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

$$\begin{aligned} & \max_{\{c_t,u_t,\nu_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t \ln(c_t) \\ s.t. \quad & k_{t+1} = R_t(y_t - c_t) \\ & h_{t+1} = b(1-u_t-\nu_t)h_t \\ & a_{t+1} = (\nu_t h_t)^{1-\xi} a_t^{\xi} \\ & k_0 > 0, h_0 > 0, a_0 > 0 \end{aligned} \tag{1}$$

- Suppose that the elasticities of R w.r.to all possible inputs (k, h, a, u, ν) 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:

$$c_t = \frac{1-\alpha\beta-\beta\varepsilon_{R,k}}{1-\beta\varepsilon_{R,k}} y_t \tag{2}$$

$$u_t = \overline{u} = \frac{1-\beta\Theta}{\Delta'} \tag{3}$$

$$\nu_t = \overline{\nu} = \frac{1-\beta\Theta}{\Delta}\left(\varepsilon_{R,\nu} + \frac{\beta(1-\xi)}{1-\beta\xi}\varepsilon_{R,a}\right) \tag{4}$$

Optimal dynamics of the state variables:

$$k_{t+1} = R_t \frac{\alpha\beta}{1-\beta\varepsilon_{R,k}} k_t^{\alpha}\overline{u}^{1-\alpha} h_t^{1-\alpha} \tag{5}$$

$$h_{t+1} = b(1-\overline{u}-\overline{\nu})h_t \tag{6}$$

$$a_{t+1} = \overline{\nu}^{1-\xi} h_t^{1-\xi} a_t^{\xi} \tag{7}$$

- If $R_t = 1$ for all (k, h, a, u, ν) and all t, then we obtain the U-L solution:

$$\begin{aligned} c_t &= (1 - \alpha\beta) y_t \\ \overline{u} &= 1 - \beta \end{aligned}$$

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

Proposition

If $b > \frac{1}{1-(\overline{u}+\overline{\nu})}$*, then the stock of human capital grows at rate* $\gamma_h = b(1-\overline{u}-\overline{\nu}) - 1 > 0$.
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* γ_y *such that*

$$1+\gamma_y = (1+\gamma_R)^{\frac{\alpha}{1-\alpha}}(1+\gamma_h) \tag{8}$$

- The U-L economy follows a BGP where HC, physical capital and production all grow at the same rate γ^{UL}
- The financial sector, together with the degree of financial literacy, affect the long-term rate of growth γ_y through two channels:
  - *Direct* effect: by affecting γ_R
  - *Indirect* effect: through an effect on γ_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) γ_R is sufficiently high compared to γ_h
  - This lower bound on γ_R is lower, the more capital intensive is the production of the final good (higher α)
- 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 α)

- Fix $\gamma_R = 0$ so that $\gamma_y = \gamma_h$
- $\gamma_h \geq \gamma^{UL}$ iff $1 - \overline{u} - \overline{\nu} \geq \beta$, 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:

$$R_t = (\overline{u} h_t)^{\delta} (\overline{\nu} h_t)^{\lambda} a_t^{\chi} h_t^{\omega} = \overline{\nu}^{\lambda} \overline{u}^{\delta} h_t^{\delta+\lambda+\omega} a_t^{\chi}$$

  - 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 δ

- *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