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Development Economics

Econ 3310

Fall 2015

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Chapter 1

Introduction

The large majority of people live in developing countries, and at least 80 percent of humanity lives on less than \$10 per day (Ravallion et al., 2008). People in developing countries are not genetically different from people living in developed countries, but their environment is very different from ours. Development economics studies how agents behave within this economic environment and suggests improvements to promote economic growth.

These notes¹ start by defining the basic indicators of development, which should be a review for most students. The third chapter introduces statistical tools that will be used throughout the course to understand the relationship between variables. Finding a correlation between two variables, but identifying causality is the ultimate objective, because only with causality are we able to truly understand the mechanisms at work. The fourth chapter discusses the basic neo-classical growth model and its empirical implications. Since there is little evidence of the convergence predicted by the model, the following chapters will discuss important issues that could affect growth but

¹They are meant as a reference for students enrolled in development economics (Econ 3310). They are not to be used for any other purpose.

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are not included in the neo-classical models. Chapters 5 and 6 focus on the role of asymmetric information on the financial sector and present solutions implemented in developed and developing countries. Chapter 7 discusses matters related to human capital accumulation: education and health. The state is a major determinant of economic growth and its role is covered in chapter 8. If developing countries are unable to promote growth-oriented policies, maybe donor countries could help them with aid or loan forgiveness. Chapter 9 discusses this possibility. Finally, chapter 10 presents other determinants of growth outside our control: history and geography.

The objective of these notes is to build a theoretical framework for understanding development issues, and to provide examples of recent empirical research testing these models. Hopefully, these notes will allow the readers to appreciate the breadth of research done in development economics and give them a taste for empirical research.

Chapter 2

Measuring Development

2.1 Introduction

This chapter defines the basic indicators of development. The first section discusses measures of output (GDP and GNP) and explains how to make cross-country comparisons. The second section focuses on inequality and introduces the Gini coefficient. The final section describes the Human Development Index, an indicator of welfare.

2.2 Measuring Output

2.2.1 GDP vs. GNP

The gross domestic product (GDP) is a widespread measure of output. It can be calculated using the market value of all goods and services produced within a country in a given period (production approach). Another indicator of output is the gross national product (GNP), which is defined as the mar-

ket value of all the products and services produced by labor and property supplied by the nationals of a country. While GDP includes goods and products physically produced in the country, GNP counts the goods and products produced by the residents of a country wherever they live. For example, if a firm from country A produces something in country B, the value of this production is counted in the GDP of country B, but in the GNP of country A.

In most developed countries, GNP and GDP are very similar. In developing country, however, the GDP is generally greater than the GNP, because the natural resources of developing countries are often extracted by foreign firms. In Gabon, for example, the GDP per capita is USD 16 183 and its GNP per capita is USD 13 060. When there is such a difference, the GNP better represents the income that stays in the country, and therefore the living standard of its residents.

2.2.2 Cross-country Comparisons

These indicators can be used for cross-country comparisons. For such an exercise, it is necessary to convert the value of the indicator into a common currency. The simplest method to perform this conversion is to use the **nominal exchange rate**. If, for example, 1 USD buys 2 Cedis (Ghana), and the GDP per capita of Ghana is 2740 Cedis, then the nominal GDP per capita of Ghana will be 1370 USD ($2740/2$). As much as this method is easy, it can be misleading. Consider the case of Indonesia during the 1997 Asian financial crisis. Between June 1997 and July 1998, the GNP of Indonesia fell from

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205 billion USD (nominal) to 34 billion USD (nominal), which represented a decrease of 83 %. In rupia (local currency), however, the story was very different. Over the same period, the GNP only decreased by 1.4 % from 487 900 billion to 481 100 billion¹. Why was there such a difference? The loss of value of the local currency and not to the actual decrease in production led to to the large decrease of the Indonesian GNP in USD. Which number should we believe? Was the recession very severe or not? It depends. If Indonesia did not import much of its consumption from the US, the lost of value of the currency did not affect much the quality of life of the average Indonesian. If, however, the average Indonesian consumed a lot of American goods, then the depreciation of the currency increased substantially the cost of living for the population and therefore decreased their quality of life. It all depends on the cost of the average consumption basket.

The **purchasing power parity (PPP) method** addresses this type of problem. Instead of using the nominal exchange, it creates an artificial exchange rate based on the cost of a representative basket of goods and services. The first step to perform the PPP conversion is to determine a basket of goods and services which is representative of the consumption in both countries. It should include such items as food, housing, transportation and leisure. This task is very challenging, because consumption habits vary greatly across countries. While wine would certainly belong to the basket in France, it is not widely consumed in a Muslim country like Saudi Arabia. The magazine *The Economist* suggested an original basket: the Big Mac. It is fairly homogeneous across, and its price is widely available. The drawback of

¹http://en.wikipedia.org/wiki/1997_Asian_financial_crisis

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the Big Mac is that demand for it is not the same in developed and developing countries. While it is inexpensive in developed countries, it is not affordable for poor people in developing countries.

Once the basket is established, one must calculate its cost in both countries. The ratio between the cost of both baskets represents the PPP conversion rate.

Consider the following example. Assume that country A has a GNP of 500 in the currency of country A, and country B has a GNP of 450 in the currency of country B, and that the nominal exchange rate between the currency rate of country A and the currency of country B is 1 : 1.5.

Using the nominal exchange rate, the GNP of country B in the currency of country A would be 300 ($450/1.5$). The GNP of country A would therefore be 166% greater than the GNP of country B.

To use the PPP method, we need information on the per unit cost of certain items in both countries:

Table 2.1: Cost of Consumer Goods

Item	Country A	Country B
Bread	10	10
Computer	100	150
Pencils	15	20
Cars	150	100
Milk	20	50

Assume that the basket is 2 units of bread, 4 units of pencils and 6 units of milk. The cost of this basket in country A is $20 + 60 + 120 = 200$ and $20 + 80 + 300 = 400$ in country B. The ratio of the cost of both baskets

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is therefore 200 : 400 or 1 : 2. In other words, the prices in country B are double those of country A. If both countries produced the same quantity of goods/services, one would expect the GNP of country A to be half the one of country B in the local currencies. With this ratio, we can now transform the GNP of country B to make it comparable with the GNP of country A using the PPP method. The GNP of country B in the currency of country A (PPP) is therefore: 225 ($450/2$). Country A produces 222% more than country B ($500/225$). Another way of seeing it is in terms of baskets. Country A can produce 2,5 baskets ($500 / 200$), while country B can only produce 1,125 baskets ($450 / 400$). Country A therefore produces 222% more baskets than country B.

As seen above, the nominal and PPP exchange rates can produce different results. These differences, however, cannot be large, because of the **law of one price**. Assume there is a large difference between both conversion rates, entrepreneurs could exploit it to make a profit. In the previous example, an entrepreneur could purchase the basket in country A for 200 units of currency A. This entrepreneur could then export this basket to country B and sell it for a price of 400 in the currency of country B. Finally, he could exchange these 400 into 266,67 of currency A using the nominal exchange rate, thus making a profit of 66,67. By performing this arbitrage, the entrepreneur purchases the currency of country A, and therefore increases demand for this currency, and its value. One would therefore expect the nominal exchange rate to converge towards the PPP exchange rate in the long run.

Discrepancies between the nominal and PPP exchange rates remain for three reasons. First, some goods cannot be exported. Housing, for example,

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is difficult to export. If some goods cannot be exported, entrepreneurs cannot exploit differences between the PPP and nominal exchange rate. Second, transaction costs eat away the profit margin and make some exports unprofitable. It would be very costly for entrepreneurs to export/import to/from a landlocked country with bad infrastructure. Finally, the government may prevent some goods from being freely imported or exported. It is, for example, forbidden to import milk. It is therefore impossible for entrepreneurs to purchase milk in Syracuse at a price of 0.79USD and sell it at 2.75CAD in Kingston². Such trade limitations make it impossible for entrepreneurs to exploit arbitrage possibilities.

2.2.3 Advantages and Inconveniences

The major advantage of GDP and GNP is their availability. Both indicators are widely available for most countries and they capture some information on output. The major drawback of these indicators is that the quality of these estimates can vary across countries. It is very challenging for developing countries to calculate accurately GNP and GDP, especially when a large part of the economy is underground. Vendors on the side of the street, farmers and small businesses may not report to statistical authorities. Another drawback is that they do not provide much information on the distribution of the income and therefore on poverty. Country A, for example, may have a larger GDP per capita than country B, but there could be more poverty in country A than in country B if income is not distributed the same way in both countries. Since one objective of development economics is to alleviate poverty, GDP

²Numbeo

and GNP may not always be appropriate indicators of poverty. Finally, these indicators also do not provide much information on the quality of life. Pollution, for example, affects life, but is not counted in the GDP.

2.3 Measuring Inequality

GDP does not take into account inequality, but inequality is important for three reasons. First, inequality has implications for efficiency. If there is a large gap between poor and rich, it is unlikely that both groups will have the same opportunities. Some highly talented individuals may never have the chance to attend school and contribute to society. Highly unequal societies do not exploit the potential of all individuals. Second, it affects the quality of life of residents. In a society with a very unequal distribution of wealth, very poor people may be inclined to turn to criminality to earn a living or they may threaten the social cohesion using violence. Finally, there are some ethical concerns. Most people would prefer living in a society where the distribution of wealth is not completely unequal. Consider this thought experiment known as the veil of ignorance. Imagine you could choose the level of inequality of the world in which you are born. Which level would you choose? Would you want to live in a society that is perfectly equal?

The **Gini coefficient** measures inequality in a country³. To calculate this coefficient we need to know the actual and the perfectly equal distribution of wealth. The function representing the share of the wealth of the poorest $x\%$ is known as the Lorenz curve. If the distribution of wealth were equal,

³In this section, we will consider wealth, but the Gini coefficient can be calculated for any variable.

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the poorest x % of the population would own x % of the wealth. The line of perfect equality is therefore a straight line going from (0,0) to (100,100). If the area between the line of perfect equality and the Lorenz curve is A, and the area between the Lorenz curve and the two axes is B, then $Gini = A / (A+B)$. If A is very small, the actual distribution of wealth is very close to the equal distribution. The Gini coefficient would therefore be very small. Conversely, if wealth is very unequally distributed, A would be very large. The Gini coefficient would therefore be close to one. The Gini coefficient varies across time and countries. The pre-tax income Gini of the US was 0.394 in 1970 and is now 0.477 (2011) indicating an increase in inequality. South Africa's Gini is 0.62 suggesting a larger inequality in South Africa than in the US.

The relationship between the Gini coefficient and output is captured by the **Kuznet curve**. When a country is very poor, all its inhabitants are all equally poor. A tribe in the Amazon, for example, would have a very equal distribution of wealth and thus a low Gini coefficient. As a society develops, certain people will take advantage of the situation and become very rich, while others will stay poor. The Gini coefficient will increase. As a society matures, however, institutions are put in place to moderate inequality. In Canada, unemployment insurance, social insurance, and free health care tend to reduce the gap between rich and poor, thus reducing the Gini coefficient. Overall, the Kuznet curve predicts an inverted U-shape relationship between the Gini coefficient and output.

2.4 Measuring of Well-Being

Production and inequality are interesting, because they have implications on the well-being of the population. People with more material goods and less inequality tend to have better health and education outcomes. The human development index directly measures health, education and wealth through life expectancy, the average number of years of schooling and national income. More specifically, each indicator is calculated in the following fashion:

$$\begin{aligned}\text{Life Expectancy Index} &= \frac{LE - 20}{82.3 - 20} \\ \text{Education Index} &= \frac{\sqrt{\text{MYS} / 13.2 \cdot \text{EYS} / 20.6}}{0.951} \\ \text{Income Index} &= \frac{\ln(\text{GNIpc}) - \ln(100)}{\ln(107,721) - \ln(100)} \\ \text{HDI} &= \sqrt[3]{\text{LEI} \cdot \text{EI} \cdot \text{II}}\end{aligned}$$

The life expectancy index (LEI) is calculated using the minimum life expectancy (20) and the maximum (82.3) to get a number between 0 and 1. The education index relies on the past school attainment (mean years of schooling or MYS) and future school attainment (expected years of schooling or EYS) for a pupils starting their education. Finally, the income index takes the GNI per capita of a given country.

As much as calculating GNP can be challenging, calculating life expectancy or the expected years of schooling is daunting. These estimates rely on a large census and require complex statistical methods which may not be available for all developing countries. Another drawback of this mea-

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sure is the lack of variation. It takes a long time to change life expectancy or the mean number of years of schooling. In that sense, testing policies using these criteria could be very disappointing in the short run. It would take decades to notice an improvement.

Chapter 3

Empirical Methods

3.1 Introduction

The previous section outlined three types of measures to describe the development of countries. A principal objective of economics is not only to describe development, but to explain it. Only once policy-makers understand cause and effect relationships are they able to implement growth-enhancing policies. This chapter describes methods used to identify causality.

3.2 Regression Analysis

The best method to visualize a relationship between two variables is to plot the data. The relationship linking the **explanatory variable** to the **outcome variable** becomes apparent from the cloud of points. One could, for example, be interested in the relationship between education and income. A researcher would collect data about the education attainment and the income

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of a random sample of people and would plot each data point. Hopefully, the relationship would show a positive relationship between education and income. One would then find the line of best-fit or regression line. In the case of education and income, the equation representing this line could be:

$$\text{income} = 10000 + 1000 \cdot \text{years of education} \quad (3.1)$$

In words, it means that each year of education increases income by \$1000 on average, and that people with no education earn \$10 000 (social welfare). Knowing the relationship between education and income, one could think about the impact of increasing educational attainment in a country. If we can trust these estimates, then every year of extra education per person will cause an increase of \$1 000 in their yearly income. Knowing the cost of the policy, one could then determine whether this policy is profitable.

3.3 Endogeneity: Problem and Solutions

The key assumption behind this analysis is **causality**: more education causes more income. Unfortunately, there is no reason to believe that the relationship between education and income is necessarily causal. Intelligent people may decide to acquire more education. These people would have had a high income even without education, because they are very intelligent, but they decide to attend school, because they enjoy the challenge. Education could be a luxury good. Rich people could have a lot of free time and decide to attend

university to keep busy. In both cases, there is a relationship between education and income. However, in neither case will increasing education cause more income. A policy to increase educational attainment would therefore be completely useless. Effective policies rely on causality.

The problem associated with education is reflective of a larger problem: **endogeneity. A variable is endogenous if a person is able to influence it in the short-term.** Adults choose their level of education; parents choose their number of children; people choose to exercise. Education, fertility and health are examples of endogenous variables. Such decisions are influenced by a large number of factors.

This type of influence can lead to a problem called **third or omitted variable.** In such cases, the relationship between the explanatory variable (education) and the outcome (income) is not direct, but both variables are caused by a third variable. In the previous example, intelligence was the third variable. Intelligent people tend to go longer to school, because they enjoy it. Moreover, intelligent people tend to earn more money. The relationship between education and earning could be due to this third variable without there being a direct relationship between education and income.

