Written Exam for the M.Sc. in Economics winter 2015-16
Advanced Development Economics – Macro aspects
Master's Course
December 21st , 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.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students' self-service system.

The exam consists of 5 pages in total.

PART I: ANALYTICAL QUESTIONS (40%)

QUESTION A. Dynamics in a Malthusian epoch.

Consider an overlapping-generations economy in the pre-modern era, where time is discrete and the time horizon is infinite ($t = 0, 1, ..., \infty$).

Individuals are identical and live for two periods. In the first period they are children and live of the resources they receive from their parents. In the second period they are adults, use all their time to work, and decide how to divide it into consumption and the costs of raising their own children.

The typical adult individual has a utility function u_t of the form

$$u_t = n_t^\gamma c_t^{1-\gamma}$$

where $\gamma \in (0,1)$, and c_t and n_t are the levels of consumption and the number of children per adult in period t, respectively. The individual's budget constraint is given by

$$\rho n_t + c_t = y_t$$

where ρ is the cost of raising a child, and y_t is the average level of income per capita in the economy.

Each period, a single homogeneous good is produced using land, labor, and the existing technology in the economy. The supply of land is exogenous and fixed at a level X. The supply of labor is the outcome of individuals' fertility decisions in the preceding period, and therefore each period

$$L_{t+1} = n_t L_t$$

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where L_{t+1} and L_t are total levels of population or, equivalently, total labor supply in periods $t+1$ and t, respectively; and n_t comes from the solution to the individual's optimization problem. Total output in period t (Y_t) is thus given by

$$Y_t = (A_t X)^\alpha L_t^{1-\alpha}$$

where $\alpha \in (0,1)$; and A_t is the level of technological sophistication in period t, which we assume to be determined by (*i*) an exogenous and time-invariant component A, and (*ii*) total total population size, in the following way:

$$A_t = A L_t^\beta$$

where $\beta \in (0,1)$ and $A > 0$.

A.1. Total output equals total income in this economy, and therefore the average level of income per capita can be defined as $y_t \equiv \frac{Y_t}{L_t}$. Compute the level of y_t for this economy.

A.2. Solve the individual's utility maximization problem and show that the optimal levels of c_t and n_t are given by

$$c_t = (1 - \gamma) y_t$$

and

$$n_t = \left(\frac{\gamma}{\rho}\right) y_t$$

Comment on these results, in particular on the effect of y_t on n_t.

A.3. Assume $L_0 > 0$ is the initial level of population. Derive the law of motion for the total population size, and construct a phase diagram to analyze its evolution. Based on this, show that population size has a unique and stable steady-state level, $\bar{L}$, and determine this level. (*Hint*: check if the Inada conditions are fulfilled.)

A.4. Determine the steady-state level for poulation density, $\bar{P}$, defined as $\frac{\bar{L}}{X}$. Assuming the economy is in the steady-state, what does the model predict for $\bar{P}$ when the economy experiences an increase in the exogenous component of the level of technological sophistication, A? Does the empirical evidence support this prediction, when we look at data across countries during the pre-modern period?

A.5. Combine the definitions of income per capita, $y_{t+1} = \frac{Y_{t+1}}{L_{t+1}}$, and total population, $L_{t+1} = n_t L_t$, to compute the law of motion of income per capita, and construct a phase diagram to analyze its evolution. Show that, given $y_0 > 0$, income per capita has a unique and stable steady-state level, $\bar{y}$, and determine this level.

A.6. What does the model predict for the levels of income per capita in the short-run (y_t) and the long-run ($\bar{y}$) when a positive exogenous technological shock (that is, an increase in A) hits the economy? Does the empirical literature support these predictions?

PART II: VERBAL QUESTIONS (60%)

QUESTION B. Culture and economic development.

