Financial Literacy, Human Capital and Long-Term Economic Growth

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Why Financial Literacy is increasingly important and increasingly multifaceted

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Financial literacy is related to better economic and financial decisions by individuals and households

- higher stock market participation (van Rooij et al. 2011)
- holding of asset portfolios which are more diversified and that earn higher returns (Guiso and Jappelli, 2008; von Gaudecker, 2015; Bianchi, 2018)
- greater disposition to leave the stock market before crashes (Guiso and Viviano, 2017)
- higher awareness in terms of borrowing decisions (Lusardi and de Bassa Scheresberg, 2013)
- better ability to plan financially (Lusardi and Mitchell, 2014)
The impact of financial literacy on macroeconomic variables has been much less investigated

- Financial literacy increases wealth inequality (Lusardi et al., 2017)
- Financial literacy induces to a better allocation of lifetime resources (Jappelli and Padula, 2013)

We study the relationship of FL with long-term economic growth
Financial Literacy (FL) is a specific form of human capital (HC) that can be accumulated but requires time and effort to be produced. Both the existing level of FL and the newly acquired FL do not affect production of the consumption good.

Benefits of the investment in FL:
- Higher FL allows to better process information on financial assets and therefore increases the return on savings.
- At a macroeconomic level:
  - Savings are converted into investment by the financial sector.
  - Higher FL allows to select better investment opportunities and therefore to increase the return on capital invested.
We use a Uzawa-Lucas (1988) (U-L) model of endogenous growth with three sectors: final consumption good, HC and FL.

We add to the U-L framework a financial sector whose return on capital invested is endogenous.

- The return on investment depends on macroeconomic conditions and FL.
Physical capital and HC \((0 \leq u_t \leq 1)\) are combined to produce the unique consumption good

\[ y_t = k_t^\alpha (u_t h_t)^{1-\alpha} \]

HC is accumulated through time

\[ h_{t+1} = b(1 - u_t - \nu_t) h_t \]

An amount \(\nu_t h_t, 0 \leq \nu_t \leq 1\) of HC contributes to the accumulation of financial literacy. The FL technology is Cobb-Douglas (Delavande, 2008)

\[ a_{t+1} = (\nu_t h_t)^{1-\xi} a_t^\xi \]
• The financial sector transfers intertemporally savings from period $t$ to $t+1$

• It delivers $R_t > 0$ units of physical capital at $t+1$ for every unit of consumption good saved at $t$. We are agnostic about the determinants of $R_t$:

$$R_t = R(k_t, h_t, a_t, u_t, \nu_t)$$

• The dynamic evolution of capital is

$$k_{t+1} = R_t(y_t - c_t)$$
The social planner solves

$$\max_{\{c_t, u_t, \nu_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t \ln(c_t)$$

s.t.  

$$k_{t+1} = R_t(y_t - c_t)$$

$$h_{t+1} = b(1 - u_t - \nu_t)h_t$$

$$a_{t+1} = (\nu_t h_t)^{1-\xi} a_t^\xi$$

$$k_0 > 0, h_0 > 0, a_0 > 0$$

(1)

Suppose that the elasticities of $R$ w.r.to all possible inputs $(k, h, a, u, \nu)$ are constant (e.g. $R$ is Cobb-Douglas)

Then we can characterize a closed-form solution of (1) by using a ”guess and verify” method in a Bellman equation
Proposition

**Optimal policy rules:**

\[
\begin{align*}
c_t &= \frac{1-\alpha\beta-\beta\varepsilon_{R,k}}{1-\beta\varepsilon_{R,k}} y_t \\
u_t &= \bar{u} = \frac{1-\beta\Theta}{\Delta'} \\
\nu_t &= \bar{v} = \frac{1-\beta\Theta}{\Delta} \left( \varepsilon_{R,\nu} + \frac{\beta(1-\xi)}{1-\beta\xi} \varepsilon_{R,a} \right)
\end{align*}
\] (2-4)

**Optimal dynamics of the state variables:**

\[
\begin{align*}
k_{t+1} &= R_t \frac{\alpha\beta}{1-\beta\varepsilon_{R,k}} k_t^{\alpha} \bar{u}^{1-\alpha} h_t^{1-\alpha} \\
h_{t+1} &= b(1 - \bar{u} - \bar{v}) h_t \\
a_{t+1} &= \bar{v}^{1-\xi} h_t^{1-\xi} a_t^\xi
\end{align*}
\] (5-7)
If \( R_t = 1 \) for all \((k, h, a, u, \nu)\) and all \(t\), then we obtain the U-L solution:

\[
\begin{align*}
    c_t &= (1 - \alpha \beta)y_t \\
    \bar{u} &= 1 - \beta
\end{align*}
\]

