Written Exam for M.Sc. in Economics autumn 2012-2013

Advanced Development Economics: The Macro Aspects

SOLUTION GUIDE

Answer A1.

Draws on Ashraf and Galor (2011) and Acemoglu et al (2002).

To answer the question it is useful to start by explaining why population density in 1500 is an interesting variable to correlated with contemporary development levels.

The basic logic is developed in Ashraf and Galor (2011, Dynamics and Stagnation in the Malthusian Epoch, American Economic Review), and goes as follows.

A key regularity from the long-run growth record is that persistent per capita growth did not emerge until a few hundred years ago, and then initially only among a select group of Western European countries (or countries of Western European "Origins" in the sense of population, such as the United States). But why did income not increase despite major technological innovations (such as the Neolithic revolution, the invention of math and movable type to name a few stellar accomplishments)? A simple explanation is that, prior to the demographic transition, temporary increases in income translated into higher fertility, which served to "erode" the positive impacts from technological change on income per capita. Hence, in the long run technological change "only" led to greater population density, but not greater income per capita. AG provide evidence on these theoretical results, using cross-country data on population density in 1500.

With this in mind, the figure then shows that countries that were technologically sophisticated, or generally productivity for geographic reasons (e.g., due to low morbidity or high geographically determined agricultural productivity), in 1500 today are the opposite today: they feature low productivity levels and thus low average income. AJR suggests that this demonstrates that geographical advantages that facilitated high density in the past no longer holds major explanatory power vis-à-vis income levels. By extension, it suggests that "something else" must be the key determinant of contemporary comparative development, besides "geography".

To substantiate, note that the countries in the figure (in the AJR study) are countries that used to be colonized. AJR propose that colonialism, and more specifically a differential colonial strategy vis-à-vis the economic institutions they put in place across countries, can account for what we see in the data. Hence, "institutions" are "more important" than geography.

The AJR argument can be summarized in the following schematic form:

Initial population density (among countries colonized) → colonial strategy → early institutions → late institutions → income per capita today.

In a nutshell AJR argue that places with initially high population density became places where the colonial powers put "extractive" institutions in place, which do not provide protection against expropriation and thus are not conducive to growth. Since institutions are highly persistent the "ripple" effects from the colonial institutions are still felt today.

In discussing the results it is perhaps worth noting that AJR themselves open the door to a rejection of their argument in introducing the "temperate drift hypothesis", which suggests that the impact of geography on development might be conditioned on prevailing technologies. For instance, if trade and international interaction has become increasingly important over the centuries for comparative development, things like sea distance between nations might become an increasingly important geographic feature. AJR cannot find support in favor of this sort of "sophisticated" geography hypothesis however. Another argument could be that the argument pertains to countries that were colonized. It could be, in keeping with Jared Diamond's (Guns germs and steel) argument that it is not random which countries become colonies and which became the colonizers and that Geography matters in this regard. If so, then the AJR argument lacks external validity. While these arguments are generally "negative" towards AJR its important to stress that it is not needed for full points to have similar views; what matters is the quality of the answer.

Answer A2.

Draws on Tabellini (2010) and Guiso et al (2006)

Tabellini examines the impact of four different dimensions of trust on long-run development, including "Trust".

Trust might matter to development for a variety of reasons. One reason is simply that it lowers transaction costs. Contracts are in practice incomplete in nature; it is not possible to take all contingencies into account (or very costly to try). In societies were people trust each other it is not so nessesary to try to deal with contingencies, which obviously lowers the costs of producing the contract and thus of transactions.

Another perspective is that "high trust" is similar to a prior belief that the "opponent" is likely to cooperate. In situations similar to the "prisoner dilemma", where coordination leads to the highest pay-off if both parties cooperate but where the is a pay-off to defection if the other party doesn't, high trust makes it more likely that both parties end up "playing" cooperate and thus to higher social pay-off.

Some of the best evidence that "trust" is more than just a reflection of institutions is found in the study of immigrants to the USA from nations around the world. The interesting finding is that people with ancestors from different countries tend to be more likely to answer in the affirmative to questions such as "generally speaking, most people can be trusted". This heteorgeniety cannot be accounted for by "institutions", as all are operating under the same set of economic institutions. Moreover, immigrants to the USA (i.e., people with ancestors in Europe, say) tend to answer in

similar ways to the question above as individuals still residing in the countries of origin. This suggests that there is strong persistency in the trust dimension.

Tabellini tries to understand regional differences in income per capita across Europe. The dependent variable is thus income per capita. Country fixed effects can be accounted for, and he also controls for current education as well as early economic development (measured by urbanization rates in the 19th century). There is a strong positive correlation between trust and income per capita.

