the pioneers of business cycle research examined fluctuations in the *level* of time series. In order to distinguish between both approaches, the cycles we are looking at may be referred to as "deviation cycles" instead. See Harding and Pagan (in press) for a classification of business cycle research. We are grateful to an anonymous referee for clarifying this point.