In a recent paper, Yurij Gorodnichenko and Gerard and Roland explore the relationship between the individualism dimension of culture, and levels of income per capita across countries. They find a positive relationship between the current levels of these two variables. The graph below shows the raw correlation between them:
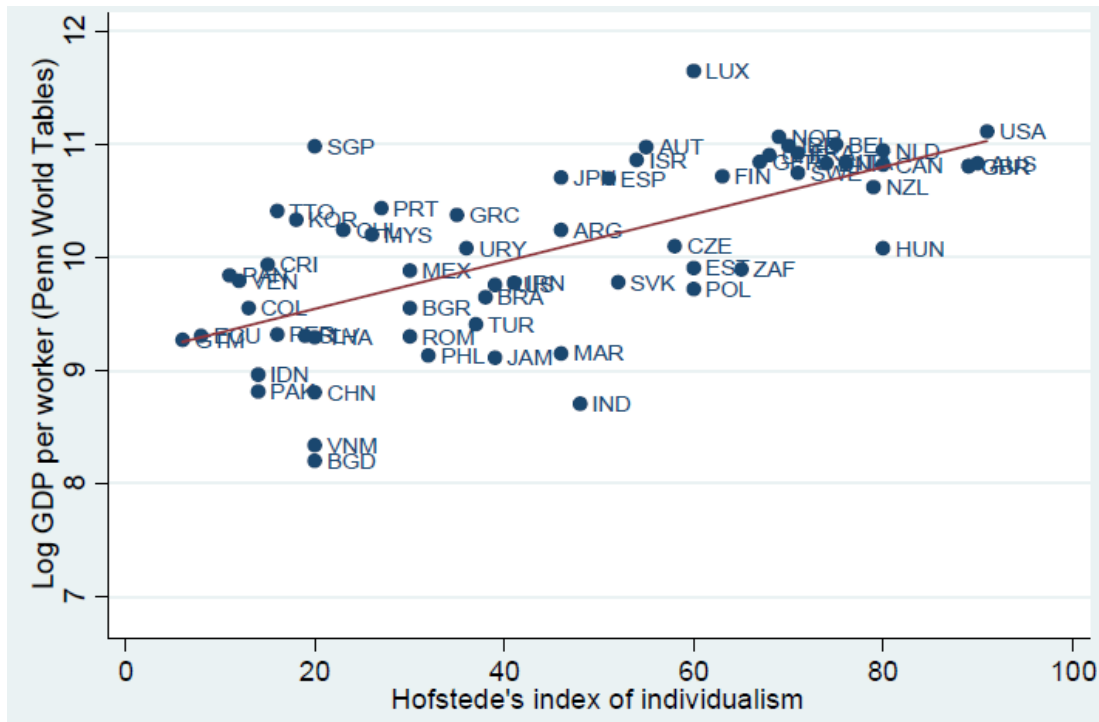
Source: Gorodnichenko, Yuriy and Gerard Roland (2015), Culture, Institutions and the Wealth of Nations. Forthcoming in *Review of Economics and Statistics*.

B.1. In general: Why should countries with a realtively more individualistic culture tend to be richer than the others, in a long run perspective?

B.2. The relationship between the index of individualism and the level of GDP per capita displayed in the graph is likely to be endogenous. In general: What type of econometric problems create concerns of endogeneity when one is running an econometric regression between a given outcome variable (y) and an explanatory variable (x)? What are possible ways to address and reduce those concerns? Illustrate your arguments with examples related to the relationship between indices of individualism and levels of economic development across countries.

QUESTION C. Institutions and economic performance.

After the end of World War II, Korea decided to divide its territory in two countries: the northern part became the Democratic People's Republic of Korea, and the south, the Republic of Korea. At the moment of division, both parts were fairly similar in terms of geographic, cultural, economic, social, and institutional characteristics. But today, almost 70 years after the peninsula's division, the economy in the South is roughly 40 times bigger than that in the North, and a number of indicators reveal other remarkable differences in demographic, socio-economic, industrial and development aspects (see for example the graphs below).
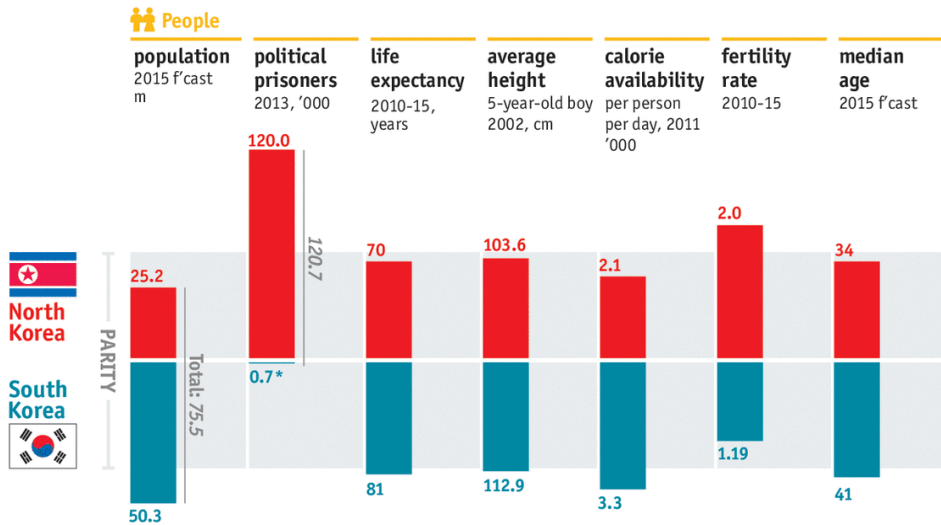
In terms of institutional setup, North Korea adopted a very centralized command of the economy, with little role for private property, under the dicatorship of Kim Il Sung. South Korea, although not democratic in its early phases, has instead relied on private ownership of the means of production, has provided legal protection for a range of producers, and has facilitated, or even suported, private investments; and has had eighteen presidential elections between 1948 and 2013 – in the last one Ms. Park Geunhye was elected president, which made her the country's first woman to assume that post.

