Financial Literacy, Human Capital and Long-Term Economic Growth

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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:**

\[ c_t = \frac{1-\alpha \beta - \beta \varepsilon_R, k}{1 - \beta \varepsilon_R, k} y_t \]  \hspace{1cm} (1)

\[ u_t = \overline{u} = \frac{1 - \beta \Theta}{\Delta} \]  \hspace{1cm} (2)

\[ \nu_t = \overline{\nu} = \frac{1 - \beta \Theta}{\Delta} \frac{\varepsilon_R, \nu + \frac{\beta (1 - \xi)}{1 - \beta \xi} \varepsilon_R, a}{\varepsilon_R, u + \frac{1 - \alpha}{\alpha \beta} (1 - \beta \varepsilon_R, k)} \] \hspace{1cm} (3)

**Optimal dynamics of the state variables:**

\[ k_{t+1} = R_t \frac{\alpha \beta}{1 - \beta \varepsilon_R, k} k_t^{\alpha - 1} h_t^{1 - \alpha} \]  \hspace{1cm} (4)

\[ h_{t+1} = b(1 - \overline{u} - \overline{\nu}) h_t \] \hspace{1cm} (5)

\[ a_{t+1} = (\overline{\nu} h_t)^{1 - \xi} a_t^\xi \] \hspace{1cm} (6)
• If $R_t = 1$ for all $(k, h, a, u, \nu)$ and all $t$ ("money under the bed") then we obtain the U-L solution:

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

• If $R_t \neq 1$ the optimal $(u_t, \nu_t)$ are constant through time (as in U-L)

• If FL does not affect $R_t$ ($\varepsilon_{R,u} = \varepsilon_{R,a} = 0$) then $\bar{\nu} = 0$
  
  More generally: the optimal accumulation of FL depends on the financial sector’s technology

• When $\bar{\nu} > 0$ the representative agent invests in new FL and reduces the quota of HC devoted to production ($\bar{u}$):
  
  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 \( b > \frac{1}{1-(\bar{u}+\bar{v})} \), and \( \varepsilon_{R,k} = 0 \) then the stock of human capital grows at rate \( \gamma_h = b(1-(\bar{u}+\bar{v})) - 1 > 0 \).
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 \( \gamma_y \) such that

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

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 $\gamma_h$.

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 $\gamma_y$ through two channels:

- **Financial sector efficiency**: by affecting $\gamma_R$
- **Human capital accumulation**: through an effect on $\gamma_h$

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 $\gamma_R$ 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’s 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 $\varepsilon_{R,\nu}$)
- $\gamma_R$ 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