In other cases, the outcome variable belongs to the group of variables influencing the explanatory variable. In such cases, the relationship is reversed: the outcome is causing the explanatory variable. This problem is therefore called **reverse causality.** In the previous example, rich people enjoyed education. More education therefore does not cause more income, but in fact more income causes more education. Reverse causality occurs mostly in a macroeconomic setting. Assume a negative relationship between

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inflation and economic growth. One could argue that when there is inflation, businesses are more cautious about investments, thus reducing growth. One could also argue that when governments observe low economic growth, they decide to stimulate the economy by printing money. In both cases, more inflation leads to less growth, but the causality channel is different. Without knowing the direction, it is difficult to suggest effective policies.

Whether we deal with omitted variables or reverse causality, it is nearly impossible to develop sound policies without identifying causality. To do so, we need **exogenous variations: those not controlled by the economic agent whose behavior we are studying**. There are three large categories of exogenous variations: natural phenomena, random controlled trials and government policies. All of these variations are outside the control of a single individual

We do not control the weather. Tomorrow, there could be rain, snow or an hurricane. Nobody has any control over these phenomena, but they affect our behavior. Take, for example, an African country whose agricultural sector highly depends on rain. If it rains sufficiently the country is wealthy. Otherwise, the country is poor. Now, assume a researcher studies the impact of economic conditions on civil conflicts¹. This researcher cannot simply collect data on economic conditions (GDP) and on civil conflicts to perform a regression, because economic conditions are endogenous to the country. Reverse causality is the first critique that comes to mind: countries struggling with civil conflicts tend to be poor. To understand the causal relationships,

¹Miguel et al (2004). Economic Shocks and Civil Conflicts: an IV Approach using Rainfall.

we need an exogenous variation: rainfall. If there is a negative relationship between rainfall and civil conflicts, it will be impossible to argue a case for missing variable. There is nothing that could affect rainfall that could also affect democracy. It would be even harder to make a case for reverse causality, because democracy could hardly cause rainfall. In that sense, if there is a negative relationship between both variables, it must be that rainfall causes an increase in wealth which prevents civil conflicts from happening.

The link between physical phenomena and economic situation is often tenuous. For this reason, economists must sometimes create exogenous variations through **randomized controlled trials (RCT)**. Such trials are very similar to medical experiments. They involve a treatment (a loan), a treated group (those receiving a loan) and control group (those not receiving a loan). Since people are allocated randomly to both groups, they should both be very similar. In that sense, receiving the treatment is not related to any third variable. The researcher then compares the outcomes of the commercial activities of individuals in both groups. If there is a difference in outcomes between both groups it must be due to the difference in treatment, because both groups are otherwise similar. In that sense, one can say that treatment causes the difference in outcome. Such RCTs provide excellent conditions to identify causality. However, they can be very expensive. Moreover, such experiments sometimes involve ethical issues.

Government policies, however, cost nothing to the researcher, they operate on a very large scale and, more importantly, they are also exogenous for any given citizen affected by them. Since policies affect behaviors, researchers can study the impact of these changes in behaviors, because they

were caused by an exogenous variation. As in the RCTs, we need to compare the outcome of people affected by the policies with the outcome of people unaffected by the policy (control group). In general, there are two types of control groups when dealing with government policies. First, people from a different region may not have been affected by the policy if the policy was not implemented there. The people of this other region provide information on what would have happened to the people in the region affected by the policy had the policy not been implemented. This method is called **difference-in-difference**. Second, some people may not be eligible for treatment but otherwise similar to the group affected by the treatment: **treatment discontinuity**. In this case, people who were not treated serve as the control group. The next section will describe both methods in more detail.

3.3.1 Difference-in-Difference

When a policy is introduced, it is impossible to know what would have happened had the policy not been implemented: the **counter-factual**. To make an educated guess for this counter-factual, we look at what happened in a similar region that was not affected by the policy. Assume that a researcher wants to know the relationship between unionization and wages in developing countries. It would be incorrect to collect data on wages of unionized and non-unionized workers, because workers choose to unionize. Unionization is therefore endogenous. Instead, we could rely on a natural experiment.

Assume that country A banned unions and country B did not. A researcher can observe wages before and after the ban in both countries. As-

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sume that average wage of a country has three components:

$$\text{average wage} = \text{country characteristics} + \text{productivity} + \text{unionization} \quad (3.2)$$

The difference in average wages in each country before and after the policy will therefore be:

$$\Delta \text{average wage}_A = \Delta \text{productivity} + \Delta \text{unionization} \quad (3.3)$$

$$\Delta \text{average wage}_B = \Delta \text{productivity} \quad (3.4)$$

Notice that the country characteristics disappear when we take the difference, because they are constant. Some of the changes in wages are due to changes in productivity and some of it is due to the change in unionization. If we assume that changes in productivity are the same in both countries, we can cancel it out by taking the difference between $\Delta \text{average wage}_A$ and $\Delta \text{average wage}_B$:

$$\Delta \text{unionization} = \Delta \Delta \text{average wage} \quad (3.5)$$

This last equation provides the impact of a change in unionization on average wages, because we were able to remove all other effects by taking the difference twice. Consider this numerical example:

Table 3.1: Average Salary in Two Comparable Countries

Country	Timing	Average Salary
Country A	Pre-Policy	22 000
	Post-Policy	21 000
Country B	Pre-Policy	23 000
	Post-Policy	24 000

The average salary after the policy in country A is \$ 21 000. Some of this amount is due to the characteristics of the country, some of it is due to productivity and finally some of it is due to unionization. The difference in average wages (-\$1 000) between the pre-policy and post-policy in country A is either due to an increase in productivity and/or the ban on unions. In country B, there is a difference of \$1 000 between pre-policy and post-policy. All of the difference in country B is due to an increase in productivity, because the policy was not implemented in country B. The difference between those numbers: $-1\ 000 - 1\ 000 = -2\ 000$ represents the impact of unionization on wages. This fictitious example would suggest that unionization decreases wages.

There are three key assumptions necessary for this procedure to lead to the causal impact of unions on wages. First, we assume that both countries have exactly the same average increase in productivity. This assumption is only correct if we are indeed comparing countries that have similar productivity shocks and therefore similar industries. Nigeria and Niger, for example, are very close geographically, but their economy is very different. A productivity shock in oil extraction would affect greatly Nigeria, but it would not have any impact on Niger.

Second, we assume that country A has the same characteristics before and after the policy. In other words, there was no other policy that may have affected earnings. If country A increased minimum wage, for example, it would be impossible to disentangle the effects of the minimum wage and those of the changes in unionization. It is therefore very important to make sure that the country did not introduce any policy that may have affected the outcome variable. Third, we also assume that country B did not introduce some new policies. For the same reasons as previously, if country B starts changing policies, it will be impossible to identify the causal impact of unionization.

If these assumptions are met, it is possible to assess the average impact of the policy on the outcome variable. Average outcomes are interesting, but they sometimes hide interesting details. Changes in unionization will not affect everybody the same way. Lawyers, for example, are generally not allowed to unionize. The change in laws will therefore not affect them. Consider the previous example with more detail in the following table:

Table 3.2: Average Salary in Two Comparable Countries

Country	Timing	Average Salary		
		High School	College	University
Country A	Pre-Policy	20 000	25 000	45 000
	Post-Policy	15 000	24 000	50 000
Country B	Pre-Policy	22 000	23 000	44 000
	Post-Policy	24 000	24 000	45 000

With this information, we can perform the difference-in-difference proce-

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ture for different groups. For people with a high school diploma, the policy causes the following impact: decrease of \$7 000 (high school), decrease of \$2 000 (college) and increase of \$ 4 000 (university). Even though the impact of the policy is overall bad (-\$ 2 000), it is good for people with university education. If a policy-maker particularly cares about these people, he may recommend the policy, even though it has an overall negative impact on salaries.

In general, there are three types of people. Some people do not change their behavior (unaffected): they were not unionized before the policy, and they are not unionized after the policy. One would not expect a large change in wages for this group. The second group consists of people who change (adopters): they were unionized before the policy, and now they are not. The wage of these people could change considerably as a result of the policy change. The final group comprises the defiers: they were and are still organized, even though it is forbidden. The average impact of the policy will depend on the size of the second group and on the impact of the policy on the outcome variable for this group. As much as this type of analysis is interesting, it is very difficult to identify these groups in the country that was not affected by the policy.

3.3.2 Treatment Discontinuity

The second method to identify causality using policies is to compare people close to the eligibility threshold. Imagine that I offer a remedial class for students who scored below 72% in the midterm. In other words, students

with a score of 73% are not allowed to attend. The first reaction of students would be to contest my decision: why 72 and not 73 or 74? Students with a mark of 73% think they are similar to those with a mark of 72%; they therefore feel they should be treated the same way. The validity of treatment discontinuity relies on this similarity. There is no difference between those slightly above the threshold and those slightly below it other than that the former did not receive the treatment, but the latter did. If I find that students with a score of 72% performed better at the final than those with a score of 73%, it is because of the remedial class and not because of any third variable.

There are some important assumptions in this example. First, I assume that the threshold was set exogenously: I chose 72, because it is a nice number². Instead, the dean of the business school could have pressured me to help students from his faculty. I would therefore have set the threshold to allow the most business student to take the remedial class. There would therefore be more business students below the threshold than above it. Any positive impact could be due to the fact that business students tend to perform badly at midterm and well at finals. Second, I assume that students cannot react to the threshold. If I had announced the threshold before the midterm, some students may have decided to game the system. Insecure students may have tried to fall just below the threshold to receive the extra help. In that sense, there would be more insecure students below the threshold than above it. The treated and non-treated on both sides of the threshold would therefore be systematically different. This difference (insecurity) could act as

²It is the sum of four consecutive prime numbers: $13 + 17 + 19 + 23$! Moreover, $72 = 2^3 3^2$, which is pretty neat!

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an omitted variable and explain any positive impact found for the remedial class. Finally, I could simply not enforce the threshold systematically. There would therefore not be any real discontinuity in treatment, and probably no discontinuity in outcome. Treatment discontinuity is a very powerful tool to identify causality. There are however some important limitations. First, one needs a continuous variable. In the previous example, marks are continuous, and it is possible to determine who is close to the threshold. If instead of marks, there was a pass/fail system, it would be impossible to differentiate between those who barely passed and those who had 100%. Second, the researcher requires many observations close to the threshold to assess the impact. Assume that a lot of students had marked in the fifties and a lot of students were in the nineties (bimodal distribution), there would not be any students close the threshold and therefore no group of similar students who received different treatments. There would only be dissimilar students who received dissimilar treatment. It would therefore be impossible to know whether any difference in outcome was caused by the characteristics of students or by the treatment. Finally, a researcher must keep in mind that any impact is specific to the students close to the threshold. If I were to offer this remedial class to students with marks below 60 %, the impact would probably be different, maybe larger because these students really need help or smaller because these students may not care that much about the course. It is impossible to know.

3.3.3 External Validity

The purpose of research is to learn something general about the world. It is important for researchers to make sure that their results can be applied to a broader set of problems, so-called external validity. In the previous example, we would like to know the impact of remedial classes in general, not specifically the impact of remedial classes in development economics at Queen's University for students with a mid-term score around 72. Both methods presented above enable the researcher to identify causality (internal validity), but by doing so we lose sight of the bigger picture. If I find that banning unions decreases wages, does it mean that making it harder for people to unionize will have a notable impact? We do not know. The impact is specific to the policy studied. Furthermore, we do not necessarily know the impact of the policy in another country. These natural experiments take place at a certain point in time and in a certain place. The results do not necessarily generalize to other time periods or other regions. **External validity requires the results to be valid on a broader scale.** Since one study is embedded in a certain context, many studies with similar results are necessary to provide external validity.

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Chapter 4

Solow Growth Model

4.1 Introduction

Before starting to use these empirical methods to identify causal relationship between variables, it is important to develop a framework to understand growth and its determinants. The Solow model offers such a tool. In this model, countries produce output using capital¹ and technology. Capital is accumulated through saving some of their present output, and it is lost through depreciation. This simple setting will allow us to study various equilibria and shocks that could affect them. Finally, we will consider whether there is any empirical evidence supporting this model.

¹Capital can be roads, machines or knowledge.

4.2 Capital Accumulation Rule and Equilibrium

4.2.1 Capital Accumulation Rule

Production is a function of capital and technology: $Y = Y(K, T)$. To understand production, we need to understand how the level of capital changes over time. There are two channels through which one can accumulate capital. First, one can save a share (s) of the production of today (Y_t) and transform it into capital in the next period (K_{t+1}). Second, a share ($1 - \delta$) of the capital of today (K_t) can still be used in the next period. Both channels are summarized in the following capital accumulation rule:

$$K_{t+1} = sY_t + (1 - \delta)K_t \quad (4.1)$$

Numerical Example Let us now predict the level of capital in future periods using the capital accumulation rule. Assume that the saving rate is 10 percent and the depreciation rate is 5 percent ($s = 0.1$ and $\delta = 0.05$). Furthermore, the production function is $y = \sqrt{k}$. If we start with a level of capital of 1, then the capital in the next period will be:

$$0.1 * \sqrt{1} + 0.95 * 1 = 1.05 \quad (4.2)$$

and output will be $\sqrt{1.05} = 1.024$.

In the following period, the capital will be:

$$0.1 * \sqrt{1.05} + 0.95 * 1.05 = 0.1024 + 0.9975 = 1.0999 \quad (4.3)$$

and output will be $\sqrt{1.09} = 1.048$.

4.2.2 Equilibrium

Since we are not interested in the actual capital of a country but in the per capita capital, because only per capita variables reflect the wealth of the inhabitants of a country, we will now transform equation 4.1 by dividing both sides by population (L_t) to get per capita variables (lower-case letters):

$$\frac{K_{t+1}}{L_t} = sy_t + (1 - \delta)k_t \quad (4.4)$$

To write the left-hand side of equation 4.4 in terms of per-capita capital, we assume that population grows at rate “ n ”:

$$L_{t+1} = (1 + n)L_t \quad (4.5)$$

Substituting equation 4.5 into equation 4.4, we get:

$$\frac{K_{t+1}(1 + n)}{L_{t+1}} = sy_t + (1 - \delta)k_t \quad (4.6)$$

$$k_{t+1}(1 + n) = sy_t + (1 - \delta)k_t \quad (4.7)$$

An equilibrium (also called steady-state) is reached when the variables remain constant. In other words, $k_t = k_{t+1} = k^*$. If capital is in equilibrium, then y will also be in equilibrium at y^* . We can find the equilibrium by substituting the equilibrium condition into equation 4.7 and solving:

$$k^*(1 + n) = sy^* + (1 - \delta)k^* \quad (4.8)$$

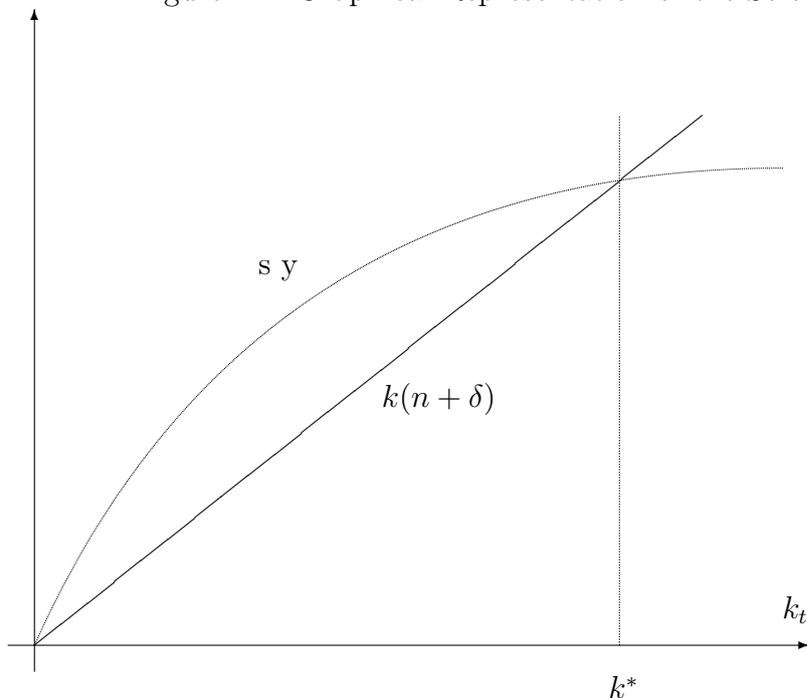
$$k^*(n + \delta) = sy^* \quad (4.9)$$

Numerical Example Assume an economy where $s = 0.2$, $n = 0$, $\delta = 0.05$, and $y = \sqrt{k}$. The equilibrium is then $k^*0.05 = 0.2\sqrt{k^*}$ which means that $k^* = 16$. Let's check the answer with the capital accumulation rule: $K_{t+1} = sY_t + (1 - \delta)K_t = 0.2 * 4 + (1 - 0.05) * 16 = 0.8 + 15.2 = 16$. The equilibrium is confirmed, because $K_t = K_{t+1} = 16$. The amount of capital per capita remains the same, and so does output per capita, so it must be the equilibrium.

