

Abbreviations used in the model solution:

- **Weil:** David N. Weil, 2013. "Economic Growth", Pearson International Edition, 3rd Edition
- **PRLB:** Dwight H. Perkins, Steven Radelet, David L. Lindauer and Steven A. Block, 2013. "Economics of Development", 7th edition, W.W. Norton & Company.
- **Ray:** Debraj Ray, 1998, "Development Economics", Princeton University Press

Problem A

Please provide short answers to the following questions and statements:

1. Please explain why intra-household inequality may be a source of bias in estimates of inequality across countries and state if the bias is positive or negative.

This question draws on Ravallion (2018).

In most living standards surveys used to calculate inequality measures in developing countries, the survey unit is the household. When constructing inequality measures, all members in the household are allocated an equal share of household income (or expenditure). The implicit assumption is then that there is perfect equality within the household. This is likely to be wrong, and if there is inequality within households, standard estimates of inequality may underestimate true inequality.

2. Please briefly describe both the private and the social benefits and costs of schooling.

This question draws on PRLB ch. 8.

The private benefits and costs to schooling are those that accrue directly to the person who attends school. The benefits come in the form of higher earnings after schooling is over. The costs are made up of foregone earnings while in school as well as any direct costs related to attending school such as books, school uniforms or school fees.

The social benefits and costs are those that do not accrue to the person who attends school, but rather to society at large. The main cost element is government expenditures on schooling. The main benefit are potential externalities on the productivity of other people by working together with a person with formal training.

3. Please explain the identification problem in theoretical poverty analyses and explain how the problem is "solved" in practice in many poverty measurements in developing countries, with respect to differences in household sizes.

This question draws on Ravallion (1998).

When setting a poverty line, one is trying to figure out the monetary value required to reach a certain level of welfare. However, the monetary value required will depend on characteristics of individual households, or of individual people. This is the identification problem.

One aspect of this problem is that household compositions differ. Income (or expenditure) is often only recorded at the household level in surveys. However, children typically consume less than adults do. Further, there are typically economies of scale in household consumption. This means that it may not be reasonable to assume that individual welfare is simply given by household income divided by household size.

Some countries use equivalence scales to account for this, where the number of adults and children are transformed to give a number of “effective adults” by which household consumption can be divided

4. Please explain what the “health multiplier” is.

This question draws on Weil ch. 6.

The general population health level is increasing with GDP per capita and, at the same time, income per capita is increasing in the health level. If a country experiences an exogenous increase in income for a given level of health, equilibrium income will increase by more than the exogenous increase due to an improvement of health, which in turn, leads to a further rise in income. This further rise in income is what is meant by the “health” multiplier.

5. Suppose a government in a developing country wishes to provide free insecticide-treated bed nets to reduce malaria infections. Please briefly describe potential advantages and disadvantages of such a programme.

This question draws on Cohen and Dupas (2010).

Free provision of insecticide-treated bed nets (ITBs) can be beneficial if uptake at the market price is for some reason below the socially optimal level. This can be the case due to externalities, i.e., personal use of ITBs reduces the infection rate for someone else in the community. Another possibility is that some households would like to buy an ITB as benefits are higher than the costs, but are credit constrained and cannot afford it.

Potential disadvantages include selection effects (some people will choose to take the free nets, even though their benefits are small); lower use of nets (because the “sunk cost fallacy” which comes from having paid for the net is no longer in effect); and the lack of a positive price as a signal of quality, which may in turn reduce use.

6. Please explain what is meant by the endogeneity of aid and what this implies for a simple aid-growth correlation analysis.

This question draws on PRLB ch. 14 and Arndt et al. (2010).

It is not random which countries receive aid. In many cases, aid is given as a way to assist countries that are poor or are experiencing low growth rates for some reason, e.g., institutional issues, war or strife, low levels of human and physical capital.

To the extent that aid is given to those countries that have relatively low growth rates, the simple correlation between aid and growth may be negative. This, however, should not be interpreted as evidence that aid does not increase growth, as this correlation is not causal but rather a result of the way aid is distributed.

