Written exam at the Department of Economics, winter 2019-2020
Advanced Development Economics – Macro aspects
Master's Course
December 14th, 2019
Individual 12-hour take-home exam, 10:00-22:00.

Answer guidelines

As a guideline, each question (A, B, and C) has a total weight of about $\frac{1}{3}$, although the final grade is determined by an overall assessment of all the answers provided.

ANSWER A. Gender inequality in the costs of raising children.

Readings:

- Galor, Oded (2012), The demographic transition: causes and consequences, *Cliometrica* 6: 1-28.

- Kleven, Henrik, Camille Landais, Johanna Posch, Andreas Steinhauer, and Josef Zweimüller (2019). "Child Penalties across Countries: Evidence and Explanations." *AEA Papers and Proceedings* 109: 122-26.

- Kleven, Henrik, Camille Landais, and Jakob Egholt Søgaard (2019). "Children and Gender Inequality: Evidence from Denmark." *American Economic Journal: Applied Economics* 11 (4): 181-209.

- Alesina, Alberto, Paula Giuliano and Nathan Nunn (2013). On the Origins of Gender Roles: Women and the Plough. *Quarterly Journal of Economics* 128(2): 469-530.

A.1. Under the described set of assumptions, the budget constraint can be written as

$$c + \tau w^M n \le y$$

which shows that the total household income $y = w^F + w^M$, has to be enough to pay for the household's total value of consumption expenses c, and the costs of raising n children, which amount to $\tau w^M n$.

A.2. Assuming the budget constraint is binding and rewriting it as

$$c = w^F + w^M - \tau w^M n,$$

and inserting it into the utility function

$$u(n,c) = \gamma \ln(n) + (1 - \gamma) \ln(c),$$

optimal fertility is given by

$$n_I^* = \arg\max_n \left\{ \gamma \ln(n) + (1 - \gamma) \ln(w^F + w^M - \tau w^M n) \right\}.$$

To find n_I^* compute the first order condition (FOC) of the optimization problem, by setting the first derivative of the objective function with respect to n equal to zero:

$$\frac{\gamma}{n} - \frac{(1-\gamma)\tau w^M}{w^F + w^M - \tau w^M n} = 0$$

$$\frac{\gamma}{n} = \frac{(1-\gamma)\tau w^M}{w^F + w^M - \tau w^M n}$$

$$\frac{w^F + w^M - \tau w^M n}{\tau w^M n} = \frac{1-\gamma}{\gamma}$$

$$\frac{w^F + w^M}{\tau w^M n} = \frac{1}{\gamma}$$

which gives

$$n_I^* = \frac{\gamma}{\tau} \left(\frac{w^F + w^M}{w^M} \right). \tag{1}$$

The optimal number of children (n_I^*) for each household (1) falls with the child penalty τ associated with the costs of rearing children, (2) increases with the household's relative preferences for children (γ), and (3) increases with w^F (the wage of the income of the parent who doesn't bear the child-rearing costs, $i = F$).

The effect of the wage of parent $i = M$ (or the parent that incurs all the costs of raising children) is a combination two effects. First, a positive income effect: if w^M is higher, the household can increase the levels of both consumption, c, and fertility, n. Second, a negative substitution effect: a higher w^M increases the relative costs of rearing children, and therefore gives incentives to the household to reduce fertility. In net terms the substitution effect dominates, and therefore an increase in w^M is unambiguously associated with a lower level of optimal fertility n_I^*. This can also be seen by rewriting (1) as

$$n_I^* = \frac{\gamma}{\tau} \left(\frac{w^F}{w^M} + 1 \right).$$

A.3. In a more egalitarian economy, the budget restriction can be rewritten as

$$c = w^F + w^M - \tau(w^M + w^F)n$$

which reflects that the child penalty τ affects now both parents' earnings in the labor market.