4.2.3 Graphical Representation

To better understand this relationship, let us visualize both sides of the equation 4.9. The left-hand side of the equation is a linear function of capital, since n and δ are constants. If k increases by 1 unit, $k(n + \delta)$ will increase by $(n + \delta)$ at all levels of k . The slope of this function is therefore constant: $(n + \delta)$. The right-hand side of equation 4.9 is also a positive function of capital, because more capital means more production. However, it is not linear, because an increase in capital does not affect production the same way

Figure 4.1: Graphical Representation of the Solow Model



at all levels of capital. Imagine you are asked to write an assignment (output) and you were given a different number of computers (capital). Without a computer, you would have to write by hand, and it would be arduous to do any research. Your output would therefore be low. With one computer, you would be productive. With two computers, you would be a bit more productive than with one. On one computer, you could write and on the other, do the research. Now, with three or more computers, there would not be much of a gain in productivity. This phenomenon is called **decreasing returns to scale: the more capital we have, the less productive is each additional unit of capital**. The slope of the $y(k)$ function therefore decreases as there is more capital. The function $s y$ is simply a constant share of the $y(k)$ function.

Interpreting the y-axis is not obvious. In short, the y-axis gives us infor-

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mation on the growth rate of capital. The left-hand side corresponds to the loss of capital due to depreciation and population growth. The right-hand side represents a gain in capital: saving leads to an increase in capital. When the right-hand side is larger than the left-hand side (on the left of the equilibrium), then capital increases, because the gain is larger than the loss in capital. Conversely, when the left-hand side is larger than the right-hand side (on the right of the equilibrium), then capital decreases, because saving is not sufficient to compensate the loss due to depreciation and population growth. When both are equal, the gain equals the loss, and there is no change: it is the equilibrium!

A more mathematical proof requires equation 4.7. Notice that if $k_{t+1} < k_t$, then $(1+n)k_{t+1} < (1+n)k_t$. We can therefore rewrite equation 4.7 as the following inequality:

$$k_t(1+n) > sy_t + (1-\delta)k_t \quad (4.10)$$

$$k_t(n+\delta) > sy_t \quad (4.11)$$

which shows that if capital decreases, then $k_t(n+\delta)$ must be above sy_t . Conversely, if capital increases, then $k_t(n+\delta)$ must be below sy_t . The only level of capital at which capital remains constant is where both expressions are equal: the equilibrium.

Not only do the curves indicate whether capital will increase or decrease, they also show the speed of change. The further away are both curves, the faster is the growth rate.

4.2.4 Stability of Equilibrium

An equilibrium can be stable or unstable. When an equilibrium is unstable, any deviation means that the system will never come back to the equilibrium. Conversely, in a stable equilibrium, the system converges back to the equilibrium after small deviations. The equilibrium represented by figure 4.1 is stable: any deviation on the left means that $k_t(n + \delta)$ is below sy_t , which means that the capital increases back to the equilibrium. Any deviation on the right means that $k_t(n + \delta)$ is above sy_t , which means that capital decreases back to the equilibrium. The equilibrium at k^* is therefore stable.

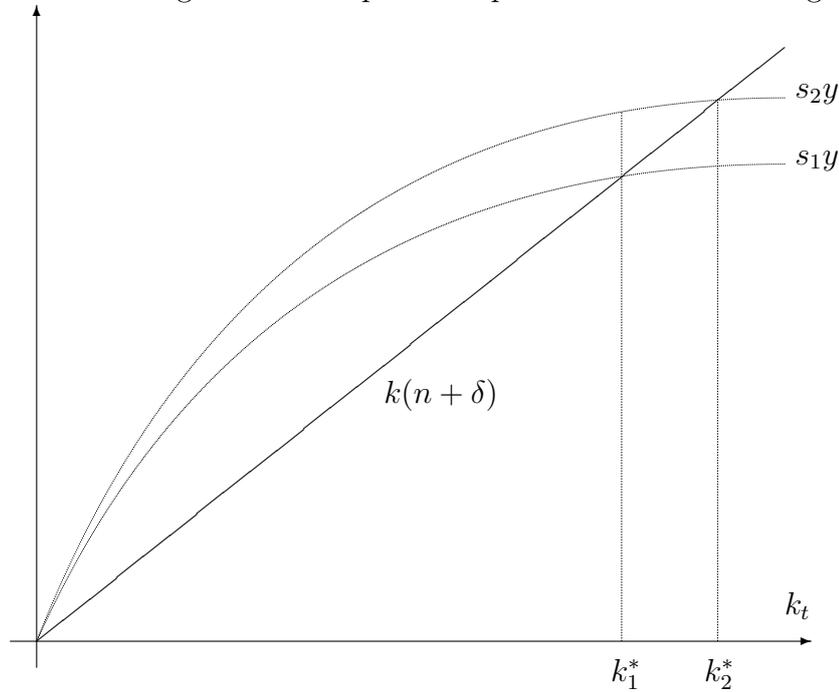
There is another equilibrium in this model at $k = 0$. If $k = 0$, then $k_{t+1} = sy(k) + (1 - \delta)k = 0$. This equilibrium, however, is unstable. Consider what happens on the right of the equilibrium: $k_t(n + \delta)$ is below sy_t , which means that the capital increases. A small positive deviation in the amount of capital leads the system to another equilibrium.

To sum it up, on the left of the k^* equilibrium, countries accumulate capital up to k^* , and on the right of the k^* equilibrium, countries lose capital until k^* . All countries independently of their initial level of capital, converge to the same equilibrium.

4.3 Comparative Statics

The equilibrium towards which an economy is converging may change through time, because of shocks to the parameters of the model: the saving rate, the growth rate of the population, depreciation and technology. If any of these variables change, the equilibrium will be affected.

Figure 4.2: Graphical Representation of a Saving Shock

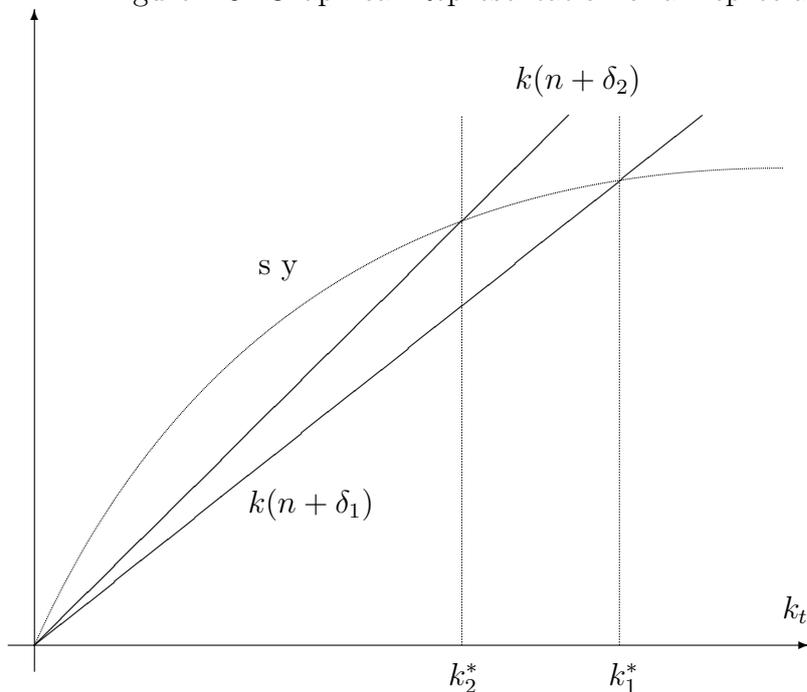


Let us first consider what happens if there is a positive saving shock, for example the government creates an incentive to save. Such a shock would increase the amount of savings in the economy for all levels of production:

When the saving shock occurred, $s_1 y$ shifted to $s_2 y$. At the initial level of capital (k_1^*), the curve $s y$ was above $k(n + \delta)$, so capital increased in the next periods up until the new equilibrium: k_2^* .

Let us now consider if depreciation increased making the $k(n + \delta)$ line steeper:

Figure 4.3: Graphical Representation of a Depreciation Shock



At the former equilibrium level of capital, $k(n + \delta)$ is above $s y$ after the shock, so there is a decrease in capital in the following periods to the new equilibrium level: k_2^* .

4.4 Extension: Poverty Trap

So far, we have assumed a fairly standard relationship between capital and production: decreasing returns to scale. This relationship may not always hold. Consider the relationship between body strength (capital) and production for example. If I give only one apple to a laborer for the whole day, he will be very hungry and his work will be bad. If I give him two apples, he will still be very hungry, and his work will still be bad. I doubled the input (apples), but I did not double the output. For very poor countries, increas-

ing capital may not result in an increase in output at low levels of capital making y very flat. The saving rate could be responsible for the flatness of sy , because people are too poor to save. In the standard model, we assumed that s was constant. If s is almost zero at low output, then sy would be very flat at low levels of capital.

Whenever sy is flat, there are multiple equilibria and a poverty trap. Countries that are below a certain capital threshold cannot make good use of capital (flat relationship). They therefore do not generate enough savings to invest sufficiently to compensate for depreciation. This vicious cycle continues in the next period leaving them with dwindling capital. Countries in a poverty trap never reach the good equilibrium.

4.5 Empirical Implications

The standard Solow model with diminishing returns predicts convergence: all countries independently of their initial level of capital should reach a very similar equilibrium assuming they have similar parameters. Not only that, but the model predicts that economies further away from the equilibrium grow faster than those closer to the equilibrium. In a world with poverty trap, however, one would instead expect divergence. Countries below a certain threshold become poorer, while countries above this threshold should grow towards the equilibrium.

Baumol (1986) uses data from 1870 to 1979 to test the convergence hypothesis. His data is limited to developed countries, because only they collected any statistical information prior to 1960. Using this dataset, he finds

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that countries with very low GDP per capita in 1870 (Finland and Japan) grew much faster than countries with very high GDP per capita in 1870 (US and UK). Unfortunately, DeLong (1988) points out an important methodological flaw. If Baumol only considers developed countries that are now very similar, he will necessarily find convergence, because these countries were possibly very different in 1870. Pritchett (1997) tackles the problem differently. He estimates the GDP per capita of less developed countries in 1870 assuming survival level, which he defines using data from countries undergoing severe droughts. With this assumption, he exaggerates the difference in 1870 between developed and developing countries. It would then be likely to find evidence of convergence, but he does not. His results indicate that developing countries are relatively poorer now than they were in 1870. There is therefore no evidence of convergence, but rather divergence.

There are a few explanations for divergence. First, there is the poverty trap. The production or the saving function assumed in the Solow model could be wrong. If either of these functions is flat at low levels of capital, then countries with low levels of capital could be converging towards the zero capital equilibrium and not towards the k^* equilibrium.

Second, there could be large differences in the equilibrium output per capita between developing and developed countries. The US, for example, has a GDP per capita around \$50 000, a saving rate close to 5%, and a population growth of 1%. Developing countries have a GDP per capita around \$1 000, an unknown saving rate, and a population growth of about 2%. Depreciation should be about 5% in all countries. The Solow model states the following equilibrium:

$$k^*(n + \delta) = sy^* \quad (4.12)$$

If we assume that $y = \sqrt{k}$, then

$$\sqrt{k} = \frac{s}{(n + \delta)} \quad (4.13)$$

Since the ratio of the GDPs per capita for developed and developing is about 50, the ratio between the equilibrium should also be 50:

$$50 = \frac{\frac{0.05}{0.01+0.05}}{\frac{S_d}{0.02+0.05}} \quad (4.14)$$

$$50 = \frac{0.5833}{S_d} \quad (4.15)$$

$$S_d = 0.0012 \quad (4.16)$$

The saving rate in developing countries would therefore need to be 0.1 percent for the equilibrium output per capita in developed countries to be 50 times larger than that of developing countries. There is no reason why there would be such a large difference in parameters, but the next chapter will investigate differences in financial system that could lead to such differences.

Chapter 5

A Primer in Finance

5.1 Introduction

The Solow model assumes a very efficient financial system: individuals save and entrepreneurs borrow this money to invest. If developing countries have weak financial systems, it could explain the divergence observed in the data. This section discusses problems that occur in financial systems. We first discuss the concept of expected value and the basic model. We then turn our attention to problems arising when information is imperfect. Finally, we describe some empirical evidence for this type of problems.

5.2 Expected Value

Expected value refers to the average value of a gamble. Take, for example, the following game: if you toss tails, you receive 1\$ and if you toss heads, you receive 2\$. What is the average value of this gamble? If you

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were to play this game infinitely, you would receive the following stream of payments: 1, 1, 1, 2, 1, 1, 2, 2, 2, 2... The total sum of money won would be $n_1 \cdot 1 + n_2 \cdot 2$ where n_1 is the number of times you toss tail and n_2 is the number of times you tossed heads. The average amount received per coin toss would be: $\frac{n_1 \cdot 1 + n_2 \cdot 2}{n}$ where n is the total number of tosses. If the coin is fair, one would expect $\frac{n_1}{n} = \frac{n_2}{n} = 0.5$ for n large enough. The expected value of this game would therefore be $0.5 \cdot 1 + 0.5 \cdot 2 = 1.5$. More generally, **the expected value of a gamble is the sum of the probability of each outcome multiplied by the value of the outcome.**

5.3 Basic Model

Any entrepreneur who wants to undertake a project but does not have any personal wealth needs a loan. For example, if someone wants to produce furniture, he will need to buy wood. A firm selling wood must receive some payment in exchange for the wood. The carpenter will need to borrow money from the bank to pay for the wood, before he can start production. Once the furniture is sold, he will be able to pay back the loan and the interest. Without credit, the entrepreneur cannot produce any furniture. Credit is fundamental for any entrepreneurial activity and therefore for the economy as a whole.

5.3.1 Actors

There are two actors involved in the credit relationship: the lender and the borrower.