7. Please state and briefly explain two channels through which climate change may have adverse impacts on poverty rates.

This question draws on Hallegatte & Rozenberg (2017).

Hallegatte & Rozenberg (2017) discuss five channels. The student should state and briefly explain at least two of these five channels:

- **Agricultural productivity and prices:** Many poor people are farmers, and a reduction in agricultural productivity or an increase in the input price may increase the number of poor people.
- **Food prices:** Poor people are also consumers of food items, and reduced agricultural productivity can lead to increased food prices, which leads to lower real wages, thus increasing poverty.
- **Natural disasters:** Climate change can increase the frequency and severity of natural disasters. The impact on the poverty rate depends on the extent to which those who are near the poverty line live in disaster-prone areas
- **Labour productivity:** Increased temperatures reduce labour productivity. This reduces real wages, and can in this way increase the poverty rate.
- **Health impacts:** Climate change can affect health through several channels including malarial incidence, stunting and diarrheal disease. These impacts lead to increased treatment costs as well as a drop in labor supply.

Problem B Savings

1. Please discuss the role of domestic savings in a closed developing economy according to the Solow model. Further, please discuss why the savings rate tends to increase as countries develop.

This answer draws on PRLB ch. 10, p. 374 ff.

In a closed economy, domestic savings is the only source of investments. In the Solow model, an increase in domestic savings results in an increase in the steady-state level of the capital stock as well as the steady-state level of income per worker.

Domestic savings in developing countries have two major components, namely private savings (the largest) and government savings. In developing countries, corporate savings are often small, so we ignore these. To understand why savings increase as countries develop, we need to understand why private savings and government savings increase.

Private savings: The propensity to save for private households can be understood using a life-cycle model. In this model, households are net savers when they are working. The decision of how much to save is made based on expected lifetime income. When households retire, they no longer earn income and spend their savings. This model has two implications for savings as countries develop. First, when

developing countries go through the fertility transition as they develop, birth rates go down. This increases the share of the population who are net savers, which increases the savings rate. Second, growth will itself increase the savings rate, since this means that those who are currently saving (the young) expect higher lifetime incomes than those who are currently dissaving (the old).

Government savings: Government revenue tends to rise faster than government consumption during the development process, which increases the savings rate. However, there is no well-developed theory to explain either revenue or government consumption.

2. Consider an economy with two goods, namely capital (K) and output (Y), and assume constant returns to scale production, perfect competition and no depreciation of capital. Please derive a measure of the returns to capital used to produce output that can be measured using available macroeconomic data. Please give a mathematical description as well as the intuition for how this differs from a measure of returns where there is only one good in the economy. (Hint: the marginal return to capital used in output production is $(P_Y * MPK) / p_K$, where p_Y and p_K are prices of output and capital, and MPK is the marginal product of capital for producing Y. Total returns to capital can be written as $p_Y * MPK * K$).

This answer draws on Caselli and Feyrer (2007).

Given the assumptions, the income share that accrues to capital can be written as

$$\alpha = \frac{p_Y * MPK * K}{p_Y * Y}$$

This implies that

$$MPK = \alpha \frac{Y}{K}$$

Inserting this in the return to capital expression, we get the following expression, which can be estimated using available macroeconomic data:

$$PMPKN \equiv \alpha \frac{P_Y Y}{P_K K}$$

In the two-good economy, the returns to capital take account of price differentials between capital good costs and output good prices. The monetary return to an additional unit of capital is the value of the marginal product of capital, $p_Y * MPK$. To get the monetary return of investing an additional unit of the local currency, we must take the price of a unit of capital into account. The monetary return to investing an additional unit of local currency in capital is therefore given as $\frac{P_Y * MPK}{P_K}$. If capital prices are high, compared to output good prices, this lowers the return to capital investments.

In a single good economy, the return to capital is simply equal to MPK, since we cannot distinguish between P_Y and P_K . This implies that the return to capital reduces to:

$$MPKN \equiv \alpha \frac{Y}{K}$$

3. The measure of capital returns in a multi-good economy derived in question 2 is denoted as PMPKN in figure 1, which is taken from Caselli & Feyrer (2007). Please explain what the four measures of capital returns across countries suggest about the functioning of international capital markets.