In order to identify the impact of trust on income, Tabellini proposes that early institutional development might have served to shape current cultural outcomes such as trust. Similarly, he hypothesizes that early literacy might have worked to increased trust.
The identifying assumption is therefore, that early institutions and education do not matter to current outcomes beyond via the historical formation of trust *conditional* on current education and institutional outcomes (as well as country fixed effects).

While this identifying assumption is plausible concerns always linger. Why did some regions manage "good institutions" historically? Could such underlying causes ("determinants") matter to economic outcomes today, even conditional on institutions and education?

Analytical questions

Draws on Aghion et al (2009); Acemoglu/Johnson (2007) and Shastry and Weil (2003).

Question 1. A sensible answer to the question will involve citing Shastry and Weil **(**2003. How much of cross-country income variation is explained by health? *Journal of the European Economic Association* 1, 387–396**),** which provides various arguments in favour of a direct impact of "health" on economic activity and proceed to show that variations in health capital can account for about 20% of the global differences in GDP per worker (conditional on TFP, physical capital and so on).

Question 2.
The basic idea that human capital (here in the sense of health) facilitates the transfer of technology goes back to Nelson and Phelps. Numerous empirical studies have confirmed this link. The second expression says that a country can growth faster the further behind the knowledge frontier it is located. That is, it suggestes "advantages of backwardness", conditional on the human capital stock.

Question 3.
Regrettably there is a typo in the exam. Eqs (1.2) should have been formulated in logs directly, i.e. $\dot{a} = \delta + \theta(\bar{a} - a) + \alpha h$. As a consequence <u>any</u> answer to this question must be awarded <u>full</u> point.

In completeness. If the eqs had been written up correctly, the derivations would proceed as follows. Take logs in equation (1.1) and differentiate wrt time

$$y = a + \beta h \Rightarrow \dot{y} = \dot{a} + \beta \dot{h}$$

Inserting (1.2.) into the former equation yields

$$\dot{y} = \delta + \theta(\bar{a} - a) + \alpha h + \beta \dot{h}$$

Finally, use that $y - \beta h = a$ in the above equation and rearrange so as to obtain the expression stated in the exercise.

The equation is isomorphic to the "conditional convergence" equation which would emanate from the Neoclassical growth model. Yet convergence derives from technology transfer rather than diminishing returns to capital. Moreover, we note that the model implies that both growth in health capital and the level matters to growth. The former effect derives from the fact that health enters the production function, and thus only stimulates growth if the stock expands. On the other hand, due to the technology transfer equation a higher level of health also matters to growth.

Question 4.

The student should explain which instruments Aghion et al invoke ("predicted mortality", taken from the Acemoglu/Johnson study, along with a set of instruments which speaks to the level of health (in this regard the authors use a large set; it is ok if the student only mentions a few).

AHM find that both a higher level and growth rate of longevity influences growth in income per capita; in keeping with the predictions of the simple model.

A concern is the prolific use of instruments, which makes the exclusion restriction doubtful, and furthermore entails the risk of "over-instrumentation".

Question 5.

The key difference lies in the model specification. AJ does not admit the level of longevity to enter their estimation equation. If AHMs specification is right then the AJ identification strategy is flawed, as the "predicted mortality instrument", constructed by AJ, inevitably is correlated with the level of life expectancy. On the other hand, the "convergence pattern" in the data (i.e., the negative correlation between levels and growth of life expectancy) might well be the consequence of the international epidemiological transition; it is not primae facie evidence in favour of the AHM specification.

C. Fertility choice.

C1. Standard computations yield

$$n = \left[\left(\frac{1-\gamma}{\gamma} \right)^{1/\sigma} y^{\frac{1-\sigma}{\sigma}} + \tau \right]^{-1}$$

The effect of changes in y on n is ambigious. Greater income will on the one hand make it more attractive to substitute family size for greater labor supply (the substitution effect); on the other hand: greater income increases the desire to consume more of both c and n (income effect)

C2. In its present form the model cannot help us. The preference parameters are constant. Evidence reviewed in the course suggest that during the 16th century (and earlier) greater income led to larger families. This suggests the income effect dominated historically, which pins down a requirement for σ. Once that choice has been made the effect of y is unambiguous. But if s can change during development it is possible that the substitution effect eventually could dominates leading to

declining fertility when income rises. However, this explanation is not empirically sound when it comes to explaining the fertility transition (see Galor, O., 2011. The demographic transition: causes and consequences. NBER working Paper 17057).