Solution guide: Advanced Development Economics (Makro), F14-R

Carl-Johan Dalgaard
University of Copenhagen

1 Answers

1.1 A1

- Institutions, Culture and Geography.

The results of any theory obviously flow from its assumptions. The basic premises in all economic models are assumption in three dimensions: production technology, preferences and market organization. Broadly speaking the three fundamental determinants are thought to capture these underlying premises.

Geography maps into production technology. Most obviously if we think of agriculture. But in practice it will be true more broadly. For instance, societies with no access to the ocean will not develop a thriving shipping industry. Hence, geography will almost inevitably matter to the composition of production, and as a result, will influence the "macro production function.

Culture captures beliefs, values and preferences. Perhaps the simplest example of culture beliefs that may matter to outcomes are differences in religious beliefs across societies. But other attributes may influence the desire the save, supply labor, consume (and what to consume) etc. Basically, "culture" can be thought to capture "preferences".

Institutions refer to the laws that ultimately govern the interaction of individuals in society. As such it can be viewed as mapping into the "organization the market".

2 A2

They essentially calibrate the level of health employing "the Mincer apporach". It works as follows. Suppose you have a production function

$$Y = K^{\alpha} (vL)^{1-\alpha}$$

where K is capital, v is the stock of health (vitality) and L is the labor force. I am ignoring schooling capital for simplicity. Now, given perfect competition

$$w = \frac{\partial Y}{\partial L} = (1-\alpha)\frac{Y}{L} = (1-\alpha)\left(\frac{K}{Y}\right)^{\frac{\alpha}{1-\alpha}} v$$

Suppose workers differ in terms of health, $v = v_i$, where i denotes the worker number. The individual wages would be explained by differences in the level of health, v.

Empirically the following equation has been estimated successfully over the years

$$\log(w_i) = w_0 + \psi s_i$$

which is form of mincer regressions, but where researchers employ stature, s, as a measure of accumulated health. The idead being that illness early in life, or lack of nutrition, leads to stunted growth. The "return" of stature, which works as a "health index", is usually found to be around four percent. Now, notice that the theoretical equation above can be reconciled with the empirical counterpart if we define

$$v = e^{\psi s}.$$

Hence, Shastry and Weil employs the latter (replaceing individual stature for average stature) as a way of capturing health in an incompassing way.

Due to lack of direct measurement of stature for a large cross section of countries they ultimately employ adult survival rates, for which the mapping to stature is known, to calculate v for a large number of countries.

Advantages: Provides one simple way to calibrate the importance of health to long-run development which is not haunted by the standard identification problems associated with regression analysis

Disadvantage: Very partial equilibrium. Does not take indirect effects into account (e.g., better health and thus longevity may increase investments in physical capital among other things.

3 A3

The first part of the explanation is that the diffusion of the Protestant Reformation spread from Wittenberg, with declining force as geographical distance increased. As a result, places geographically closer (within Preussia) to Wittenberg seems to have obtained the greatest number of converts.

The second part of the explanation is that the Protestant movement supported education, since it allowed the congregation to read the bible in their own language. Hence, this was in essence a religious dogma, which down the line turned out to be useful when Industrialization got in full swing.

4 B questions

4.1 B1

The maximization problem is

$$\max_{c,n} \log(c) + \beta \log(n)$$

S.t.

$$c + \lambda n + pb = I$$

where

$$b\sigma = n$$

Which can be stated

$$\max_{n} \log\left(I - \left(\lambda + \frac{p}{\sigma}\right) n\right) + \beta \log(n)$$

FOC

$$\frac{-\left(\lambda + \frac{p}{\sigma}\right)}{I - \left(\lambda + \frac{p}{\sigma}\right) n} + \beta \frac{1}{n} = 0$$

$$\beta = \frac{\left(\lambda + \frac{p}{\sigma}\right) n}{I - \left(\lambda + \frac{p}{\sigma}\right) n}$$

$$\beta I = (1 + \beta)\left(\lambda + \frac{p}{\sigma}\right) n$$

$$n = \frac{\beta}{1 + \beta} \frac{1}{\lambda + \frac{p}{\sigma}} I$$

The key observation is that when the survival rate of the offspring rises (i.e., child mortality declines) optimal family size goes up. The reason is that the loss of kids before they grow to maturity (which ultimately is what the parent values in the objective function) constitutes a cost of having kids. As mortality falls, or survival declines, these costs skrink and thus inticies the parent to expand family size.

The solution also shows that when income goes up, the parent desires a greater family. As kids are concieved to be a normal good, this is no surprice. Similarly, greater cost of surviving kids (λ) or higher metabolic costs of carrying a child to the end of weaning (possible interpretation of p) works to lower family size. Finally greater (cultural) value of families (bigger β) increases fertility.

