Written Exam for the M.Sc. in Economics winter 2014-15-R
Advanced Development Economics – Macro aspects
Master's Course
February 18th , 2015

(3-hour closed book exam)

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by "eksamen på dansk" in brackets, you must write your exam paper in Danish.

A. Verbal Questions

A.1 What are "the fundamental determinants of productivity"? Explain why they are thought to be "fundamental".

A.2. The table contains the results from a so-called development accounting analysis, due to Shastry and Weil. Health seems to account for about 20 percent of the total variation in income per worker across countries. How do the authors measure health in their empirical analysis, which underlies the results reported in the table below? Discuss strength and weaknesses of the approach.

TABLE 3. VARIANCE DECOMPOSITION USING ADULT SURVIVAL AS A MEASURE OF HEALTH

Factor	Percentage contribution to variation in ln(Output/Worker)
Physical Capital	20.1
Human Capital from Education	21.6
Human Capital from Health	19.0
Productivity	39.3

A.3.

In an influencial study, Becker and Woessmann (2009) demonstrate on a sample of countries in Preussia that school attainment in the 19th century was increasing with the distance to the city of Wittenberg. What might explain this fact?

B. **Analytical Questions**

Consider an economy in the process of development. Time is discrete , t=0,1,2,.. and extends into the infinite future. Individuals live for two periods. Each "household" is represented by a unique parent, who will be rearing a number of off-spring, n_t. Accordingly, as a matter of accounting, the population at time t+1, L_{t+1}, is given by the population in the previous period multiplied by the number of off-spring: $n_t L_t$

In the first period of life individuals are children. During this period, the child live off the consumption of her parent. In period two individuals are grown up. They work and decide on how to divide their resulting income, I_t, between consumption, c_t, and expenditure on having off-spring on their own, n_t. More specifically, n_t is the number of offspring that *survive* until adulthood. During their life b_t births occur of which a fraction σ dies during childhood. Hence $\sigma b_t = n_t$. For simplicity, we ignore uncertainty. Hence, the fraction of kids that die during child is known with certainty. The preferences of an individual being a parent in period t are given by $u_t = \log(c_t) + \beta \log(n_t)$, and the budget constraint is $c_t + \lambda n_t + pb = I_t$, where p is a positive (time invariant) parameter, p>0.

Question B.1. Solve the maximization problem, and derive the solution for optimal family size (i.e., optimal n_t). Explain why income and the parameters of the model affect optimal *n* in the manner suggested by the formula.

Production, Y_t, is given by $Y_t = AL_t^\alpha X^{1-\alpha}$ where A is the level of productivity, X is land area (both are assumed constant), and L_t is the labor force at time t. Assume labor compensation is given by the average product, Y_t/L_t (because there are no property rights to land, say). As a result, the income of the representative parent, supplying 1 unit of labor, is simply $I_t = AL_t^{\alpha-1} X^{1-\alpha}$.

Question B.2. Derive the law of motion for population size, and use it to construct the phase diagram for the model. Establish that a steady state exists; that it is unique, and stable.

Question B3.

Use the phase diagram to analyze the impact on steady state population density from an increase in child survival. In addition, derive steady state income per capita and analyze the impact from greater child survival. Explain why these results obtain.

Question B4.

Is the result from question B3 supported empirically? Explain on what basis we know that the answer is either yes, or no.

Question B5.

Going beyond the model: (i) could declining mortality, in theory, explain the fertility decline? Explain why you answer yes or no. (ii) What would speak for, or against, the idea that the mortality transition explains the fertility transition?