Lender The lender can borrow funds from international markets and then lend them to entrepreneurs. International markets require a payment of R_f for each unit of capital. When lending one unit of capital to an entrepreneur, the lender asks for a payment of r .

Borrower The borrower has a project that he cannot undertake without credit. This project involves a cost of 100 units of capital now and an uncertain return later. There is a probability π that the project is successful providing a return of R_g . This return is sufficient to pay r to the lender. The borrower therefore keeps $R_g - r$ when the project is successful. There is also a probability of $1 - \pi$ that the project is not successful giving a return of R_b . In such a case, the borrower is unable to pay back r . Instead, he gives all of R_b to the lender and keeps nothing. In other words, the borrower has **limited liability**.

5.3.2 Zero-Profit Condition

The lender is part of a competitive market. If it makes a loss lending to entrepreneurs, the lender will leave the market. If it makes a profit, more lenders will enter the market, thus increasing competition and reducing r . In equilibrium, there cannot be any profit: **the cost of borrowing funds on the international markets must therefore equal the expected value of lending to**

$$R_f = \pi r + (1 - \pi)R_b \quad (5.1)$$

Solving for r :

$$r = \frac{R_f - (1 - \pi)R_b}{\pi} \quad (5.2)$$

5.3.3 Efficiency

When r is set in this fashion, all profitable projects are undertaken. A project is profitable if its expected value is above the cost of funds:

$$\pi R_g + (1 - \pi)R_b > R_f \quad (5.3)$$

Since the zero-profit condition is met, we know that

$$\pi r + (1 - \pi)R_b = R_f \quad (5.4)$$

If we subtract the previous inequality from this equality, we get:

$$\pi R_g - \pi r > 0 \quad (5.5)$$

$$R_g > r \quad (5.6)$$

which means that the expected value for the borrower will be positive and the borrower will undertake the project:

$$\pi(R_g - r) > 0 \quad (5.7)$$

Overall, when borrowers have profitable projects and when the bank sets a r to satisfy the zero-profit condition, all profitable projects are undertaken. The world is perfect!

5.4 Informational Problems

Unfortunately, the actual world is not perfect. In the previous example, the bank knew exactly the borrower and the type of project. In reality, banks rarely know that much about borrowers. The next examples will describe situations when banks do not have perfect information.

5.4.1 Adverse Selection

Assume that there are two types of borrowers: safe and risky borrowers. Furthermore, assume that the bank knows the prevalence of the types, but cannot distinguish between the two types of borrowers. Safe borrowers have projects that always have a payoff of R_s , while risky borrowers have projects that have a payoff of R_g with a probability of π and a payoff of R_b with a probability of $(1 - \pi)$ whereby $R_g > R_b$. There is a share α of safe borrowers and a share $(1 - \alpha)$ of risky borrowers. Under those parameters, the zero-profit condition becomes:

$$R_f = \alpha r + (1 - \alpha)(\pi r + (1 - \pi)R_b) \quad (5.8)$$

There is a probability of α that the lender faces a safe borrower who will always pay back the loan. There is also a probability $1 - \alpha$ that the lender faces a risky borrower. Risky borrowers will pay back r with probability π , and will pay R_b with probability $1 - \pi$.

Solving for r , we get:

$$r = \frac{R_f - (1 - \alpha)(1 - \pi)R_b}{\alpha + (1 - \alpha)\pi} \quad (5.9)$$

The r that solves this equation could be greater than R_s . In this case, it would be unprofitable for safe borrowers to take the credit and undertake the project. Adverse selection forces safe borrowers out of the market and makes it impossible for them to undertake their project, even though safe projects are profitable ($R_s > R_f$).

Anticipating that safe borrowers will not borrow, banks now increase r to satisfy the zero-profit condition when only the risky types borrow:

$$\pi r + (1 - \pi)R_b = R_f \quad (5.10)$$

Numerical Example Assume that 90% of borrowers are risky. When their project is successful (probability of 50%) they get 180. If it is not, they get 50. Safe borrowers always get 110. The cost of funds (R_f) is 105. The interest rate charged by the bank when both types of borrowers are on the market is:

$$r = \frac{105 - 0.9 \cdot 0.5 \cdot 50}{0.1 + 0.9 \cdot 0.5} = \frac{82.5}{0.55} = 150 \quad (5.11)$$

At that rate, safe borrowers always make a loss ($110 - 150 = -40$), so they do not borrow, even if their project is profitable ($110 > 105$). The bank anticipates this decisions. The equilibrium interest rate is therefore:

$$r = \frac{105 - 0.5 \cdot 50}{0.5} = \frac{80}{0.5} = 160 \quad (5.12)$$

At that r , risky borrowers are still borrowing, because $0.5 \cdot (180 - 160) + 0.5 \cdot 0 > 0$. All in all, safe borrowers do not undertake a project (efficiency loss), but risky borrowers do.

5.4.2 Ex Ante Moral Hazard - Unknown Projects

All borrowers are now the same, but they have different projects. The lender cannot observe which project is undertaken, and therefore cannot make r conditional on the project chosen. The borrowers choose the project with the highest expected payoff for themselves. The payoff of the safe project is always $R_s - r$. The payoff of the risky project for a borrower is $R_g - r$ when the project is successful and 0 otherwise. The borrower will choose the risky project over the same project if

$$\pi(R_g - r) > R_s - r \quad (5.13)$$

The lender anticipates the decision of the borrowers, and sets r to fulfill its zero-profit condition conditional on the preferred project. Notice that R_b does not play a role in the decision of the borrower. A borrower would be glad to increase R_g while decreasing R_b , because his payoff only depends on R_g and not on R_b . Lenders, on the other hand, would not benefit from an increase in R_g , because they only receive r if the project is successful, but they would benefit from a higher R_b . There is therefore a conflict between the interest of the borrower and those of the lender. Furthermore, there could be a conflict between the choice of the borrower and the optimal project for society. A project may have the highest expected value, but still not be chosen by the borrower as we will see in the next example. In mathematical terms, $R_s > \pi R_g + (1 - \pi)R_b$, but $\pi(R_g - r) > R_s - r$

Numerical Example Assume $R_s = 120$, $R_b = 100$, $R_g = 130$, $\pi = 0.5$, and $R_f = 110$. The safe project is better for society than the risky project, because the expected payoff of the former is 120, and the expected payoff of the latter is 115. However,

$$120 - r < 0.5(130 - r) \tag{5.14}$$

$$55 < 0.5r \tag{5.15}$$

$$r > 110 \tag{5.16}$$

which is necessarily the case since $r > R_f$ and $R_f = 110$.

The optimal project is not chosen due to moral hazard. As in the case of adverse selection, the asymmetry of information leads to a welfare loss for society.

5.4.3 Moral Hazard - Unknown Outcomes

In the two previous sections, the bank could distinguish between the good and the bad outcomes. Such an assumption may not always hold. If the entrepreneur sells his products on a foreign market, for example, the bank cannot observe if the entrepreneur is successful or not. The lender must therefore rely on the statement from the entrepreneur to determine whether the outcome was good or bad. If the outcome is good and the borrower says the truth, his payoff will be $R_g - r$. If the outcome is good and the borrower lies, his payoff is $R_g - R_b$. If $R_b < r$, then $R_g - r < R_g - R_b$. In words, it is always optimal for the borrower to lie and pretend the outcome was bad¹.

If the lender always receives R_b , it is impossible to fulfill the zero-profit condition, because $R_b < R_f$. The lender will leave the market, and entrepreneurs will no longer be able to finance their projects. This outcome is worse than the two previous ones, because it means that the whole financial system breaks down.

¹One can easily show that when the outcome is bad, it is always better to tell the truth.

5.4.4 Terminology

Here is a review of the basic terminology:

- π : probability of success of a project
- α : share of safe borrowers
- R_g : payoff of a project if the outcome is good
- R_b : payoff of a project if the outcome is bad
- R_s : payoff of a project when it entails no risk (safe projects)
- R_f : payoff of a risk free investment like government bonds
- r : amount paid by borrowers back to the bank
- c : value of collateral (it's in the next chapter...)

5.5 Empirical Evidence

Even though these models probably capture some important issues on the lending market, it is very difficult to assess the extent of these informational problems in the real world. Karlan and Zinman (2009) perform an RCT to assess the presence of adverse selection. They sent out credit offers to 58 000 South-African households. Some of them received an offer (contract 1) with a low interest rate (r_{low}), and some of them received an offer (contract 2) with a high interest rate (r_{high}). Once a household accepted contract 2, the interest rate was lowered to r_{low} .

Adverse selection predicts that both safe and risky borrowers will accept contract 1 (r_{low}), but that only risky borrowers will accept contract 2 (r_{high}). If this self-selection takes place, one would expect the default rate to be higher for contract 2 than for contract 1. If there is a large difference in default rate between both, we can conclude that there are significant differences between safe and risky borrowers. This conclusion is only true if there is no other mechanism at work. The interest rate in contract 2 was lowered for this reason: to avoid moral hazard. A higher interest rate could encourage people to choose risky projects (ex-ante moral hazard) or to lie about outcomes to avoid paying the interest rate (ex-post moral hazard). Since the interest rate paid is the same for both contracts, any difference must be due to adverse selection. The authors find no significant difference between the default rates for both types of contracts.

To test for the presence of moral hazard, they make another offer (contract 3): a high-interest rate (r_{high}), but no change afterwards. The types of households accepting contract 3 would also have accepted contract 2 and vice-versa. There is therefore no adverse selection taking place. Borrowers, however, could choose different types of projects depending on the interest rate paid: borrowers paying r_{high} could choose riskier projects, and therefore default more often. Again, the authors find no significant increase in the probability of default.

This study would therefore suggest that there is neither adverse

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selection nor moral hazard on credit markets. It is however important to keep in mind that those offers were sent to consumers and not to businesses. It is therefore unclear whether these conclusions hold for businesses who can choose between projects. The causality channel is clear, but the external validity is less so.

Chapter 6

Overcoming Informational Asymmetry

6.1 Introduction

This section will study different solutions that have been implemented to address adverse selection and moral hazard. First, we will focus our attention on mechanisms used in developed countries: collateral, equity and dynamic incentives. We will then turn our attention to developing countries to explain other mechanisms: ROSCA and group-lending. The chapter will conclude with some empirical evidence on the effectiveness of these mechanisms.

6.2 Solutions in Developed Countries

6.2.1 Collateral

A collateral is an asset that is pledged by the borrower in case of non-payment. The lender receives the collateral if the borrower defaults, thus partially removing limited liability. The value of the collateral increases the payoff of the bank when the borrower defaults. The collateral (c) can actually remove any risk for the bank if $R_b + c = R_f$. In such a case, the loan will be riskless and $r = R_f$. Even when $R_b + c < R_f$, the presence of the collateral reduces the risk born by the bank, and therefore reduces the interest paid by the borrower. The zero-profit condition becomes:

$$R_f = \pi r + (1 - \pi)(R_b + c) \quad (6.1)$$

and the interest rate is:

$$r = \frac{R_f - (1 - \pi)(R_b + c)}{\pi} \quad (6.2)$$

which is lower than without collateral. The collateral could reduce the interest rate below the threshold that makes it profitable for safe borrower to borrow, thus eliminating adverse selection.

Furthermore, collateral can allow banks to offer different types of loans targeted at different types of borrowers. Some loans can include a high interest rate and no collateral, while other loans can require a low interest rate and some collateral. Risky types will

prefer the first loan if:

$$\pi(R_g - r_{high}) > \pi(R_g - r_{low}) - (1 - \pi)c \quad (6.3)$$

and safe types will choose the second loan if:

$$(R_s - r_{low}) - 0 \cdot c > R_s - r_{high} \quad (6.4)$$

If both inequalities are met, both types can borrow. There is therefore no adverse selection, because all projects are undertaken.

Numerical Example: Adverse Selection Assume that $\alpha = 0.9$, $\pi = 0.5$, $R_g = 180$, $R_b = 50$, $R_f = 105$ and $R_s = 110$. We have shown previously that adverse selection arises. If we introduce the following two contracts. Contract 1 has an interest rate of 105 and a collateral of 60, and contract 2 has an interest rate of 160 and no collateral. Safe borrowers will prefer contract 1 to contract 2: $110 - 105 > 110 - 160$. Risky borrowers will prefer contract 2 to contract 1 if:

$$0.5 \cdot (180 - 160) > 0.5 \cdot (180 - 105) - 0.5 \cdot 60 \quad (6.5)$$

$$10 > 37.5 - 30 \quad (6.6)$$

With these two contracts, the lender can now provide loans to both types of borrowers.

Collateral can also eliminate moral hazard, because it makes the risky project less attractive to the borrower. Indeed, when the risky project fails, the borrower loses collateral. Collateral can therefore ensure that borrowers choose the safe project if:

$$\pi(R_g - r) - (1 - \pi)c < (R_s - r) \quad (6.7)$$

Numerical Example: Moral Hazard Assume $R_s = 120$, $R_b = 100$, $R_g = 130$, $\pi = 0.5$, and $R_f = 110$. We have previously shown that borrowers choose the risky project. When a collateral of 20 is introduced, the safe project is chosen if:

$$(120 - r) > 0.5 \cdot (130 - r) - 0.5 \cdot 20 \quad (6.8)$$

$$130 > r \quad (6.9)$$

which will necessarily be the case, because $r < R_g$ for any project to be completed.

Collateral is used widely in developed countries. A mortgage, for example, is a form of collateral. If the borrower stops paying back the loan, the lender takes the house. The use of collateral is, however, more difficult in developing countries. First, if borrowers have no asset, it is difficult for them to pledge anything as collateral. Second, the ownership of assets requires documentation. A farmer may have been farming land all his life, but he may not have

any piece of paper recognizing his ownership. If the farmer cannot provide evidence of his ownership, then the bank cannot accept the land as collateral. Third, the bank could come into difficulties claiming the collateral in the case of default if the judicial system is weak. Anticipating these difficulties, the bank may wish not to ask for collateral.

6.2.2 Equity

Another way to address moral hazard is to finance a business through equity. Equity allows the equity-owner to claim a share of the revenues. If a person owns γ percent of a firm, then he is entitled to γ percent of the income generated by this firm. When choosing between the safe and risky project, the entrepreneur who still owns $(1 - \gamma)$ percent of the firm will choose the safe project if:

$$(1 - \gamma)R_s > \pi(1 - \gamma)R_g + (1 - \pi)(1 - \gamma)R_b \quad (6.10)$$

$$R_s > \pi R_g + (1 - \pi)R_b \quad (6.11)$$

In other words, the entrepreneur will choose the safe project if it is the one with the highest expected payoff for society. Equity removes the conflict between lender and borrower, and therefore solves the agency problem.

Equity is used widely in developed countries. Venture capital, for example, uses a mix of debt and equity to address moral haz-

ard issues. One challenge of equity is determining what is the fair share of the company (γ) that an investor should receive for a certain amount of money¹. To perform this task, one needs to evaluate the company and its future income. Such a task is daunting even for firms in developed countries where there is an abundance of information. It is therefore very difficult to implement in developing countries.

