

# 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:*

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

$$u_t = \bar{u} = \frac{1-\beta\Theta}{\Delta} \quad (2)$$

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

*Optimal dynamics of the state variables:*

$$k_{t+1} = R_t \frac{\alpha\beta}{1-\beta\varepsilon_{R,k}} k_t^\alpha \bar{u}^{1-\alpha} h_t^{1-\alpha} \quad (4)$$

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

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



- 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:

$$c_t = (1 - \alpha\beta)y_t$$

$$\bar{u} = 1 - \beta$$

- If  $R_t \neq 1$  the optimal  $(u_t, \nu_t)$  are constant through time (as in U-L)
- If FL does not affect  $R_t$  ( $\varepsilon_{R,\nu} = \varepsilon_{R,a} = 0$ ) 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

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

- 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  $\gamma^{UL}$
- 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  $\varepsilon_{R,u} + \varepsilon_{R,v} \geq \varepsilon_{R,h}$  then  $\gamma_h \leq \gamma^{UL}$  and  $\gamma_y \geq \gamma^{UL}$  provided that  $\gamma_R$  is sufficiently high,
- (ii) If  $\varepsilon_{R,u} + \varepsilon_{R,v} < \varepsilon_{R,h}$  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  $\varepsilon_{R,\nu}$ )
  - $\gamma_R$  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 ( $\bar{u}$ )
  - 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