C.1. In general: What are *institutions*, why do we consider them as a *fundamental* cause of differences in economic performance, and what distinguishes them from other *fundamental* causes of differences in economic performance?
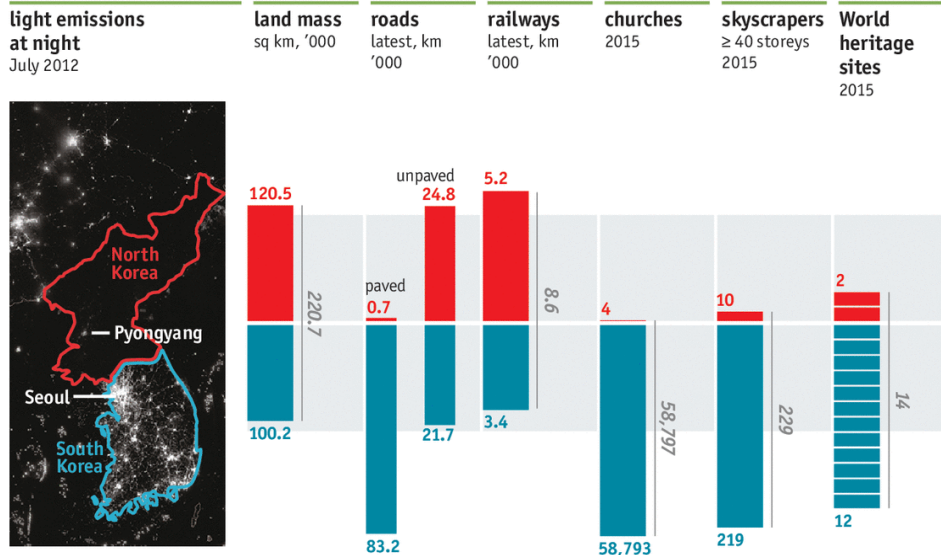
C.2. Based on Acemoglu, Johnson and Robinson' definitions of different types of institutions: What type of institutions does North Korea seem to have, compared to South Korea? In general: What are the consequences of having different types of institutions on economic development?

North-South divides

The two Koreas' share of:

👥 People

	population 2015 f'cast m	political prisoners 2013, '000	life expectancy 2010-15, years	average height 5-year-old boy 2002, cm	calorie availability per person per day, 2011 '000	fertility rate 2010-15	median age 2015 f'cast
North Korea	25.2	120.0	70	103.6	2.1	2.0	34
		0.7*				1.19	
South Korea	50.3		81	112.9	3.3		41

North Korea / South Korea — PARITY

Total: 75.5 | 120.7

🏢 Infrastructure & environment

	light emissions at night July 2012	land mass sq km, '000	roads latest, km '000	railways latest, km '000	churches 2015	skyscrapers ≥ 40 storeys 2015	World heritage sites 2015
North		120.5	unpaved 24.8 / paved 0.7	5.2	4	10	2
South		100.2	83.2 / 21.7	3.4	58,793	219	12

220.7 | 8.6 | 58,797 | 229 | 14

North Korea — Pyongyang — Seoul — South Korea
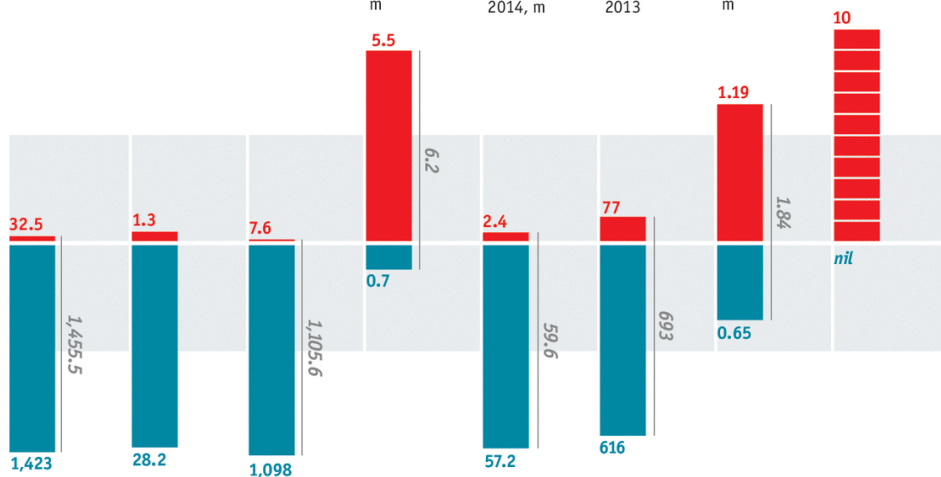
💲 Economy   ·   🏭 Industry & technology   ·   🚜 Military

	GNI 2014, $bn	GNI per person 2014, $'000	total trade Goods, 2014 $bn	iron-ore production 2013, tonnes m	mobile phones subscriptions 2014, m	CO$_2$ emissions m tonnes 2013	armed forces 2015 f'cast m	nuclear warheads 2015, estimate
North	32.5	1.3	7.6	5.5	2.4	77	1.19	10
South	1,423	28.2	1,098	0.7	57.2	616	0.65	*nil*

1,455.5 | 1,105.6 | 6.2 | 59.6 | 693 | 1.84

*Includes conscientious objectors and those convicted of praising the North

Source: Korea opportunities, *The Economist*, October 9th, 2015.