- The optimal \((u_t, \nu_t)\) are constant through time: \((\bar{u}, \bar{\nu})\) in (3) and (4);
- If \( \varepsilon_{R,\nu} = \varepsilon_{R,a} = 0 \) then \( \bar{\nu} = 0 \);
- \( 1 - \bar{u} - \bar{\nu} \geq \beta \) if \( \varepsilon_{R,h} \geq \varepsilon_{R,u} + \varepsilon_{R,\nu} \).
Proposition

If \( b > \frac{1}{1-(u+v)} \), then the stock of human capital grows at rate
\[
\gamma_h = b(1-u-v) - 1 > 0.
\]
If moreover \( \varepsilon_{R,k} = 0 \) and \( R_{t+1} = R_t(1 + \gamma_R) \) for all \( t \), then production of the final good grows at rate \( \gamma_y \) such that

\[
1 + \gamma_y = (1 + \gamma_R)^{\frac{\alpha}{1-\alpha}} (1 + \gamma_h)
\]  

(8)
• The U-L economy follows a BGP where HC, physical capital and production all grow at the same rate $\gamma^{UL}$

• The financial sector, together with the degree of financial literacy, affect the long-term rate of growth $\gamma_y$ through two channels:
  - Direct effect: by affecting $\gamma_R$
  - Indirect effect: through an effect on $\gamma_h$
Suppose $\gamma_h = \gamma^{UL}$ (= growth rate of the economy if there was no financial sector)

From (8):

$$\gamma_y \geq \gamma^{UL} \text{ iff } (1 + \gamma_R)^{\frac{\alpha}{1-\alpha}} \geq 1 + \gamma^{UL}$$

The financial sector *amplifies* growth only if (i) the return on investment is increasing with time ($\gamma_R > 0$), and (ii) $\gamma_R$ is sufficiently high compared to $\gamma_h$

- This lower bound on $\gamma_R$ is lower, the more capital intensive is the production of the final good (higher $\alpha$)

When the return on investment generated by the financial sector is sufficiently high, then the stock of physical capital grows faster than HC, amplifying economic growth (impact depends on $\alpha$)
• Fix $\gamma_R = 0$ so that $\gamma_y = \gamma_h$

• $\gamma_h \geq \gamma^{UL}$ iff $1 - \bar{u} - \bar{v} \geq \beta$, i.e. iff $\varepsilon_R, h \geq \varepsilon_R, u + \varepsilon_R, \nu$

• Intuition:
  • In this case (as in U-L), the only driver of economic growth is the accumulation of HC
  • A high elasticity of $R$ w.r.to HC ($\varepsilon_R, h$) induces a (relatively) high investment of the existing HC in new HC and a (rel.) little investment in new FL and in production
  • Overall the stock of HC grows at a higher rate due to the presence of the financial sector
Consider:

\[ R_t = (\bar{u} h_t)^\delta (\bar{v} h_t)^\lambda \ a_t^\chi h_t^\omega = \bar{v}^\lambda \bar{u}^\delta h_t^{\delta+\lambda+\omega} a_t^\chi \]

- It is realistic to expect \( \lambda \geq 0, \delta + \lambda + \omega \geq 0 \) and \( \chi \geq 0 \), while we are agnostic about the sign of \( \delta \)

**Direct Effect:**

\[ 1 + \gamma_y = (1 + \gamma_h)^{1+\frac{\alpha(\delta+\lambda+\omega+\chi)}{1-\alpha}} \]

- The financial sector amplifies growth if \( \delta + \lambda + \omega + \chi \geq 0 \)
- To interpret this result, assume that \( \omega = \chi = 0 \). Then \( \gamma_y \geq \gamma_h \) when \( \delta + \lambda \geq 0 \)
- Growth is amplified if the investment in new FL has a sufficiently strong effect on the return generated by the financial sector
**Indirect Effect:**

\[ \varepsilon_{R,h} > \varepsilon_{R,u} + \varepsilon_{R,\nu} \text{ when } \omega > 0 \]

- Financial sector efficiency exhibits some form of increasing returns on HC
- It is optimal not to use much of the existing HC to accumulate new FL (and to produce the final good), but to accumulate more HC
We analyze the relationship between FL and economic growth by relying on an endogenous growth model (U-L) extended to include a financial sector.

- The financial sector produces returns on savings (investment)
- The return depends on macroeconomic conditions and FL

The presence of a financial sector and the accumulation of FL affect economic growth through two channels:

- A direct one: through an increase in the accumulation of physical capital due to the increasing return generated by the financial sector
- An indirect one: through an increase in the accumulation of HC
- The optimal investment in FL depends on the financial sector production function
- Next step: to calibrate the long-run elasticities of the financial sector production function