A.4. With the new budget constraint (**A.3**), the optimal number of children (n_E^*) is given by

$$n_E^* = \arg\max_n \left\{ \gamma \ln(n) + (1-\gamma) \ln(w^F + w^M - \tau[w^F + w^M]n) \right\}.$$

To find n_E^* compute the FOC of the new optimization problem:

$$\frac{\gamma}{n} - \frac{(1-\gamma)\tau(w^F + w^M)}{w^F + w^M - \tau w^M n} = 0$$

$$\frac{\gamma}{n} = \frac{(1-\gamma)\tau(w^F + w^M)}{w^F + w^M - \tau w^M n}$$

$$\frac{w^F + w^M - \tau(w^F + w^M)}{\tau(w^F + w^M)} = \frac{1-\gamma}{\gamma}$$

$$\frac{1}{\tau n} = \frac{1}{\gamma}$$

which gives

$$n_E^* = \frac{\gamma}{\tau}. \tag{2}$$

A.5. Comparing (1) and (2) we have that

$$n_I^* = \frac{\gamma}{\tau}\left(\frac{w^F + w^M}{w^M}\right) > \frac{\gamma}{\tau} = n_E^*.$$

If the child penalty τ and the fixed parameter γ stay constant, optimal fertility in the more egalitarian case (where both parents are affected by the child penalty) is lower than in the more inegalitarian case (where only one of the parents is affected by the child penalty τ). The reason is that the more egalitarian case is also more expensive for each household in terms of raising children: $(w^F + w^M)\tau n > w^M \tau n$. If the price of consumption stays fixed, the relative higher costs of rising children in the egalitarian case motivate households' to reduce the optimal number of children to have.

A.6. A comparison of columns (5) and (6) in this table does provide with a correlation that is in line with the theoretical correlation between child penalties and fertility predicted in **A.5**. More specifically, column (5) in the table shows larger levels of long-run child penalties (measured as the average reduction in mothers' earnings compared to fathers' from $t = 5$ to $t = 10$ years after the first child was born) in the German-speaking countries (Germany and Austria) than in the Scandinavian countries (Denmark and Sweden).

Consistent with the theoretical correlation between child penalties and optimal fertility in **A.5**, column (6) shows lower average numbers of offspring in the long-run (at $t = 10$) in Germany and Austria, than in Denmark and Sweden.

A.7. The graph shows at least three interesting differences in the child penalties between Denmark and Sweden:

1. Both the short- and the long-term differences in child penalties between women and men are larger in Sweden than in Denmark.

2. Despite the fact that the long-run child penalties for women compared to men are in a similar order of a magnitude in both countries, the child penalty for women compared to men in Sweden is about twice as large than in Denmark in the short-run ($t < 5$).

3. Fathers in Sweden are affected by a temporary reduction in labor market earnings in the short-run, as compared to men in Denmark – who are not affected by child penalties in labor market earnings practically at anytime before or after their first child is born.

A.8. Differences in child penalties for women and men can be attributed to a large range of factors, but two of them that are highlighted in the literature are (*a*) cultural gender norms (for example as discussed and shown in Alesina, Giuliano, and Nunn (2013), and Kleven et al. (2019 *AEJ: Applied)*, and (*b*) government policies.

Denmark and Sweden have similar cultural gender values and attitudes, and, while important by themselves, these factors are not likely to be the main drivers of the differences in child penalties we observe between these two countries. To see this, consider Figure 4 in Kleven *et al.* (2019 *AERPP*), which shows a cross-country correlation between long-run child penalties and gender norms, and small differences in terms of these norms between Denmark and Sweden. (In more detail: Figure 4 in Kleven *et al.* (2019 *AERPP*) shows that Denmark and Sweden have the lowest level of survey respondents agreeing with the idea that women with children under school age or starting school should stay at home, or not work outside the home full-time or part-time; compared to the UK and the US, or Austria and Germany. It also shows a difference of about 5% in the level of survey responses to that idea Denmark and Sweden; compared to differences of about 10% between the UK and the US, or Austria and Germany.)