4.2 B2

Since

$$L_{t+1} = n_t L_t = \frac{\beta}{1 + \beta} \frac{1}{\lambda + \frac{p}{\sigma}} I_t L_t$$

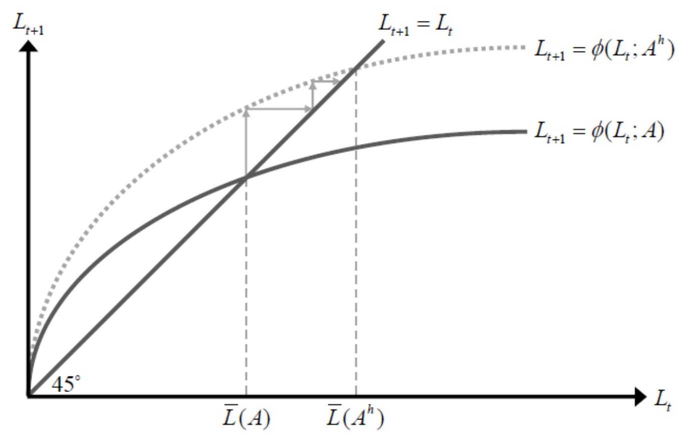

Figure 1: The Evolution of Population Size

and since $I = y_t$

$$L_{t+1} = n_t L_t = \frac{\beta}{1+\beta}\frac{1}{\lambda + \frac{p}{\sigma}} Y_t = \frac{\beta}{1+\beta}\frac{1}{\lambda + \frac{p}{\sigma}} A L_t^{\alpha} X^{1-\alpha} \equiv \Phi\left(L_t\right), \; L_0 \text{ given.}$$

where the last bit uses the information given on the production function.

In order to construct the phase diagram the student will have to examine the properties of Φ. It should be demonstrated that we have the following: $\Phi(0) = 0$, $\Phi'(L) > 0$ for all L, $\Phi''(L)$ for all L and that $\lim \Phi'_{L\to 0} = \infty$ and $\lim \Phi'_{L\to\infty} = 0$.

Thus Φ is sticktly concave, starting at the orgin. There is a unique intersection with the 45 degree line in the usual (L_t, L_{t+1}) diagram; thus the steady state is unique (the non-trivial one, anyway). It is evidently also stable in the sense that not matter the initial $L_0 > 0$, $\lim_{t\to\infty} L_t = L^* > 0$. The figure below (from Ashraf and Galor) depicts the function Φ in in the (L_t, L_{t+1}) space, for to different values of A.

4.3 B3

An increase in σ shifts the $\Phi(L_t)$ up, for any level of L. Geometrically, the move is as in the diagram above (akin to the shift from a low productivity level A^l to a high one A^h). Starting at an initial steady state L_1^*, long run population density moves up to $L_2^* > L^*$.

From the transition equation we know that

$$L_{t+1} = n_t L_t = \frac{\beta}{1+\beta}\frac{1}{\lambda + \frac{p}{\sigma}} y_t L_t.$$

In the steady state $L_{t+1} = L_t = L^*$ implying

$$\frac{\beta}{1+\beta}\frac{1}{\lambda+\frac{p}{\sigma}}y^* = 1$$

or

$$y^* = \frac{1+\beta}{\beta}\left(\lambda + \frac{p}{\sigma}\right)$$

Hence, as σ increases (higher survival rates, lower child mortality) income per capita declines.

We are now in a position to discuss the full consequences of the shock to child mortality. In the short run, for income given, the lower "price" of a surviving child raises fertility. In the long run, however, this addition fertility works to depress income per capita as the land-labor ration declines. Overall, therefore, increases in life expectancy (due to lower child mortality) would be "bad" for living standards.

4.4 B4

In this section it would be natural for the student to cite the work of cervelatti and sunde (2011) (if not by name, then the content of the study), which examines the impact of increases in life expectancy in the aftermath of the emergence of penicilin.

The authors split the sample, and examine the impact on, respectively, countries that have undergone the mortality (and fertility) transition and countries that have not. They find that among the former group rising life expectancy worked to *increase* income per capita, the *opposite* is true for the latter group. Hence, the present model is broadly consistent with the evidence in the latter regard, which is the relevant sample as the model obviously pertains to a pre-mortality transition setting.

4.5 B5

In theory: yes. The argument would have have to revolve around the precautionary motive for having children. When mortality declines the risk of ending up without any kids declines, which may induce parents to lower their (optimal) family size.

Empirically: In general, the mortality transition precedes the fertility decline. Hence, this would seem to indicate that mortality may indeed be responsible for the reduction in net fertility. However, the regularity is not universal: The US would be one (glaring) exception to the rule. Moreover, there is a very long time lag between the mortality decline and the fertility decline (at least in the demographic transitions observed in the 20th century) - easily a century - which may make one wonder if this "theory" holds in reality: where people really that slow to understand that circumstances had changed. The causes of the demographic transition (which may well differ from one case to to the next) remains an important resereach area.