This answer draws on Caselli and Feyrer (2007).

The figure shows estimated returns to capital for four different measures of returns to capital. MPKN is the naive measure without the adjustment for the price of capital, compared to the price of output.

The two measures MPKL and PMPKL are versions of MPKN and PMPKN-measures where the measure of α is corrected for returns to natural capital. Normally, α is measured residually as $\alpha = 1 - \text{labor share}$. The α will therefore also contain returns to natural capital. Caselli & Feyrer are interested in the return to physical capital only, and they adjust the α measure to take account of this.

The figure shows that returns to capital do not seem to be equalized using the naïve measure, MPKN. However, both the natural capital-augmentation as well as the multi-good augmentation of the returns measures make returns to capital more equal across countries, and using both (the PMPKL measure), returns are quite close to being equal across countries.

This suggests that international capital markets are well-functioning in the sense that they allocate capital such that returns are equal across countries (allocative efficiency).

4. Consider a closed-economy developing country, in which a new source of natural resources is discovered. Assume that the revenue from the proceeding natural resource extraction accrues to the government. Please discuss which effects one can expect on domestic savings, domestic investments and domestic growth.

This answer draws on Weil ch. 15 and PRLB ch. 10, p. 374 ff.

The additional revenue can affect capital accumulation to the extent that the increase in government revenue increases government savings and therefore domestic savings. However, there are several reasons why this may not happen:

- Government savings may not increase, if increased revenue leads to an overexpansion of the government sector of the economy (**overconsumption**), or if the additional revenue is distributed to favoured groups in the economy (**political effects**)
- A decrease in private savings may offset the increase in government savings. This phenomenon, **called Ricardian Equivalence**, occurs if households expect that the additional revenue will lead to a tax cut in the future and attempt to smooth consumption by reducing their current savings.

An additional reason why natural resources may be a "growth curse" rather than a blessing is its effects on **dynamics of industrialization** (also known as **Dutch disease**). A country with natural resource wealth may tend to export natural resources and import a larger share of manufactured goods for consumption, rather than producing manufactured goods at home. This effect may be enhanced by an appreciation of the exchange rate (the exchange rate channel is not mentioned in

Weil). These effects lead to a lagging manufacturing sector. Since the manufacturing sector has the most rapid technological process, this means that the country's long-run growth rate is reduced.

Problem C Two types of market failure

Sharecropping:

1. Consider a farmer in a developing country. Please discuss the efficiency properties of this farmer's production if he/she i) owns the land, ii) pays a fixed rent for the land, and iii) pays a share of farm output as rent (i.e., sharecropping). Please illustrate your answer with a relevant figure.

This question draws on Ray ch. 12.

The student could use a figure such as Ray figure 12.3 to illustrate the answer. Consider first the case of the farmer i) owning the land. The production function of the farmer has decreasing marginal product of labour (MPL) for a fixed amount of land. We assume that the costs of the farmer of applying additional labour is constant, for instance because the outside option in terms of a job with a fixed hourly wage is available to the worker. The farmer applies labour to the rented land such that MPL is equal to the constant marginal cost (MC).

A fixed-rent contract decreases the return to all amounts of labour applied by a fixed amount. Thus, it shifts the MPL curve down at all points. However, the amount of labour that achieves $MPL = MC$ is unchanged. Therefore, total production and efficiency is unchanged (even though a share of production now accrues to the landlord instead of to the farmer).

Under sharecropping, a fixed share of output is paid to the landlord. This "swivels" the MPL curve down, and reduces MPL at all points. This means that $MPL = MC$ is achieved at a lower labor input. Therefore, under sharecropping total production and efficiency is reduced.

2. Please discuss how sharecropping can occur as a consequence of risk aversion and a failure in the insurance market

This question draws on Ray ch. 12.

Sharecropping is not efficient, but it may be preferred if tenants are risk averse, since sharecropping reduces the return of the tenant in good years but increases it in bad years, compared to a fixed rent contract.