Some of the differences in child penalties between Denmark and Sweden are probably more strongly related to different taxation schemes and public policies about family and children – for example the length of paid parental leave, the extent to which parts of the paid parental leave are reserved only for women or for men, childcare provisions, etc. The OECD data on the number of weeks that parents are entitled in different countries shows important differences between these two countries.

For instance, they show that during the last two decades Denmark has drastically reduced the number of weeks reserved for fathers from 17 in 2000 to 2 in 2018, while Sweden has increased them from 6 to 14. This can explain the short-term reduction in earnings for Swedish fathers compared to Danish fathers. That would be the case, for example, if (*a*) the legislation changes have motivated longer paternity leave periods for Swedish fathers during the first year after their first child was born, and (*b*) the Danish fathers do not tend to take longer leaves than the 2 weeks that are reserved for them. (*NB:* while the importance of cultural differences between Denmark and Sweden do not look large in a cross-country comparison, we can imagine here why they are still important. For example, part of the explanation for the short paternity leave in

Denmark could be based in cultural differences between Danish and Swedish fathers).

The OECD data table also shows differences in trends of parental leave available for mothers. Denmark increased maternity leave from 28 weeks in 1990 to 50 in 2018, while Sweden reduced them from 63 to 56. These trends can also be related to larger child penalties for Swedish mothers if they have been associated with actual longer periods of maternity leave taken during the first year after their first children was born. The fact that maternity leave available for women both in Denmark and Sweden is similar (50 and 56 weeks), could explain the relatively similar level of long-run child penalty. That could be the case if mothers in both countries reduce the number of hours worked after the first year in which their first child is born, or shift to jobs in sectors with relatively lower salaries. (Evidence for Denmark supports this last point. Kleven *et al.* (2019 *AEJ: Applied*) find robust differences in terms of the effects of childbirth on the careers of women relative to men: the probabilities of becoming a manager, or taking a job in the public sector, or shifting to a job where the manager is a female with children, are all higher over time for women than for men in Denmark.)

ANSWER B. Long-run development.

Readings:

- Acemoglu, Daron (2010). Chapter 4: Fundamental Determinants of Differences in Economic Performance, in "Introduction to Modern Economic Growth," Princeton University Press.

- Alsan, Marcella (2015). "The Effect of the TseTse Fly on African Development." *American Economic Review* 105(1): 382-410.

- Andersen, Thomas B., Carl-Johan Dalgaard, and Pablo Selaya (2016), "Climate and the Emergence of Global Income Differences." *Review of Economic Studies* 83(4): 1334-1363.

- Gershman, Boris (2017), *Long-Run Development and the New Cultural Economics*, in "Demographic Change and Long-Run Development", Matteo Cervelatti and Uwe Sunde (eds.) Cambridge, MA: MIT Press, 2017, Chapter 9, pp. 221–261.

- Acemoglu, Daron and James A. Robinson (2010), "The Role of Institutions in Growth and Development." *Review of Economics and Institutions* 1(2): 1-33.

- Acemoglu, Daron, Jacob Moscona, and James A. Robinson (2016). "State Capacity and American Technology: Evidence from the Nineteenth Century." *American Economic Review: Papers and Proceedings* 106(5): 61-67.

- Alesina, Alberto, Paula Giuliano and Nathan Nunn (2013). "On the Origins of Gender Roles: Women and the Plough." *Quarterly Journal of Economics* 128(2): 469-530.

- Sánchez de la Sierra, Raúl (2019). "On the Origin of States: Stationary Bandits and Taxation in Eastern CongoPreview the document." Forthcoming in *Journal of Political Economy*.

B.1. The most *proximate* explanation of cross-country current differences in real GDP per capita combines (*a*) differences in the rate of technological progress, and (*b*) differences in the amount of physical and human capital per worker. That is, more developed countries (or countries with higher levels of real GDP per capita and average productivity) have larger amounts of physical capital per capita, better educated workforces, and the capacity to sustain more constant rates of innovation and technological change.

