November 3, 1987

Jeremy Greenwood
Department of Economics
Social Science Center
University of Western Ontario
London, Ontario
Canada N6A 5C2

Dear Jeremy:

I enjoyed your presentation of the GHK paper—I think it's a really first rate research effort, combining interesting new economic hypotheses with some major new methods. But I do have some questions, which are sharpened versions of seminar comments.

1. I don't understand what you mean when you describe your preferences as lacking intertemporal substitution. To see this, assume that an agent faces an integrated budget constraint

\[
\max_{\{c_t\}, \{L_t\}} \sum_{t=0}^\infty \beta^t u(c_t, L_t)
\]

subject to

\[
\sum_{t=0}^\infty (P^{ct} c_t + P^{Lt} L_t) \leq \sum_{t=0}^\infty (P^{ct} \pi_t + P^{Lt} \lambda_t)
\]

where \(c_t, L_t\) are consumption and leisure; \((P^{ct}, P^{Lt})\) are their Arrow Debreu prices; and \((\pi_t, \lambda_t)\) are commodity endowments. By no intertemporal substitution effect, I expect we mean that there is no impact of a compensated change in \(P^{Lt}\) on the demand for leisure at date \(t\). But with lifetime utility (U) held fixed, then there is such an effect. With marginal lifetime utility of wealth (\(\Lambda\), the multiplier on the bc) held fixed, then there is no intertemporal substitution effect for any form of \(u(c_t, L_t)\). What is your definition?

2. Prescott (1986) and King/Plosser/Rebelo (enclosed) argue that one should constrain business cycles by resorting to growth evidence. Your utility specification implies that growth in productivity and capital will raise hours—this seems like a strange implication to me.
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I also want to (again) raise the possibility of your visiting the University of Rochester either during 88-89 or later. (It would at least raise your UWO salary to have such an offer). Let me know what you think.

Sincerely,

[Signature]

Robert G. King

RGK:nk
December 17, 1987

Professor Robert G. King
Department of Economics
University of Rochester
Rochester, NY 14627
U.S.A.

Dear Bob:

Thanks for your letter. I meant to reply earlier but I got held up
doing other things. I have the following comments on the issues you raised.

(1) Concerning the intertemporal substitution of labor supply in our model,
consider the following programming problem

\[ V(a; w(s), r(s)) = \max_{t} \left\{ U(c_t, l_t) + \beta \int V\left(a_{t+1}, w(s_{t+1}), r(s_{t+1}) \right) d\phi(s_{t+1} | s_t) \right\} \]

s.t.

\[ c_t + \frac{a_{t+1}}{1+r(s_{t+1})} = w(s_{t}) l_t + a_t \]

where c, l, and a represent the agent's consumption, labor supply and
asset holdings while w(s) and r(s) portray the market wage and interest
rates both being functions of the current state of the world s which
follows the Markov process described by \( \phi \). Labor supply has a
decision-rule of the form

\[ l_t = l(a_t, w(s_{t}), r(s_{t})) \]

...2
If this decision-rule is not a function of \( r(s_t) \) then we say there is no intertemporal substitution effect present on labor supply. With the utility function \( U(c_t, \ell_t) = U(c_t - G(\ell_t)) \) this is clearly the case, since the efficiency condition for \( \ell_t \) is simply

\[ G'(\ell_t) = w_t, \]

so that

\[ \ell_t = G^{-1}(w_t). \]

(2) It is true, as you mentioned, that our utility function will imply that growth in productivity and capital will raise hours. This undesirable feature can be eliminated, however, by modifying the utility function slightly. Specifically, let

\[ U = U(c_t + G_t(1-\ell_t)) \]

Here \( G_t \) is a technological factor affecting household's production, \( t \) which is similar in nature to the standard type of production function shock affecting firms' output; i.e. leisure in efficiency units, \( \ell_t^* \), can be written as \( \ell_t^* = G_t(1-\ell_t). \) For a given growth process in productivity and capital, a time series process should be constructed for \( G_t \) which renders stationarity in hours (although hours worked may actually declined over time). Labor's productivity in home and firm production are being affected symmetrically here. Such an idea has been operationalized in Hercowitz (JME 1986) and Hercowitz and Sampson (1987).

Also, Greg and I now have a program running that seems to solve tax-distorted equilibria easily. We're searching around for interesting fiscal policy experiments to run. We would welcome any suggestions you may have.

Finally, while I find the prospect of visiting Rochester for 1988–89 attractive it would not be a good year to choose from my perspective. I have a sabbatical for 1989–90, and any leave I take would delay this opportunity. I would be interested in visiting Rochester for the 89–90 year, though. A good time to discuss this would
be toward the end of this summer since I have to apply for my sabbatical in the fall.

Best wishes,

Jeremy Greenwood
(519) 661-3489

P.S. (a) The AER has now accepted our paper for publication. Thanks for your's and Charlie's interest in it. If the paper hadn't already been in process at the AER for so long (it had gone through two of the eventual three rounds of referee) so that we were somewhat obligated to Taylor we would of certainly taken you both up on your offer.

(b) I'm working on a paper with Boyan Jovanovic on the relationship between co-ordination and growth. Hopefully, I'll be able to send you something on this next term.