Sharecropping reduces the expected return of production on the land, but it may be possible for the landlords to set the share of output that accrues to them such that 1) the landlord (who is risk neutral) is indifferent between a fixed rent and a sharecropping contract and 2) the tenant prefers a lower expected return and a lower variance.

The sharecropping agreement and the resulting reduction in efficiency could be avoided if it were possible for the tenant to insure against a bad harvest in the insurance market. However, this is often not

possible for several reasons including moral hazard issues and the systemic nature of bad harvests (if one person has a bad harvest, it is likely that many others also have), which is a failure in the insurance market.

Credit rationing:

3. In many developing countries, credit rationing is widespread. Please explain what credit rationing is and how it can be caused by a combination of informational asymmetries between borrower and lender and limited liability.

This question draws on Ray ch. 14.

Credit rationing is the phenomenon that, at the going interest rate, borrowers would like to borrow more but cannot. Likewise, lenders could raise interest rates without decreasing the size of the loan, but will not.

Credit rationing may occur if lenders cannot differentiate between “safe” and “risky” borrowers. In a stylized case, safe borrowers’ projects yields a return, R , with certainty and risky borrowers’ projects yields a return R' , $R' > R$, with some probability p , and fails otherwise, in which case the lender loses the entire loan principal due to limited liability. Since $R' > R$, the risky borrower can take a loan at a higher interest rate.

The lender now has a choice: i) set the interest rate so low so that both the safe and the risky borrower would like a loan. In this case, there is equal chances that either get the loan (due to informational asymmetry); or set the interest rate higher and only the risky borrower can accept the loan.

If the risky project is too risky (i.e, p is too low compared to the difference between R' and R), the lender may prefer to set a low interest rate to have a chance of attracting the safe borrower. Note that in this case, there is credit rationing: there are two potential borrowers at the going interest rate, but only one gets a loan.

4. There is some hope that microfinance can help alleviate market failures in the credit market. Please explain what microfinance is and the mechanisms through which microfinance may improve credit market outcomes.

This question draws on Ray ch. 14.

Microfinance is available through many different organizations in many different developing countries. The central feature of the lending policy of microfinance, is that borrowers are organized into groups, and if one group member defaults on their loan, it has implications for all group members: no group member may be allowed to borrow again.

The groups may help alleviate the issue of informational asymmetries and may decrease project risk.

In the case of informational asymmetry, it may be that borrowers are better able than lenders to identify other “safe” projects with low default risks. There is an incentive to team up with such safe projects,

since a default in the group has negative implications for everyone in the group. This means that risky borrowers may be driven out of the market.

In the case of project risk, the structure of microfinance gives group members an incentive to monitor and influence the choice of other group members' projects in ways that decrease project risk. If there is limited liability, individual borrowers have an incentive to carry out too risky projects, since the costs of failure are not borne by the individual borrower; this incentive may be diminished by the microfinance structure.

5. It has proven difficult to evaluate the effects of microfinance.
 - a. Please give an overview of potential issues faced when evaluating effects of microfinance by simply comparing the outcomes of those who use microfinance to those who do not.
 - b. Banerjee et al. (2015) evaluate six studies of microfinance. Please give an overview of their main findings of the impacts of microfinance.

This question draws on Banerjee et al. (2015).

@a: There may be both demand-side and supply-side biases in such evaluations.

Demand-side bias may occur because there is self-selection into micro-finance programmes. This means that those who participate may differ from those who do not. It is hard to know which way this biases the results, as it is both possible that people choose to borrow because they expect a higher future income and wish to smooth consumption, or because they expect a lower future income and wish to borrow while they still look like attractive borrowers.

Supply side bias may occur because microfinance programmes are often specifically targeted towards poor households. A comparison between the outcomes of these households and other, less poor, households is therefore problematic.

@b: Banerjee et al. (2015) find, that, overall, microfinance works in the sense that it leads to more borrowers, more entrepreneurship and changed consumption patterns. However, it does not appear to lead to "social transformation": First, there are few measurable effects on standard welfare measures. Second, there are few measurable effects on investments in education and health, which could improve future welfare. Third, the impacts on entrepreneurship are modest in size.