This type of proximate explanations have been extensively studied in the research literature in comparative development and long-run economic growth. However, they only provide with a partial answer to the main question, because they do not explain why more developed countries have been able to accumulate larger amounts of physical and human capital per capita, or to sustain more constant rates of innovation and technological progress.

B.2. To answer the deeper questions that follow from **B.1**, one can rely on Acemoglu's (2010) clusters of *fundamental* causes of differences in comparative economic development: (*a*) geography and climate, (*b*) institutions, or (*c*) culture.

The first set of fundamental causes (*geography and climate*) can be observed in the maps shown in question **B**. For example, one can see there that countries that are far from equator (or that have most of their territories in temperate zones, such as the UK or Australia), have higher levels of GDP per capita than countries that are closer to the equator (or that have a larger proportion of their territories in tropical zones, such as India and Bolivia). This observation can lead to different theories about the effects of the large variety of geographic and climatic features correlated with distance to the equator (for instance differences in temperature and precipitation patterns, topography, soil quality for agriculture, access to the ocean and navigable rivers, access to natural resources, disease environments, etc.).

Two salient types of explanations within the cluster of geography and climate focus on aspects related to (*i*) differences in agricultural productivity, and (*ii*) the burden of infectious diseases in tropical zones. However, these two type of explanations cannot account satisfactorily for important features of the development process. For example, they cannot account for the fact that countries that historically achieved a relatively high level of agricultural productivity, also failed to industrialize and embark on a path of sustained growth and technological progress. Explanations that emphasize the importance of the burden of tropically-clustered diseases are more plausible. But then again they are not entirely useful, as they tend to be confounded with the consequences of economic development, rather than with causes of it. For example, many developed countries of today managed to eradicate malaria in the past, because the process of economic development enabled them to do so (Acemoglu 2010).

As another cluster of fundamental causes, one can cite the quality of *institutions*. Institutions basically relate to the way in which countries or societies are organized. They can be defined as "the rules of the game in a society or, more formally, the humanly devised constraints that shape human interaction" (following a definition by Douglass North, cited in Acemoglu 2010).

Among the different types of institutions that affect comparative development, we can highlight the role of economic institutions (or those that affect economic incentives, such as the functioning of contracting systems, the presence of markets, the structure of property rights, etc.). Given that economic institutions are collective choices and the outcome of political bargaining, they critically depend on the nature of the political institutions that allocate different types of political power in society.

Differences in economic and political institutions have large explanatory power for comparative development. They can explain, for example, the "reversal of fortune" in former colonies 500 years ago – which followed from the different types of European colonization strategies applied in the colonies. That is, territories in the richest empires (such as the Mughal Empire in Asia or the Inca Empire in South America), turned into some of the less developed areas of the world today. This happened in important part because the richest empires of the past were exploited by the colonizers with extractive

types of institutions. (Applying the same logic, some of the poorest territories in the former colonies – such as areas in the current US or New Zealand – turned into some of the most developed areas of the world today, by building up on colonization strategies based on more inclusive types of institutions.)

Given that the way in which countries and societies organize themselves matters to understand differences in long-run development, we can include *culture* as the last cluster of fundamental causes of differences in comparative development.

Culture matters because it is the collection of people's preferences, values, beliefs, and social norms, which directly affects attitudes, incentives and actions of individuals and societies. For instance, differences in trust, religion, work ethic, risk preferences, and social capital; as well as differences in individual and social values of individualism and collectivism, have been proposed and studied as fundamental determinants of differences in long-term economic performance (Gershman, 2017). As a specific example, Gorodnichenko and Roland (2017) found that countries with cultures that were relatively more individualistic than collectivistic tend to have higher rates of innovation, which is a main driver of long-run differences in comparative development.