6.2.3 Dynamic Incentives

The last mechanism to address informational asymmetry is to provide dynamic incentives. The lender can induce good behavior from the borrower by increasing the loan if the borrower pays back and by threatening to ban the borrower from future lending if he defaults on his loan. This threat changes the incentives of the borrower, because lying becomes more costly. A borrower will now pay back if:

$$(R_g - r) + V > (R_g - R_b) \quad (6.12)$$

whereby V is the value of keeping a good relationship with the bank. If the borrower were to default, he would lose the possibility to borrow in the future and the possibility to grow his business.

Such a procedure is normal in developed countries, because bor-

¹This challenge makes TV programs like Dragon's Den the more interesting.

rowers can be easily identified and because there is a central repository of information (credit bureau) that allows banks to share information on borrowers. Since there is generally no identification procedure in developing countries, it is very difficult for a bank to ban someone from further credit. If a bank operates as a monopoly, it may be possible to keep track of borrowers who have defaulted on its loans. If there is more competition, borrowers can change banks and always start with a fresh slate and never lose V .

6.3 Solutions in Developing Countries

The biggest difference between developing and developed countries is the access to information. In Canada, the social insurance number (SIN) serves as identification. If you default on a loan, future lenders will learn about it by using your SIN and ban you from future credit. Very few developing countries have such identification policies. Since information is scarce, people with information like money-lenders can ask for high interest rates and make large profits. Outsiders, like banks, cannot compete, because they do not know the people and it would be very costly to gather this information. This section presents solutions that rely on the information held within the community.

6.3.1 Independence

Before starting this section, it is important to introduce the concept of statistical independence. Consider two events: sunshine in Kingston and sunshine in Timbuktu on any given day. Is the probability of sunshine in Kingston different knowing that there is sunshine in Timbuktu? Not really. In other words, the probability of sunshine in Kingston is independent of the probability of sunshine in Timbuktu.

Now consider two other events: sunshine in Kingston and sunshine in Toronto. Is the probability of sunshine in Kingston different knowing that there is sunshine in Toronto? Yes. If there is sunshine in Toronto, odds are that it is also sunny in Kingston. In other words, the sunshine in Kingston is not independent of sunshine in Toronto.

Statistical independence matters when we calculate the probability of two events happening. When two events are independent, we can simply multiply their probability to know the probability of both events happening². If the probability of sunshine in Kingston is 30% and 90% in Timbuktu, the probability that it's sunny in both cities is 27%. If the probability of sunshine in Toronto is 40%, the probability that it's sunny in both Kingston and Toronto is not 12%. The probability of both events would be very close to 30%, because the probability of sun in Kingston given that it's

²From Bayes' rule: $P(A|B) = \frac{P(A \cap B)}{P(B)}$. If $P(A|B) = P(A)$, because A and B are independent, then $P(A \cap B) = P(A)P(B)$.

sunny in Toronto is probably close to 100%. Statistical independence will play a major role when trying to assess the probability of two projects being successful in a group.

6.3.2 ROSCA

The first type of organization developed to provide loans was the Rotating Saving and Credit Association (ROSCA). Such an association is composed of a certain number of people who meet regularly. At each meeting, each member contributes a certain amount, and one member takes the total amount. For example, in a ROSCA made of 10 people each contributing 10 USD, one person takes home 100 USD. This ROSCA would meet 10 times, and each time a different person would take the total amount. After 10 meetings, the ROSCA would dissolve.

ROSCAs work well because members choose other members. If a good borrower wants to join a ROSCA, he will choose the one composed of good borrowers like himself. The other borrowers will know he is a reliable person and let him join. Choosing an unreliable person could jeopardize the ROSCA, because this person may simply leave once he has received the total amount and never pay back. If the ROSCA is unsure about a person, it can put that person last. If the person contributes throughout the cycle, he will receive the total amount. There is therefore no risk for the ROSCA. As the person proves he is reliable, he will move up the

ranks in future cycles. The person responsible for the ROSCA is usually the most trustworthy person and therefore the first person to receive the total amount.

ROSCAs also work well, because they serve as a forum. One can ask for advice and get to know other people in the community with similar objectives. These gathering also serve to monitor and confront members. If one member finds that another member is engaging in risky behavior, the ROSCA can decide to exclude the risky member or ask for improvements. In good times, the ROSCA offers advice; in bad times, the ROSCA monitors its members.

The main advantage of a ROSCA is its simplicity. The ROSCA only needs to keep track of who received the pot and who shows up at the meeting. Nobody guards any large sum of money or keeps track of numerous deposits or withdrawals. A ROSCA is also temporary. Once everybody has received the total, members can leave the ROSCA and new members can join it. This simplicity is also an inconvenience. Since everybody receives the same amount, all members of the ROSCA must save towards similar goals. A firm that wants to borrow to purchase an expensive machine, for example, will not be able to use a typical ROSCA. It would have to find other firms with similar needs to create one. Having to collaborate with a large number of people can also be a disadvantage. It may be difficult for some individuals to take part in such a group if they are ostracized in the community or live far away.

At first glance, the ROSCA does not make sense for the last

person. This person could put money aside whenever the ROSCA meets, and he would receive the same lump sum at the end as if he had joined the ROSCA. If the last person leaves, the person who has second-to-last is now last and faces the previous problem. If the ROSCA does not make sense for the last person, this person will also leave until the ROSCA disappears. The reason why ROSCAs exist is that saving is not easy for poor people. First, it is not profitable for banks to cater the saving needs of poor people, because it is very costly to keep track of these small transactions. Banks therefore introduce fees that make it unprofitable for poor people to use their services. Without banks, it is difficult to keep anything safely. Second, there is always pressure to spend for oneself, for the family or for the community. The ROSCA provides social pressure to save. Not making a payment on the ROSCA is very shameful. Participants therefore discipline themselves to make regular contributions, which ensures that they receive the total sum and are able to make a large purchase like a sewing machine. A mother who knows that she will owe certain school fees on a certain day can ask to receive the pot on that day to bring it immediately to the school officials. There is therefore no temptation to spend the money on small luxuries.

6.3.3 Group-lending

Groups are generally smaller than ROSCAs: usually two to four people who ask a bank for a loan. The first person in the group receives the loan. When this person pays back, the next person receives the loan and so on until the last person. Since the loan to the second person is conditional on payment from the first person, the group shares the liability for the loan. If someone does not pay back, the rest of the group must reimburse the loan or they are blocked from future loans. Members of a group therefore have strong incentives to choose the other members of the group wisely.

Assortative Matching For simplicity, let us assume groups of two borrowers. In a given village there are lots of people interested in forming groups. These people all have independent projects with a certain probability of success (π). When a project is successful, the payoff is R_g . If a borrower “i” forms a group with borrower “j”, he will have the following expected payoff:

$$\pi_i\pi_j(R_g - r) + (1 - \pi_j)\pi_i(R_g - 2r) \quad (6.13)$$

In words, if both borrowers are lucky (probability $\pi_i \cdot \pi_j$) borrower “i” has a payoff of $R_g - r$ (payoff of his project minus repayment). If borrower “i” is lucky and borrower “j” is not (probability $(1 - \pi_j)\pi_i$) borrower “i” has to pay back his loan and the one of borrower “j”. If borrower “i” is unlucky, he gets nothing. Notice how

the assumption of independence of projects simplified the calculations.

To better understand the expected payoff, we can simplify it to the following expression:

$$\pi_i(R_g - 2r) + r\pi_i\pi_j \quad (6.14)$$

It is clear from this expression that the expected payoff of borrower “i” increases when π_j increases. In other words, everybody wants to form groups with borrowers that have a high probability of being successful. Borrowers with a high probability of success also want to form groups with other borrowers with a high probability. In the end, groups are formed of borrowers of the same type: so-called assortative matching.

Perspective of the Lender The lender knows that borrowers match assortatively. The lender will therefore have the following expected payoff for a loan to a group of two borrowers with independent projects:

$$2[\pi_i^2 r + \pi_i(1 - \pi_i)r + (1 - \pi_i)\pi_i r + (1 - \pi_i)^2 R_b] \quad (6.15)$$

The probability of getting R_b has therefore shrunk, because it requires a double default, which is less likely than a single default. One can therefore expect the interest rate charged by the bank to be lower when groups borrow. If the interest rate is lower,

the probability of adverse selection will shrink. Furthermore, the lender can also avoid moral hazard. Since each borrower does not want to pay the loan of the other borrower, each borrower will make sure that his partner chooses the safe project and pays back. Instead of having to monitor the borrower, the lender puts the borrowers in charge of monitoring each other. They do so, because it is in their interest.

Throughout this discussion, we have assumed independence. If borrowers undertake similar projects in the same area, this assumption is not realistic. If the payoffs of the projects are highly dependent, the probability of default (i.e. receiving R_b) does not change significantly from the individual to the group loan. We have also assumed that the payoffs of the projects are sufficient to cover the loan of the partner. This assumption may not be realistic when projects are not highly profitable. If borrowers are unable to pay back the loan of their partner, group-lending does not really improve the outcome for the lender.

Advantages/Disadvantages Just like ROSCAs, group lending solves informational asymmetry problems. The main advantage of group-lending versus the ROSCA is its size. It is much easier to find a partner than it is to find 9 or 10 other people with similar objectives to form a ROSCA. This flexibility, however, comes at a cost. One now needs microfinance institutions to keep track of loans issued and repayments. These institutions must generate revenues

to pay rent and salaries. Unfortunately, small loans do not generate a lot of income, but they require as much bookkeeping as larger loans. Microfinance institutions, therefore, tend to prefer established companies that need larger loans. ROSCAs are therefore better tailored to the poorest of the poor.

6.3.4 Empirical Evidence

In theory, ROSCAs and group-lending have nice theoretical properties to reduce information asymmetry and thus increase the efficiency of the financial system. The question is now whether they work. This question may seem strange, because if microfinance institutions are profitable, there is no cost. If a policy has a benefit and no cost, it must be good. As a matter of fact, most microfinance institutions are only profitable because they receive subsidies or loans at preferential interest rates. Both measures are costly. Understanding whether microfinance works is therefore a relevant policy question.

Before answering this question, we need to ask ourselves what we expect from microfinance. How could it influence the livelihoods of poor people? Microfinance could increase the wealth of borrowers. As much as wealth is interesting, it is very difficult to measure. If we cannot measure wealth, we could study variables that depend on it (consumption, health or education of children) and that are easier to measure. Maybe access to finance does not

increase consumption, but it makes it smoother. Imagine a farmer who usually go through a period of severe poverty at the end of the winter, but who can now generate some income sowing. His average consumption has not changed much, but for one or two months in the year, it has increased a lot.

Not only do we have to worry about the variable we should measure, we also have to think about time frame. One could measure the outcome variable right at the time when the loan is taken, but it would be surprising to find any impact. One could wait one, two or five years before collecting data. These different time frames will provide information on short- and long-term impacts. In the short term, borrowers may work harder, and therefore have worse health outcomes, but in the long-term, their growing businesses could provide them with sufficient income to live a healthy life. Long-term studies are challenging, because of attrition: losing track of participants. Borrowers may move, and it may be hard to find them after a number of years. If unsuccessful candidates have a higher probability to move, because they are ashamed of having failed, the researcher may not capture the real impact. Assume that people similar to the borrowers, but who did not borrow have a wealth of 100 two years after the loan was granted. Borrowers can be successful and have a wealth of 150 or they can fail and have a wealth of 50. There's a 50% chance of success. Overall, the expected wealth of borrowers is therefore 100, the same as the wealth of non-borrowers. If the researcher can only find successful

borrowers, because the other ones have moved away, he will assume that the expected wealth of borrowers is 150, because these are the only borrowers he can find. He will therefore conclude that microfinance increases wealth by 50% and encourage the propagation of microfinance. Attrition can therefore significantly bias (upwards or downwards) research results.

In the previous example, we assumed we could find people similar to the borrowers (counter-factual) who were not affected by the loan, but this task is easier said than done. Some people who did not borrow might still have been affected by the loan. Imagine a small village where one person takes up a loan to start a business. This entrepreneur will probably need supplies and labor. He will therefore purchase goods from other entrepreneurs and hire villagers. These people did not borrow, but they were affected by the loan. If we take them as a comparison group, we are underestimating the impact of microfinance. Even if we choose people who were not affected by the loan, one has to wonder why these people did not borrow. In other words, borrowers could be significantly different from non-borrowers (third variable); borrowers had a business ideas, and they could write a business plan to convince a microfinance institution to lend them money. Many unobservable skills are necessary to transform an idea into a business. Borrowers could be more creative, better communicator, more persistent than non-borrowers, and these skills could influence the outcome variable. One solution to address this issue is to use new borrowers as

control and experienced borrowers as treated group. Both groups borrowed, so they both must have similar skills. It is however unclear why the new borrowers did not start borrowing earlier. Are experienced borrowers trailblazers and new borrowers, followers? In this case, there would be a significant difference between both groups and we would not solve the omitted variable problem. Coleman (1999) takes advantage of a natural experiment to address the endogeneity. An NGO wanted to lend to a number of groups in Northern Thailand. This NGO advertised the program, and groups of interested borrowers formed. Unfortunately, the funds were cut. It was impossible to provide funds to all groups, so it randomly chose some groups. This issue was unfortunate for borrowers, but an excellent opportunity for researchers, because it made it possible to compare the outcomes of similar groups: some received funding and others, did not. Borrowers and non-borrowers were randomly chosen, so there was no issue with omitted variable. Overall, the paper finds that microfinance has no significant impact on a series of variables. This result could be due to the fact that Northern Thailand has good financial institutions. An additional financial institution may therefore not have increased significantly access to funds. External validity is always an issue.

Banerjee et al. (2013) use an RCT to address this issue. Spandana, an Indian microfinance institution, entered the microfinance market in Hyderabad. Some neighborhoods were randomly chosen

to receive a branch. Overall, the researchers find that households in the neighborhoods served by Spandana had a higher probability of creating a new business (5 vs. 7 percent), they were more likely to buy durable goods, but they consumed less. Overall, this study finds a modest but positive impact of microfinance.

These two studies suggest that microfinance may not be the silver bullet that will eradicate global poverty. There are many reasons behind this sobering conclusion. First, not everybody is an entrepreneur. Microfinance enables entrepreneurs to start their business, but it does not turn the average person into an entrepreneur. Second, entrepreneurs in poor countries tend to start very simple businesses, like street vending. A loan to start such a business will not transform the existence of these entrepreneurs, but may help them through hard times. These ventures are not very profitable, because there are already many street vendors. It is therefore a very competitive market with a limited potential for profit. One should, however, not think that all investments in developing countries are unprofitable. Mel, McKenzie, and Woodruff (2008) gave capital to small businesses and monitored them afterwards. They noticed an increase in profit of 50 to 60 percent. Some businesses may be able to grow their profitability, but maybe not the very small businesses targeted by microfinance institutions. Finally, microfinance alone will not improve infrastructure problems, corruption or all the other problems plaguing developing countries. If people do not start businesses, because it is impossible to trans-

port goods to the next village, providing loans will not change their behavior.

6.4 Looking Forward

Even though group-lending was the beginning of microfinance, more and more institutions are turning away from it. Some good borrowers simply do not want to get involved in the businesses of others or deal with the social pressure. Similarly, it can be very costly to monitor other borrowers or take part in weekly meetings for entrepreneurs in rural areas..

