Financial Literacy, Human Capital and Long-Term Economic Growth

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April, 21-22, 2022

7th Cherry Blossom Financial Education Institute, Washington D.C.

- Up to now, Financial Literacy (FL) is viewed mostly as a microeconomic concept
  - Policy view: the increasing importance for *every individual* to be financially literate in an increasingly complex world (OECD)
  - Large empirical evidence that FL is related to better economic and financial decisions by *individuals and households*
    - higher stock market participation (van Rooij et al. 2011)
    - better ability to plan financially (Lusardi and Mitchell, 2007), and to protect against longevity risk (Brown, 2016)
    - holding of asset portfolios which are more diversified and earn higher returns (Guiso and Jappelli, 2008; von Gaudecker, 2015; Bianchi, 2018)

- The impact of financial literacy on macroeconomic outcomes has been much less investigated
  - Financial literacy increases wealth inequality over time (Lusardi et al., 2017)
  - Financial literacy induces better savings decisions and a better allocation of lifetime resources (Jappelli and Padula, 2013)
- We study the relationship of FL with long-term economic growth

- Financial Literacy is a specific form of human capital (HC) that can be accumulated over time
  - *A combination of awareness, knowledge, skill, attitude and behaviour necessary to make sound financial decisions and ultimately achieve individual financial wellbeing* (OECD definition)
- To acquire FL involves costs and benefits
  - Costs:
    - It requires time, effort and cognitive ability to be produced
    - Both the existing level of FL and the newly acquired FL do not affect production of the consumption goods
  - Benefits:
    - (micro) Higher FL allows to better process information on financial assets and therefore increases the return on savings
    - (macro) 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 on 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

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

- New FL is produced by using a quota $0 \leq \nu_t < 1$ of existing HC. 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:

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

- The dynamic evolution of capital is

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

- The main trade-off related to the investment in financial literacy:
  - It increases the returns on savings and on asset holdings (higher R_t)
  - It increases the opportunity cost of time for human capital accumulation (lower $1-u_t-\nu_t$): financiers vs. engineers (Philippon, 2010)

Proposition

Optimal policy rules:

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

$$u_t = \overline{u} = \frac{1-\beta\Theta}{\Delta} \tag{2}$$

$$\nu_t = \overline{\nu} = \frac{1-\beta\Theta}{\Delta} \frac{\varepsilon_{R,\nu}+\frac{\beta(1-\xi)}{1-\beta\xi}\varepsilon_{R,a}}{\varepsilon_{R,u}+\frac{1-\alpha}{\alpha\beta}\left(1-\beta\varepsilon_{R,k}\right)} \tag{3}$$

Optimal dynamics of the state variables:

$$k_{t+1} = R_t \frac{\alpha\beta}{1-\beta\varepsilon_{R,k}} k_t^{\alpha} \overline{u}^{1-\alpha} h_t^{1-\alpha} \tag{4}$$

$$h_{t+1} = b(1-\overline{u}-\overline{\nu})h_t \tag{5}$$

$$a_{t+1} = (\overline{\nu} h_t)^{1-\xi} a_t^{\xi} \tag{6}$$

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

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

- If $R_t \neq 1$ the optimal (u_t, ν_t) are constant through time (as in U-L)
- If FL does not affect R_t $(\varepsilon_{R,\nu} = \varepsilon_{R,a} = 0)$ then $\overline{\nu} = 0$
  - More generally: the optimal accumulation of FL depends on the financial sector's technology
- When $\overline{\nu} > 0$ the representative agent invests in new FL and reduces the quota of HC devoted to production $(\overline{u})$:
  - Higher FL allows a better allocation of savings, higher returns on the financial markets, faster growth of physical capital (and possibly lower growth of HC)

Proposition

If $b > \frac{1}{1-(\overline{u}+\overline{\nu})}$, *and* $\varepsilon_{R,k} = 0$ *then the stock of human capital grows at rate* $\gamma_h = b(1-(\overline{u}+\overline{\nu})) - 1 > 0$.
Moreover, let $R_{t+1} = R_t(1+\gamma_R)$, *with* $\gamma_R \geq 0$ *for all* t. *Then output and consumption grow at rate* γ_y *such that*

$$1+\gamma_y = (1+\gamma_R)^{\frac{\alpha}{1-\alpha}}(1+\gamma_h) \tag{7}$$

- Both the U-L and our economy with $R_t = 1$ follow a BGP where HC, physical capital and production all grow at the same rate γ^{UL}
- If $R \neq 1$ and $\gamma_R = 0$ our economy follows a BGP, at which all variables k, h, a, y and c grow at rate γ_h
- If $\gamma_R > 0$ different sectors grow at a different rates
  - Physical capital grows faster than production and consumption, which in turn grow faster than HC

- The financial sector, together with the degree of financial literacy, affect the long-term rate of growth γ_y through two channels:
  - *Financial sector efficiency*: by affecting γ_R
  - *Human capital accumulation*: through an effect on γ_h
- We study the effect of FL on growth by comparing our economy with a financial sector with the analogous U-L economy (without that sector)

Proposition

Consider an Uzawa-Lucas framework with BGP growth rate $\gamma^{UL} = b\beta - 1$, *and our model described above. Assume that* b *is the same in the two setups.*
Then along the BGP the following results hold:
(i) If $\varepsilon_{R,u} + \varepsilon_{R,\nu} \geq \varepsilon_{R,h}$ *then* $\gamma_h \leq \gamma^{UL}$ *and* $\gamma_y \geq \gamma^{UL}$ *provided that* γ_R *is sufficiently high,*
(ii) If $\varepsilon_{R,u} + \varepsilon_{R,\nu} < \varepsilon_{R,h}$ *then* $\gamma_h > \gamma^{UL}$ *and* $\gamma_y > \gamma^{UL}$.

- The size of the elasticities of the financial sector' return with respect to human capital stock and its allocation determines *whether and how* finance (and FL) improve growth
- Point (i): R depends relatively more strongly on FL formation than on HC $\rightarrow$ financial sector efficiency
- Point (ii): R depends relatively more strongly on HC than on FL $\rightarrow$ HC channel

- Relatively to an analogous economy without the financial sector:
  - It is convenient to devote less time to general education (HC grows less)
  - This time is devoted to the investment in FL (FL level grows relatively fast)
  - FL has a strong positive impact on the financial sector return (high $\varepsilon_{R,\nu}$)
  - γ_R is relatively high
- From (7):

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

- FL is one driver of economic growth, through its positive effect on financial efficiency
  - But it is not always *sufficient* to amplify growth, because it reduces HC accumulation

- Relatively to an analogous economy without the financial sector:
  - It is convenient to devote more time to education (HC grows faster, i.e. $\gamma_h \geq \gamma^{UL}$)
  - If $\varepsilon_{R,\nu} > 0$ it is optimal to invest in FL, and this is done by reducing the HC devoted to production ($\overline{u}$)
  - The higher growth rate of HC increases economic growth, as in U-L
  - FL does not reduce HC accumulation and might *amplify* growth (if $\varepsilon_{R,a} > 0$)

- 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:
  - *efficiency of the financial sector*
  - *human capital accumulation*

- The optimal investment in FL depends on the financial sector production function
- FL amplifies growth when it increases the efficiency of the financial sector

- The production function of the financial sector R determines the magnitude of the Financial Sector Efficiency and of the Human Capital effects
- Need to calibrate the different elasticities of R w.r. to its determinants
  - Distinction between stocks and flows