B.3. The interaction between the different types of fundamental causes can certainly help to explain differences in comparative development across sub-national regions. We can illustrate that with two main types of examples from the course's literature.

- Differences in geography and climate within countries can help to understand better how other fundamentals work.

  - Alsan (2015) finds that climatic conditions that determine the subsistence of the tsetse fly in Africa matter for long-run development, because they shaped the way in which population density spread across African regions, and this affected how political centralization (a key element to the formation of states and centralized polities) expanded throughout the continent.

  - Andersen, Dalgaard, and Selaya (2016) provide reduced-form evidence that the level of UV radiation (probably the strongest correlate of distance to the equator) helps to understand the emergence of global income differences, due to its impact on the returns to human capital investments, and the timing of the demographic transition that helps different sub-national regions to transit from a regime of pre-industrial economic stagnation, into one of sustained growth.

  - Sánchez de la Sierra (2019) studies how essential forms of the state have appearead in different parts within Eastern Congo, by looking at how the demand for different minerals, provided incentives for armed groups to act as "stationary bandits" in different ways, and in particular to establish different tax and protection schemes in different locations.

- Culture and institutions affect individual and social behaviors; and they can also condition the way in which each other operates. Studying the way in which culture and institutions coevolve helps to understand the dynamics of economic and political outcomes better, both at national and subnational levels.

- Fisman and Miguel (2007) test whether people from countries where social norms are weak against corruption, tend to get parking tickets more often than people from countries with stronger norms against corruption, in situations with varying risks of legal enforcement.

- Lowes *et al.* (2019) found that an improving formal institutions in the Kuba Kingdom in Central Africa is associated with less effort from parents to transmit to their children socially desirable behaviors. Their research therefore suggests that efficient institutions can act as a substitute of socially desirable cultural values.

ANSWER C. Migration, cultural change, political change, and economic development.

Readings:

- Knudsen, Anne Sophie Beck (2019). "Those Who Stayed: Individualism, Self-Selection and Cultural Change During the Age of Mass Migration." Manuscript Lund University. Available at https://annesofiebeckknudsen.com/research/

- Gorodnichenko, Yuriy, and Gerard Roland (2017). Culture, Institutions, and the Wealth of Nations. *Review of Economics and Statistics* 99(3), 402-416.

- Lowes, Sara, Nathan Nunn, James A. Robinson, and Jonathan L. Weigel (2017). "The Evolution of Culture and Institutions: Evidence from the Kuba Kingdom" *Econometrica* 85(4): 1065-1091.

- Aesina, Alberto, and Paola Giuliano (2015). "Culture and Institutions." *Journal of Economic Literature* 53(4), 898-944.

- Acemoglu, Daron and James A. Robinson (2010), "The Role of Institutions in Growth and Development." *Review of Economics and Institutions* 1(2): 1-33.

C.1. Knudsen (2019) studies cultural causes and effects of migration, building on the idea that (*a*) voluntary migration is a process in which some people choose to leave and some others choose to stay, and that (*b*) this has consequences in the original home location of migrants.

Her results are based on evidence for the voluntary settlement hypothesis proposed by researchers in psychology, or the idea that voluntary migrant individuals do not constitute a random selection of individuals from the origin populations, because the more individualistic type of individuals in the origin population tend to self-select for migration.

The reason (as studied by social psychologists, sociologists, and other social scientists) is that the more individualistic types tend to emphasize the importance of independence, personal accomplishments, individual innovations, artistic achievements, etc.; as compared to the collectivist types, who tend to derive identity from social relations, discourage individuals from standing out, and therefore put a relatively stronger emphasis on conformity rather than on distinction (see for example Gorodnichenko and Roland, 2017).

If individualist types self-select into migration, and migration takes place in large numbers, then th process of migration has the capacity to affect the cultural composition of the origin populations. In particular, large migration has the capacity to increase the relative prevalence of collectivist values in the areas of origin. Knudsen (2019) provides convincing evidence of migration-induced composition effects and cultural change during the Age of Mass Migration, using the commonness of first names among

the origin and the migrant Scandinavian populations, as a marker of historical individualist values.