Another traditional tool of microfinance has been frequent and early repayment. Borrowers are generally asked to start paying back a week after the loan was granted. Traditionally, a microfinance organization will determine the size of the loan based on how much money a household can devote to paying back without considering the payoff from the project. If the amount owed does not depend on the project, borrowers can start repaying immediately and repayment is less risky. The lender can also collect a lot of information through the frequent repayment. Such tight deadlines, however, make it impossible for borrowers to make a big investment, which would only produce income after a certain period of time. It is therefore not surprising that borrowers engage in street vending or similar activities. Microfinance does not cater the needs of ambitious entrepreneurs. Group lending and frequent

repayment were designed to reduce risk-taking, but risk is not always bad. Without risk, there would be no microsoft, google etc. Maybe too much emphasis has been put on default and not enough on performance.

Microfinance is actually evolving towards normal finance. Collateral, for example, is playing an increasingly larger role. Even if it is not very valuable, collateral could reduce moral hazard if borrowers care about the collateral. Take, for example, a gift from a deceased grand-parent. It has very little value, but it would be very hard for a borrower to give it away. Such objects can therefore prevent moral hazard. Another way to make use of collateral is to ask borrowers to first become savers. Once a certain amount has been saved, a person can use this amount as collateral to borrow money.

Microfinance institutions can also rely on dynamic incentives: borrowers who pay back receive greater loans, and those who do not are banned. Even though Karlan and Zinman (2009) show that dynamic incentives reduce default rates³, banning borrowers from future loans could be too harsh. Henry Ford, for example, went bankrupt before being successful. Lenders need to discipline borrowers, but it is also important to forgive and let borrowers learn from their experience. The growth of microfinance seriously jeopardizes dynamic incentives in the absence of centralized information. Assume there are five lenders in a village and

³In their case, they offer lower interest rate in the future to borrowers who pay back.

no centralized information. If a borrower defaults, he can still turn to another borrower who not know anything about the initial default. While competition is generally good, in this case, competition could destroy the market by eliminating dynamic incentives. When borrowers default, they reduce the profitability of microfinance institutions, and could ultimately lead to bankruptcy. If a microfinance institution experiences financial problems, the value of the relationship decreases, because the institution may stop existing in the near future and will be unable to provide more loans even if the borrower pays back. In such cases, moral hazard can lead to a self-fulfilling prophecy. Profitability is therefore a priority for the microfinance sector. As mentioned above, profitability comes at the cost of smaller borrowers, because they do not generate a lot of income, but they cost as much. If small borrowers are no longer served by microfinance, its usefulness as a poverty reduction tool will be jeopardized. To avoid this trade-off, some institutions are being creative to reduce cost. Cell phones, for example, are being used to transfer funds. Lenders can cut their cost by automatizing the process and borrowers need not travel far to make payments. Some efficiency gains can be made to cater the needs of the poor.

Chapter 7

Human Capital

7.1 Introduction

Microfinance may not work, because people do not have sufficient human capital to make use of it. Human capital can take the form of education or health. In the first section of this chapter, we consider what is common to both forms of human capital. We then study the return to education, issues specific to health and other related problems. Finally, we discuss solutions that have been implemented to improve health and education outcomes.

7.2 Commonality of Education and Health

7.2.1 Long Term Investments

Education and health are both long term investments. One goes to high school with the hope that 5 to 10 years later, one will earn

a higher income. Similarly, one exercises with the hope that it will reduce the chances of obesity or heart problems. In both cases, one suffers a cost now to receive a benefit much later. A lot of discipline is required to carry through such long term investments. There is always an incentive to skip the gym today. Skipping once will not have any substantial long term impact, but it provides a benefit. Following this logic, one would skip all the time, which then has a big impact. It is very difficult to discipline oneself when the reward is down the road but the cost must be paid now. People therefore tend to under-invest in education and health.

7.2.2 Information

If the reward takes place in the long term, it is also very uncertain. People may not know the payoffs of different decisions. They need to have access to trustworthy information to make the right decision. Take a sick person who is examined by a doctor who prescribes some medication. The drug may taste bad or it may be burdensome to take it, but the person still proceeds with the treatment, because they trust the doctor's advice. The same thing is true about education. Most people go to university, because they think they will earn more if they do than if they don't. Without this information, people would take the wrong decision. It is very difficult for people to gather information on long-term outcomes. Everybody has some beliefs about the best strategy against a cold,

because they are frequent. Beliefs about the best treatment against tuberculosis are more difficult. People therefore rely on experts. Such experts are scarce in developing countries or they may not be trusted by the local population, because they do not belong to the same ethnic group or because they come from the capital. It is therefore difficult for people to take informed decisions relating to education and health.

7.2.3 Externality

Finally, health and education decisions cause externalities. In other words, my decision affects other people. If I choose to be immunized against the flu, I reduce my probability of getting the flu. I also decrease this probability for people around me who will not be infected by me. These people do not factor in my decision, but they are affected by my decision. Moreover, they do not compensate me for the benefit they incur through my behavior. In the presence of externalities, people do not receive the social benefit of their action, so they tend to under-invest.

Moreover, one has the incentive to free-ride the externality. If everybody I know receives the vaccine, my probability of being infected by the disease is zero. There is therefore no reason to be vaccinated. If everybody thinks this way, nobody will be vaccinated, and everybody will be sick.

In the case of education, externalities can also lead to match-

ing problems. To be productive, one needs other people who are productive. Think of a hockey team. Take the best forwards and defense in the league, but put an average person in the net. Will this team win games? No. Similarly, if you are a consultant, you need to rely on good lawyers, accountants, IT people to perform well. Assume a person is born in a country where nobody has any education. Will that person get education? Probably not. It will not be profitable for that person to be the only one with an education, because there will be nobody with whom to work. An investment in human capital is sometimes not profitable, because the level of human capital in the economy is too low: poverty trap.

Such a poverty trap can also affect a group of the population. Assume that there are green and purple people, but they do not work together. Green people are highly educated, but purple people are not. There is no incentive for a purple person to get education, because there will not be any other educated purple person with whom to work. Ethnic segregation can therefore create poverty traps for certain ethnic groups.

7.3 Education

7.3.1 State of Education

Education is so essential for development that it is enshrined in the second Millennium Development Goal: "to ensure that, by 2015,

children everywhere, will be able to complete a full course of primary school.” Attending school is important, but the ultimate goal is learning. One would expect that schooling would automatically lead to learning. Unfortunately, it doesn’t. In India, close to 35 percent of children (7 to 15) could not read a simple paragraph, and almost 60 percent of the same age group could not read a simple story, even though they attend school (Banerjee and Duflo, 2011). The problem is that schools are highly dysfunctional. The World Absenteeism Survey reports that teachers miss one out of every 5 days of work. In India, when teachers are in school, they are not in front of a class 50 percent of the time they should be.

Banerjee and Duflo¹ argue that the problem is that teachers do not think that investing in weak/young students is profitable. Teachers therefore do not believe that teaching is worthwhile. This belief reformulates the poverty trap: students with low capital (skills) do not improve their skills much when we invest in them. A similar reasoning can be used to understand why girls tend to receive less education than boys. If families think that investing in girls is not productive, then they will take them out of school. The underlying assumption behind the behavior of teachers and parents is that the return to education is low at the elementary level.

¹chapter 4 in Poor Economics

7.3.2 Return to Education

Determining the return to education is difficult, because education is endogenous: people choose their level of education. If certain characteristics influence this choice and if they also affect the outcome variable, the omitted variable problem makes it impossible to identify causality.

Duflo (2001) uses a natural experiment to address this issue. Between 1973 and 1978, 61 000 schools were built in Indonesia. This massive construction effort increased schooling in areas where schools were built. Children in those areas went to school longer, because it was easier for them to go to school not because they were more intelligent or motivated. On average, this policy increased schooling by 0.12 to 0.19 years, and raised earnings by 1.5 to 2.7 percent. Overall, the author estimates that one extra year of schooling would lead to an increase of income by 6.8 to 10.6 percent. These results indicate that the return to schooling is clearly positive. One reason why early education has such a high return is that it enables further education. A person who can read can then learn from a book. By reading more books, a person reads faster and can absorb more material. The more education one has, the easier it is to acquire even more education. In other words, there is an increasing returns to scale.

If the return to education is so high, why don't parents put more pressure on governments to reform the schooling system?

They may not know about it, and they may not be able to monitor teachers. If parents lack basic education, they are unable to monitor the progress of their children. A person who cannot read is unable to determine whether his child reads well or not. This vicious circle means that uneducated parents will have uneducated children.

7.4 Health

Health can also be affected by vicious circles: sick people are unable to work, and therefore become poor. Poor people cannot afford medication, and they cannot cure their disease. There is some evidence of long term consequences of health. In Latin America, for example, a child who grew up malaria free earns 50 percent more per year for his entire adult life (Bleakley, 2010). Developing countries are particularly prone to this type of vicious circle, because they are home to a number of serious diseases (malaria), they lack the basic infrastructure to keep those diseases at bay (water and sanitation) and they are missing a social net to prevent people falling into extreme poverty.

If becoming sick could have such dramatic consequences, one would expect people in developing countries to invest heavily in prevention, especially if it is inexpensive. Eighteen cents (PPP), for example, are sufficient to buy bleach to purify water and prevent waterborne diseases for a family of six for one month. Similarly,

an oral rehydration solution can prevent dehydration in cases of diarrhea and costs very little. Finally, bed nets to prevent malaria cost about 14 USD (PPP) and last for 5 years. Banerjee and Duflo² report that people in developing countries need to be encouraged to adopt healthy behavior.

Quality of care seems to be an important issue. Das and Hammer (2005) went in the field to assess the knowledge of medical doctors. They presented them with cases, and asked them which questions they would ask to this fictitious clients and what treatment they would recommend. On average, doctors tend to under-diagnose (ask too few questions) and over-medicate (give too much medication). Banerjee and Duflo argue that over-medication may simply be response to a demand from patients who seek the placebo effect (i.e. feeling good, because something has been done).

Government medical centers also seem to provide bad services. A large majority of them was closed when randomly visited by researchers. It is therefore understandable that poor people do not seek medical services if they expect a closed door. If poor people distrust government services, they will certainly not listen when government officials try to convince them to engage in preventive care.

As in the case of education, information seems to be key, but preventive care is a difficult sell. People don't feel better after a vaccination, so there is no immediate benefit. They may also

²chapter 3 in Poor Economics

not understand that prevention works only for certain diseases. If they suffer from an unrelated disease following the vaccination, they may think that the vaccine was ineffective or even caused the disease. Curative care is much easier. People feel bad before meeting the doctor and they feel better afterwards, because something was done (maybe a placebo effect). Such a treatment is expensive and often useless in the long term, but it has a pleasant short-term impact.

7.5 Related Problems

7.5.1 Nutrition

Nutrition could explain some issues relating to human capital. If poor people do not eat sufficiently, they are unable to invest in their human capital. There is, however, no evidence suggesting that the poorest people have a lack of food³. Banerjee and Duflo (2009), for example, find that between 56 and 78 percent of the total budget of households living with less than 1 USD (PPP) is spent on food. If food were an important issue for poor people, one would expect a share closer to 100%. Jensen and Miller (2008) also find that households who benefit from a positive income shock choose more expensive calories⁴ and not more calories.

³This is not to say that nobody is starving, but it does not seem to be an important issue for the average poor person in a developing country. Starvation, however, is an important issue in war-torn countries or regions affected by natural disasters.

⁴shrimps and meat in this Chinese study

If the quantity of food does not seem to be an issue, quality seems to matter. Iodine, for example, serves as a building block for the thyroid gland, which itself is responsible for the development of the brain in the fetus. Field, Robles and Torero (2009) use an RCT to show that babies born to mothers who received regular doses of iodine completed a third to half a year of schooling more than children in the control group. This increase in schooling could have important consequences for the earning potential of these children.

In spite of this evidence, a large majority of women do not take iodine supplements during their pregnancy. One may wonder why if the long-run return outweighs the cost? Again, the lack of information could explain this behavior. If women do not know that iodine will help their children, they will not be ready to pay for it.

7.5.2 Fertility

Large families could also be responsible for a lack of human capital and thus for poverty in developing countries. If parents had fewer children, they could focus more resources on each child and thus increase their health and education outcomes. To have fewer children, families would need to control their fertility through contraceptives. Perhaps families want contraceptives, but do not have access to them. Gibbons, Pitt and Rosenzweig (1993) study the impact of new family-planning clinics in Indonesia. They find that

there are more clinics in regions with lower fertility (reverse causality), but the increase in the number of clinics in a given region is not correlated with a decrease in fertility in a given region. It would therefore seem that clinics locate where there is a need for them, but they do not seem to decrease fertility. At least in this study, there is evidence that the demand for contraception is met. Maybe households do not want contraceptives.

To understand the demand for contraceptives, we need to dig into the household decision process. In many developing countries, men take household decisions, but it is generally women who are responsible for child-rearing. If men take the decision, but women carry the cost, the household could choose too many children if benefits outweigh cost for the man in the household, but what are the benefits of having children?

Most developing countries do not have retirement programs. People are expected to save for their retirement, but we saw from the ROSCA that saving is not easy. Children can be a form of saving. When the parent is unable to work due to old age, the child can provide support. In such a setting, having a lot of children means that there is a good probability that at least one or two of them will earn enough to be able to support the parents. High-fertility could therefore be a consequence of a bad financial system. We can therefore expect high fertility to continue until saving or insurance mechanisms are developed to cater the needs of the poor.

7.5.3 Brain Drain

Investing in the human capital of a population may not be a good investment for governments in third-world countries if these highly qualified people tend to leave the country afterwards. Brain drain reduces the incentives to invest. The only way governments can reduce brain drain is by offering a good infrastructure to enable talented people to be productive in their home country.

7.6 Solutions

7.6.1 Conditional Cash Transfers

If people take wrong decisions, governments must intervene to encourage them to make the right decision. One avenue used by governments is to introduce conditional cash transfers. A poor family, for example, can receive a certain amount per month but only if the children attend school and the family seeks preventive care. Schultz (2004) showed that Progresa, for example, increased secondary school enrollment from 67 to 75 percent for girls in poor Mexican households using a treatment discontinuity setting. Interestingly, similar programs in Malawi and Morocco reached similar outcomes but without making the payment conditional on certain behavior (Banerjee and Duflo, 2011). It would seem that parents do know what is good for their children, but they may lack the income to consider long-term objectives.

7.6.2 Selling or Giving?

Another avenue to increase demand for human capital is to provide services for free. In Canada, for example, flu shots are provided free of charge. One problem is that people do not value objects for which they have not paid. People who are receiving bed nets free of charge, for example, may simply not use them, while those who paid for them do. In a randomized controlled trial, Dupas (2010) finds no evidence in use across prices paid for bed nets. It would therefore seem that making people pay for a service does not increase their willingness to use it.

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Chapter 8

Role of the State

In developed countries, health and education are generally considered as part of the mandate of the state. The previous chapter has highlighted how developing countries are failing when providing both services. This chapter takes a closer look at other services provided by the state. To provide these services, the state needs to raise revenues. If the state has difficulty raising revenues to pay salaries, civil servants will pay themselves with corruption. Finally, some models in political economy could explain why democracies make mistakes.

8.1 The State and the Economy

The state is involved in economic activities. Consider the life of a company. First, an individual starts the company. Most countries require business owners to register. In Peru, de Soto took

10 months to register a textile business. A similar procedure only takes four hours in New-York. Such a high cost could deter the most motivated entrepreneur.

Once a firm is established, it may decide to purchase land to produce. Such a transaction requires notarized documents to clearly indicate ownership. Without such a notary system, nobody knows who owns the land, and a firm may not know if it is buying land from the rightful owner. Investors could lose their investment if the real owner were to come forward or contest the ownership claim. In case of conflict, the judicial system would determine who is the rightful owner. If the judicial process is slow, this procedure could be very costly. In the presence of uncertainty about ownership, entrepreneurs may simply avoid purchasing land altogether to avoid costly mitigation.

The firm will finally start to produce goods or services. Generally, production requires electricity. In Uganda, there was no electricity 89 days of the year which forced businesses to purchase generators at a high cost. Ninety-two percent of businesses in Nigeria have a generator. Once a product is finished, the firm will need to bring it to consumers using the road network. In Columbia 70 percent of roads are in poor conditions making transport very long and expensive. These firms cannot be competitive on international markets, because they face higher costs than firms in developed countries.

When the state fails to provide basic services, it is not profitable

to start or grow businesses. Bad public services therefore have very important economic consequences on economic growth.

8.2 Generating Income

8.2.1 Taxation

To provide public services, the state must raise revenues. In developed countries, taxation is the most important tool to collect money: employees pay income tax, and consumers pay consumption taxes. Both taxes require an important collection infrastructure. Indeed, the state must know where people work and all retailers must be connected with the taxation authority. Since developing countries lack this type of infrastructure, they use other methods to collect revenues which can have a large negative impact on growth.

8.2.2 Marketing Boards

Marketing boards were initially created to help farmers export their crop. Instead of finding an export firm or exporting by themselves, farmers simply needed to sell to the marketing board, which would then export on international markets. Due to its size, the marketing board could negotiate good prices for local crop. The producer would then receive a certain proportion of the international price. Governments quickly realized that they could exploit

their monopoly position to generate revenues, and the share of the price received by producers gradually shrank. Cocoa producers received 89 percent of world prices in 1949. By 1983, they were receiving only 6 percent of the world prices (Easterly, 2002).

Such a policy is obviously bad for farmers, but most importantly it prevents farmers from reacting to price changes. Imagine that there is a dire need for cacao in the world. The prices for cacao would increase. The cacao farmers, however, may not capture any of this increase, because the price they receive is capped by the marketing board. Farmers therefore do not react to changes in prices by adjusting their crop. Furthermore, if prices are artificially low, farmers have no incentive to produce efficiently using machinery or fertilizer.

8.2.3 Tariffs

Governments can also generate income by taxing imports: tariffs. Even though they generate income, such tariffs increase the cost of the imported goods for consumers and producers thus making it harder for them to compete on international markets. Take the example of a carpenter. Assume that the international price of one unit of wood is 100 and there is a tariff of 20 percent in country A on wood. Carpenters need one unit of wood and one unit of work (cost = 10) to produce a chair. The production cost of the chair in country A is therefore $100(1 + 20\%) + 10 = 130$. Firms abroad,

however, are able to produce the chair at a cost of 110. Country A now needs to introduce a tariff of $(130/110 - 1) = 18$ percent on chairs to protect the local carpentry industry and export subsidy to allow the carpentry industry to export. Tariffs undermine the competitiveness of sectors depending on these inputs.

The infant industry hypothesis is usually argued to justify tariffs. The idea is that an industry needs some time to reach a maturity and be competitive. The tariff is introduced by the government for a certain period until the industry has reached an optimal size. The problem is that the threat of removing the tariff is not credible. When it comes time to remove the tariff, the industry argues that it has not yet reached the optimal size. Removing the tariff now would jeopardize the whole industry and force thousands of workers (and voters) to unemployments. Parties therefore agree to keep the tariff until next time...

The broader problem with tariffs is that they limit international trade. Trade is good, because it allows countries to specialize in what they do best. Consider the following example of absolute advantage where two countries can produce cars and bicycles. It costs 5 units to produce one car and 20 units to produce one bicycle in country A, while it costs 10 units to produce one car and 10 units to produce one bicycle in country B. It costs less to produce cars in country A, and it costs less to produce bicycles in country B. In other words, country A has an absolute advantage in producing cars and country B has an absolute advantage produc-

ing bicycles. If both countries have 100 units, trade could increase overall production. Without trade, country A could produce 4 cars and 4 bicycles, and country B could produce 5 cars and 5 bicycles. Overall, the world would produce 9 cars and 9 bicycles. With trade, country A could produce only cars (20), and country B could produce only bicycles (10) and the two countries would trade. Overall, the world would now produce 20 cars and 10 bicycles with the same resources. Trade increased output by 11 cars and 1 bicycle.

Even if a country does not have any absolute advantage, trading is still advantageous. It costs 5 units to produce one car and 5 units to produce one bicycle in country A. In country B, it costs 10 units to produce one car, and 20 units to produce one bicycle. It costs less input to produce both goods in country A. In other words, country A has an absolute advantage in the production of both goods. Country B, however, has a relative advantage in producing cars. It costs 0.5 bicycles to produce one car in country B, while it costs one bicycle to produce one car in country A. Trade can be beneficial. Without trade, country A could produce 10 cars and 10 bicycles and country B could produce 6 cars and 2 bicycles with an endowment of 100. With trade, country B can produce 10 cars and no bicycle and country A can produce 7 cars and 13 bicycles. Overall, the economy produces 16 cars and 12 bicycles without trade, and 17 cars and 13 bicycles with trade. Again, trade increased total output, even though country B had no absolute advantage.

Even if trade is good for society, it may not be good for everybody. In the previous example, the bicycle producers in country A are unemployed once trade takes place if they cannot train to produce cars. Trade can therefore disadvantage some groups if they do not produce the specialty of the country. Canada, for example, specializes in the production of ideas. People in the manufacturing sector lost their jobs due to free trade agreements and they have difficulty retraining. For these people, trade is bad. If they have a strong lobby, they will be able to block welfare improvements.

8.2.4 Inflation

The final way through which a government can generate revenues is simply by printing money. When there is more money in circulation, each unit of money loses some of its value. It therefore takes more of each unit of money to buy a product. In other words, prices increase, and there is inflation. Zimbabwe is particularly notorious for inflation. In August 2008, the inflation was 471 billion percent. As of 2013, Zimbabwe no longer has a national currency.

Inflation acts as a tax on saving. Assume that you save 100 USD at the beginning of the year and the interest rate is 5 percent. A computer costs 100 USD, but the price will increase by 10 percent over the course of the year. At the beginning of the year, you can afford one computer; at the end of the year, you can afford $105 / 110 = 0.95$ computer. By saving, you lost 5% of a computer. The

real interest rate in this economy is therefore -5 percent. More generally, the real interest rate can be approximated using this formula:

$$\text{real interest rate} \approx \text{nominal interest rate} - \text{inflation} \quad (8.1)$$

People lose purchasing power when they save money. They will therefore save less when inflation increases. This behavior will have banks that will no longer have the liquidity to lend money to businesses. This problem is aggravated when a country has usury laws. Such laws prevent banks from charging an interest above a certain limit. If this limit is 20 percent and the inflation is 30 percent, for example, banks lose money when they lend to businesses, so they obviously stop lending. Without credit, the whole economy cannot grow.

Finally, inflation has another negative impact on businesses. Inflation makes it very hard to predict future prices. Imagine a company that wants to produce a catalog to advertise its products for the coming year. What price should they advertise? Now, the price may be “p”, but in 6 months, the prices could have doubled or maybe tripled. This uncertainty makes it very hard to plan future projects, because future costs are unknown. To compensate for this uncertainty, firms will ask for higher prices which fuels inflation further.

8.3 Corruption

If countries are unable to generate enough income to pay their employees, civil servants will find ways to pay themselves through corruption: the misuse of public office for private gain. Initially, economists thought that corruption was good. Huntington (1968), for example, argues that corruption enables individuals to avoid bureaucratic delays and incentivizes civil servants to work harder. Mauro (1995), however, finds that bureaucratic efficiency¹ is positively correlated with economic growth and investment. Since bureaucratic efficiency is endogenous, this correlation does not imply causality, but it is very suggestive that corruption is bad for the economy.

8.3.1 Channels

Wrong Incentives The first channel through which corruption adversely affects growth is by creating the wrong incentives for civil servants and for the youth. If civil servants receive a certain sum of money every time a person needs to fill out a form, there is an incentive to create more forms. Moreover, civil servants do not have any incentive to offer services on line or by telephone, because corruption requires face contact. More forms and less technology mean more hurdles for entrepreneurs who want to start businesses and create growth.

¹Pakistan was in the 1.5 to 4.5 range in the period from 1980 to 1983, and Canada was in the 9-10 range over the same period.

Youth also face wrong incentives. A society wants their youth to study productive disciplines to be employed productively. These productive jobs pay high wages which serves as incentive. Students therefore want to learn productive skills that will allow them to earn a good salary. In corrupt countries, the people earning the highest salaries are the corrupt civil servants. The youth, therefore, has the incentive to become civil servants and not plumbers, doctors, engineers or economists. Talent is wasted in the bloated public administration.

Increase Costs Corruption also increases the cost of doing business, but it does so in an unpredictable way. Assume that one always pays a certain amount to a civil servant to receive a form. If the civil servant doubles the amount, one has no choice but to pay. It is impossible to enforce a contract with a corrupt civil servant, because corruption is generally illegal. Corruption therefore creates a lot of uncertainty for businesses, which reduces the incentives to start businesses.

Staying under the Radar Not all businesses are equally affected by corruption: small firms may be able to stay under the radar. Imagine a self-employed person. Local authorities are probably not aware of the existence of this business. Since that person is very productive, he decides to grow the business and hires employees. As the business grows, it becomes more visible. At one point,

local authorities may realize that they could earn some bribes from this business, so they start showing interest and the entrepreneur must start paying bribes. If only medium-sized firms pay bribes, entrepreneurs have the incentive to stay small. These businesses could grow and hire more people, which would help the economy but it is optimal for them to remain small and avoid the attention of public officials.

A similar argument can be presented for entrepreneurs that do not register their business to avoid attention. At one point, these businesses may need a loan, but a bank will not lend to a business that does not legally exist. Registration may become even costlier once a firm has grown, because local officials may notice that the business operated without a license for a number of years. Corruption therefore affects the growth of businesses.

Hard on the Poor Corruption hurts poor people particularly badly, because they often depend on support from the state. Assume that to receive a payment, one needs to provide one's birth certificate. To receive this document, the poor person may need to pay a bribe. If this person is unable to pay the bribe, he will not receive the birth certificate and will not be eligible for the payment to which he is entitled. The state will therefore be unable to undertake social programs or the benefits of these programs will accrue mostly to civil servants due to corruption. Similarly, misfortune increases reliance on public service (police) and therefore the probability of

corruption. Corruption hits people when they are down (Hunt, 2007).

Undermines Democracy Corruption not only undermines social policies, it also impairs all other decisions from the government. Imagine a policy against pollution. If the civil servant who is responsible for controlling pollution is corrupt, factories will be able to pollute as much as before the policy was introduced. The power of elected officials is therefore nil in the presence of corruption.

8.3.2 Types of Corruption

There are generally two types of corruption: centralized and decentralized. In the first case, the dictator or president is in control of the corruption. He decides how much will be paid for different services and the revenue is collected centrally. In the second case, the central power is weak and different groups decide how much they will charge like in Afghanistan or DR Congo. The economic impact of decentralized corruption is worse than centralized corruption, because the different groups ask too much and do not consider the harm they are doing to other groups.

Assume there are three people who want to go from city A to city B. They all value the trip differently, because the purpose of their trip differ. Person 1 has a value of 100, person 2, 300 and person 3, 500. There are two road-blocks between city A and city B at which travelers must pay to go through. The people at the

road-block know there are three types of people, but they cannot distinguish the people².

In the presence of centralized corruption, one person will choose the toll at both road-blocks to maximize total revenue. This person will choose 150 at each both road-block: $(150, 150)$ ³. At that price, person 1 will stay home, while person 2 and 3 will make the trip. The road-blocks will therefore generate a revenue of 600. Consider another strategy $(100, 100)$. At that price, person 1 will still not travel, and the total revenue generated is 400. Finally, let's consider $(200, 200)$. At that price, person 1 and 2 will not travel, and the total revenue generated is 400. Both strategies generate less income than the profit-maximizing strategy.

In the presence of decentralized corruption, two different groups choose the toll at each road-block. The profit-maximizing equilibrium strategy is $(500, 0)$. Consider other strategies. The previous equilibrium $(150, 150)$ is no longer optimal, because the first group can deviate and raise the cost to 300 to double its profit from 300 to 600. Consider now the strategy $(300, 0)$. Instead of asking for 0, the second road-block can increase its profit by asking 200. $(300, 0)$ is not an equilibrium, but $(300, 200)$ may be one. At this equilibrium, person 3 will still decide to travel, but person 2 will not. If person 2 does not travel, the first road-block can ask 500, and the second road-block cannot ask for anything. The profit-maximizing

²It is a similar setting to adverse selection.

³Any combination that sums to 300 is a profit-maximizing equilibrium

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strategy is therefore (500, 0). Notice that person 2 is no longer traveling from city A to city B. There is therefore a welfare loss.

The road-block example could be a metaphor for the numerous steps that an entrepreneur has to go through to undertake a project. He will first need to register the business at the Ministry of Commerce. Then, he may need to fill some paperwork at the Ministry of Labor. Finally, he may need to get some permission from the Ministry of the Environment. If these three organizations are controlled by different ethnic groups, they will try to get as much revenue as possible without any consideration for the harm done to other ethnic groups. However, if the central power is strong, the ministries will coordinate not to hurt the economy too much and maximize the total amount of bribes.

8.4 Political Economy

The previous section described numerous ways through which a government can hurt growth, but it is difficult to understand how such governments can persist. One would expect voters to vote against bad governments. Even dictators cannot survive indefinitely if the population is unhappy⁴. Political economy is a field of economics that studies the decisions of voters and politicians/dictators. After all, they are also humans taking decisions.

⁴Think of the Arab spring

8.4.1 Elections

In democracies, governments are elected. Citizens vote for the party that is closest to their political convictions. If there are two parties, the one with 50 percent plus one of these votes will win. To reach this majority, parties will try to be closest to the political convictions of the voters. Since both parties are trying to convince the same people, theory predicts that political parties will converge to the same platform. In that sense, democracies do not generate diversity but conformity. If a politician in a developing country has suggested bad policies that appealed to the electorate, it is unlikely that another candidate will be able to beat this candidate with different policies.

To remain in power a politician must please the public and his allies through local spending. These local projects are paid by the central government, but they sometimes benefit only certain regions. Such projects may be unprofitable but still undertaken. Consider the following example. Province A wants to build a park at the cost of 100. The overall utility generated from the park is only 25. If the province were to pay for this park alone, it would not build it. However, if the central government pays for it, the province will only disburse a fraction of the cost. If there are “ k ” provinces, the province will pay $\frac{1}{k}$ of the total cost. If there are more than 4 provinces, province A will pay less for this project than it will reap in utility. It will therefore be in the province’s interest

to suggest this project to the central government. If all provinces behave in this fashion, the central government will undertake many unprofitable projects. These projects will be financed using tariffs or inflation which are in turn detrimental to growth in the long term.