The graph in question **C** illustrates that, between 1867 and 1900 (by the end of the period of Swedish mass migration), people that had remained in low-migration areas tended to support left-wing parties, support labor movements – and in particular become member of trade unions, *less* than people who had remained in high-migration areas. If support for labor movements, membership in trade unions, and left-wing socialist policies reflect an area's preference for collectivist public policies, the graph suggests a clear correlation between high-migration and an accentuated presence of collectivist values.

Such a correlation definitely resonates with the voluntary settlement hypothesis, the composition effects of mass migration, and the process of migration-induced cultural change proposed by Knudsen (2019).

C.2. The political effects of large migration flows can be interpreted as an effect on the institutional make-up of a country, which can have long term repercussions for the country's capacity to sustain prosperity and distribute it more equally in the long-term.

For example, based on the model by Acemoglu and Robinson (2010), support for labor movements and an increase in the membership of workers in trade unions, can also increase the bargaining power of workers and improve the economy's income distribution. (These effects can be lasting, if changes in the income distribution also affect the workers' de facto political power in the country.)

The support for labor movements and an increased union membership can also affect the economy by making salaries higher. If higher salaries and unionization expand in the economy before (or at early stages of) industrialization – as it was the case of Sweden by the end of the nineteenth and the beginning of the twentieth centuries – then those changes also have the capacity to affect the structure of the economy, or to have important demographic effects. For instance, higher salaries may motivate entrepreneurs to invest more in innovation, to compensate for the higher costs of labor, and this innovations may give rise to an acceleration in the rate of technological progress, that could start reinforcing circles of faster industrialization and structural change. As another mechanism, higher salaries (and faster rates of technological progress) at early stages of industrialization, may motivate, or even require women to join the labor force. This can reduce fertility rates – which can have developmental effects, as discussed for example in Galor (2012).

Support for left-wing policies at early stages of development may also have effected long-term growth and distribution by (re)shaping the institutions that allocate de jure political power. For example, if a better functioning democracy requires a more effective capacity to solve collective action problems, then a larger representation of collectivist values in politics may contribute to making institutions more inclusive – which could help to make growth and a more equal income distribution more sustainable. Through a different mechanism, left-wing policies may have materialized in faster socialization of ideas to create or expand the policies of a welfare state – which then again

could have contributed to expand inclusion, or to maintain the resources and institutions necessary to promote economic growth and a more equal income distribution in the long-run.

The political effects of large migration in the origin populations can also be analyzed as a case of coevolution of institutions and culture. (Alesina and Giuliano, 2015, provide a comprehensive overview of the the historical, theoretical, and empirical relationship between culture and institutions in the context of comparative development). Lowes *et al.* (2019), for example, document a case where better institutions substituted to some extent some socially desirable dimensions of culture – more precisely, Lowes *et al.* (2019) found that an increase in the effectiveness of formal institutions in the Kuba Kingdom in Central Africa tended to reduce parents' efforts to inculcate their children socially desirable behaviors.

In the case of the political changes induced by large migration analized in this question, we can theorize something different than Lowes *et al.* (2019), and also challenge the idea to visualize cultural values in diametrically opposed dimensions (as in the comparison of individualist and collectivist cultural values). That is, we can theorize that the larger support for labor movements, and the larger representation of collectivist values in politics – which arguably made political and economic institutions more inclusive – also instigated a new type of dynamics towards a more inclusive *cultural equilibrium*, where balance between both individualist and collectivist values was able to contribute to maintaining institutional efficiency. Given the persistent features of institutions and the strong inter-generational mechanisms that help culture to be transmitted over time, it is also possible to theorize that the dynamics of the coevolution of political and cultural changes associated with large migration, also promoted convergence towards the more inclusive cultural equilibrium.