8.4.2 Referendum

In many democracies important decisions are taken through a referendum. Voters are asked whether they agree or not with a certain proposition. The advantage of a referendum is that people have no incentive to exaggerate. If a person thinks the proposition is good, he has no incentive to vote against the proposition. The major disadvantage of a referendum is that people cannot express the intensity of their choice. Consider a government that considers investing in research to cure cancer and launches a referendum to know the opinion of the population. People with cancer and their relatives will benefit greatly from this project: increase in utility of 10 000. People without cancer will have no benefit but will incur a small cost: loss in utility of 0.1. The former group is very enthusiastic and will vote yes, while the latter group does not really care, but will probably vote no. The majority of voters will therefore vote no, even though the project would improve welfare.

8.4.3 Uncertainty

To take the right decision in an election or referendum, voters need information about outcomes. Sometimes the precise information just does not exist. Before the Arab spring people were clearly unhappy with their leaders, but deposing them would not necessarily lead to democracy. It could have just led to chaos. If there is no better alternative, people may simply keep a bad leader to avoid chaos. Similarly, if many ethnic groups could take over, the ethnic group actually in power could keep a bad dictator to avoid losing power.

This uncertainty about outcomes can also exist for government policies. A policy could affect people differently. Think of a free-trade agreement. Overall, society will benefit, but some people may suffer and others may benefit from it. Assume that there is a referendum on a free-trade agreement. The policy will be good for 40 percent of the population: increase in utility from 100 to 200. These people will vote for the policy. For the remaining 60 percent of the population, however, it is unclear whether the policy will be good or not. Some of these people ($1/3$) will see an increase in their utility from 100 to 200 and others ($2/3$) will see a decrease from 100 to 25, but these people do not know to which group they belong. For people with an uncertain outcome, the expected change from the policy is: $\frac{1}{3} \cdot 100 - \frac{2}{3} \cdot 75 = -16.5 < 0$. These people will therefore vote against the policy. Overall, the policy will not

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be accepted even though the it has a positive impact on society:

$0.6 \cdot 100 - 0.4 \cdot 75 = 30 > 0$. Uncertainty affects the voting behavior.

8.5 Improving Governance

8.5.1 Transparency

Information reduces uncertainty and transparency ensures that governmental decisions can be monitored. Between 1991 and 1995, it is estimated that Ugandan schools received only 13 percent of the spending from the central government. The remaining 87 percent was diverted through corruption. To address this issue, the central government started publishing newspaper accounts of monthly transfers to school districts. In 2001, schools received about 80 percent of the funds from the central government (Svensson, 2005). With the information from the newspaper, the parents were able to monitor school boards and make sure that their children received their fair share. To identify causality, the researchers looked at the distance between the school and the closest newspaper outlet. Since it is easier for parents to monitor schools close to a newspaper outlet, there should have been less diversion in schools closer to news outlets, which is what happened. By providing the information, the government was able to reduce corruption, because the people on the ground could monitor school boards.

8.5.2 Decentralization

In the case of Uganda, the local population suffered the most from bad governance. These people therefore had incentives to monitor local officials when they were given this opportunity. In general, decentralization gives the local population this opportunity by transferring some power from the central to local authorities. In the field of education, the central authority, for example, could choose the topics to be covered at elementary school to ensure homogeneous education across the country, but local authorities could choose the teachers, because local authorities are in a better position to monitor the teachers and have incentives to do so. In South Korea, the central authority built the canals, but local authorities were in charge of maintenance (Wade, 1997). Local authorities have more information, and they can use this information to improve services. The intuition is very similar to group-lending.

The drawback of decentralization is that the local population may not have the institutions to prevent local elites from capturing power. At the central level, there are journalists covering the doings of officials. At the local level, there may not be anybody who can oppose local elites. In that sense, decentralization could mean that locally marginalized groups lose resources to which they are entitled. To prevent such drawbacks, decentralization must be accompanied by institution-building.

8.5.3 Affirmative Action

Building more inclusive institutions means incorporating groups that have been generally excluded from power. Women in India, for example, have rarely had their say in local politics. To address this problem, the Indian government randomly chose 88 out of 265 villages in which only women were allowed to run as head of the village council. Duflo and Chattopadhyay (2004) then compared the investment decisions in these villages. Traditional political economy would predict no change, because politicians must always please the same people. However, the researchers found that in villages represented by women more spending was done on priorities of women (drinking water quality) than in comparison groups. Furthermore, in villages represented by women, more women attended local meetings. If democracies always elect the same people with the same ideas, forcing under-represented groups to take the leadership could bring new ideas and open up the democratic process.

Chapter 9

Role of Donors

If developing countries are unable to find the best policies, maybe donors have the expertise to help them. The first section of this chapter explains why developing countries may need aid. The next chapter discusses whether aid is effective and improvements to the donors' policies to improve effectiveness. Finally, we present two opposing view on the future of aid to developing countries.

9.1 Why Do Developing Countries Need Aid?

Germany, Canada and Japan did not need outside help to develop their economy. Why do developing countries need any help? The rationale behind aid is the poverty trap. Developing countries are unable to save enough to invest. In other words, the saving function is close to 0 at very low levels of capital. Aid from developed countries could enable developing countries to invest and produce

more to leave the poverty trap. The incremental capital-output ratio is used to determine the amount of capital needed by a developing country:

$$\text{ICOR} = \frac{\delta K}{\delta Y} \quad (9.1)$$

The ICOR is generally in the neighborhood of 3, which means that it takes an increase of three units of capital to increase output by one. The greater the ICOR, the less efficient is the economy. If an international organization thinks that to prevent a humanitarian catastrophe, output needs to increase by 1 million, the country will need a capital investment of 3 million. Some of this money will come from internal saving, and the rest from external donors. Since internal saving is rarely sufficient, there is a need for external donors.

The key assumption is that aid becomes capital, and capital produces output. Unfortunately, it is far from obvious that this relationship holds. Zambia, for example, received 2 billion USD from 1960 to 1993. Per capita income in Zambia was 600 USD in 1993 down from 800 in 1960. There is no evidence that aid transformed into capital. If the infrastructure is not conducive to invest, aid money will not be invested, and output will not increase.

9.2 Effectiveness of Aid and Improvements

The case of Zambia suggests that aid does not work. Burnside and Dollar (2000) study the correlation between aid and growth. They find no positive correlation using the whole sample. However, if the sample is restricted to countries with good governance, there is a positive relationship. Correlation, however, is not causality. Aid is endogenous: developed countries decide how much money they give. Assume that aid is useful, but that output is very random. It could depend, for example, on the weather. If the country goes through a drought, it will have a low output; if it has clement weather, the country will have a high output. Countries providing aid want to help developing countries going through hard times. Aid will therefore be high when output is low, and it will be low when output is high. In other words, there will be a negative correlation between aid and output, but this relationship is due to reverse causality.

It is also unclear what is aid. If the aid helped build schools and trained nurses, there was probably a positive impact. If foreign aid was used to purchase luxury cars, it probably did not increase output. It may therefore not be very useful to determine whether aid is overall good or bad. We should rather identify profitable projects instead of answering a very vague question.

Donor countries should evaluate projects to identify best practices and make their aid conditional on changes in the institutions.

Conditional help is a good idea, but it is hard to implement. Should we let populations suffer hunger, because their leaders are corrupt?

Easterly suggests the following three advices. First, donors should specialize to improve efficiency. Second, donors should avoid ineffective aid channels like food aid that destroy local markets. Third, donors should limit their overhead cost to improve efficiency.

The Paris Declaration proposes five similar objectives for aid:

- **Ownership:** Developing countries set their own strategies for poverty reduction, improve their institutions and tackle corruption.
- **Alignment:** Donor countries align behind these objectives and use local systems.
- **Harmonization:** Donor countries coordinate, simplify procedures and share information to avoid duplication.
- **Results:** Developing countries and donors shift focus to development results and results get measured. Instead of volume.
- **Mutual accountability:** Donors and partners are accountable for development results.

The idea is that developing countries should be in charge of their own development. Should governments that have failed their population for the last 50 years be put in charge?

9.3 Loan Forgiveness

Maybe aid is not the right avenue. Instead, we may simply want to remove the debt accumulated by developing countries to let them start with a fresh slate: loan forgiveness. There is an ethical reason why loans granted to dictators should be forgiven. These dictators used the money to buy luxury goods, and now we ask the population to pay back. There is however very little economic evidence suggesting that loan forgiveness promotes growth. Generally, loans that are forgiven are quickly replaced by new loans. The overall debt of the country therefore does not change. Furthermore, loan forgiveness creates bad incentives: a head of state has the incentive to mismanage in the hope that loans will be forgiven.

9.4 What's Left?

9.4.1 Sachs: Big Push

Why doesn't aid work? Because the whole infrastructure does not work. Improving a road will not promote economic growth if entrepreneurs cannot find the finance to buy trucks or if nobody is trained to drive trucks. Everything is inter-connected. For aid to be effective it has to be so large that all problems are tackled at once. Thinking back to the poverty trap, capital must be increased substantially to leave the poverty trap.

Empirical evidence, however, does not suggest that small im-

provements are not profitable. A small dose of iodine or bet nets have a large impact on the population. The problem is not that people cannot afford them, it is that people simply do not take up the policy. Before understanding why people do not change their behavior a big push could be a big fail. Furthermore, such a plan would be extremely expensive, and would be very similar to colonialism.

9.4.2 Easterly: Incremental Changes

Instead of a big push, Easterly suggests small incremental changes. One should monitor these projects to determine whether they are effective in reducing poverty. If they work, they should be implemented on a larger scale. If not, they should be abandoned. Using this method, donors will be able to identify best practices and use them elsewhere. The problem with this method is that what works in one country may not work in another one or at another point in time (external validity). It is therefore unclear whether the lessons learned from these projects will really improve our knowledge of developmental issues at large. One never bathes in the same river twice.

9.5 Maybe it's not Aid

Donor countries have not been very successful providing aid to developing countries, but there are other ways through which de-

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veloped countries could help developing countries. Trade between developing and developed countries could enhance welfare. One sector of the economy where very little trade takes place is agriculture. Developing countries have an absolute climate advantage in comparison to developed countries. One would therefore expect large benefits from trade. Unfortunately, lobbies have prevented trade liberalization to take place in agriculture, because farmers in developed countries would clearly lose from such trade agreements.

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Chapter 10

Everything Else

The previous eight chapters have discussed problems that can be addressed through policies. Some determinants of development, however, cannot be changed. History and geography, for example, are hard to change. The first section of this last chapter discusses the long-term consequences of colonialism and slavery. The second section studies the role of geography, more specifically the problems related to natural resources.

10.1 History

10.1.1 Colonialism

Colonialism has had a long-lasting impact of developing countries, but the impact vary across countries. Peru and the US were both colonized by European nations, but both countries are very different today. The colonization style could explain why these two coun-

tries are so different today. The differences in colonizing strategies are due to the resources available in both countries. In Peru, the conquistadors discovered a densely populated area with large deposits of gold. They could therefore easily exploit the resource without the use of settlers. They established extractive institutions.

In the US, the British did not find any gold and the area was sparsely populated. It was therefore impossible to exploit the local population to mine natural resources. Instead, the British decided to send settlers to farm the area. With the settlers came British law and inclusive institutions. These two strategies led to very different institutions. In Peru, most of the population was enslaved by powerful owners and was unable to claim basic rights. In the US, the settlers were the owners of their land and could demand democratic rights. The two development paths therefore diverged. Modern day Peru has a GDP per capita of 6 017 USD (PPP) and the US has a GDP per capita of 48 111 USD. Not only is Peru poorer, it is also less equal: the Gini coefficient is 0.48 in Peru and 0.45 in the US.

The allocation of colonies was the first objective of the 1884 Berlin conference. This conference took place without any input from developing countries. The borders were therefore drawn to satisfy European objectives. Some ethnic groups were divided across many colonies and some rivaling groups were forced to co-exist in one colony. These colonies then became countries when

developing countries fought for independence in the sixties. Even when ethnic groups lived in peace, colonial powers sometimes created tensions to facilitate the administration of the colonies. In Rwanda, for example, Belgian colonial powers gave preferential treatment to Tutsis, even though the Hutus formed the majority. This discrimination ultimately led to the Rwandan civil war.

10.1.2 Slavery

The second objective of the Berlin conference was to end slavery. The Atlantic slave trade started at the beginning of the XVIth century to provide labor to colonies in America and peaked in the XVIIIth century. The most obvious impact of slavery is the drain of strong men. It is estimated that 70 000 were shipped yearly across the Atlantic at the peak of the slave trade. One less obvious impact of slavery affected the people staying in Africa. Slavery created bad incentives for the local population. Kidnapping people and selling them to slave companies became more profitable than agriculture. Villages would therefore raid other villages to kidnap people and sell them. In response to this increased warfare, villages resettled away from the main communication axes and closed themselves to the outside world. This behavior then led to a reduction in trade and correspondingly to efficiency. More importantly, it also led to distrust towards foreigners. These attributes were then passed on to the next generation.

Nunn (2008) finds that regions most affected by slavery are still under-performing today. There could be some endogeneity in the extent of slavery. Regions with bad economies at the time of slavery could have decided to engage more in the slave trade than those with good economies. If regions with bad economies in the past still have a bad economy now, the relationship between slavery and the economy could be due to an omitted variable. To address this issue, he considers the distance between a region and the closest port (i.e. the market for slaves). It will be less costly for slave traders to import slaves from regions closer to a sea port. There is however no reason why these regions should have better economies. Regions more affected by slavery, because they were close to a sea port, still suffer today from the slave trade. Interestingly, regions in rugged areas were not negatively affected by the slave trade, probably because it was too complicated to enslave the population in those areas. It would seem that mistrust is the reason why these regions still suffer from the slave trade. Survey evidence suggests that the population in regions affected by the slave trade still tend to trust less. Trust is important for economic growth. A lender must trust that borrower will pay back, and a patient must trust that the cure suggested by the nurse is the right one. Without trust, it is very difficult to develop fruitful business connections. It would seem that the slave trade reduced trust, which in turn hurt the economy.

10.2 Geography

Ruggedness protected some regions from the slave trade, but it also prevents them from taking part in international trade. Land-locked countries also have a harder time exporting/importing goods. These countries need more infrastructure, because they cannot rely on the sea to trade with other countries.

Natural resources could bring wealth to a country, but it rarely does. Governments in countries with abundant natural resources have no incentive to develop the economy, since they can rely on revenues from the natural resources. These governments are also more unstable. It is very tempting to overthrow a government to take control of natural resources. The Democratic Republic of Congo exemplifies this problem. The country is rich in all sorts of minerals, and dozens of armed groups fight over these resources creating social problems and insecurity. If the economy is diversified, overthrowing the government does not promise as much of a reward.

Even if the country is stable, abundant natural resources can hurt the rest of the economy through the Dutch disease. Due to the export of natural resources, there is high demand for the local currency thus increasing the value of the currency. It then becomes very hard for other sectors of the economy to export, because it is expensive for other countries to import these goods. In that sense, natural resources prohibit economic diversification

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and make the country very vulnerable to fluctuations in the price of the natural resources. Botswana is a country that avoided the resource curse in colonial time. The leaders knew that the country possessed reserves of diamonds but hid this information from the British colonial powers to avoid attention. Botswana is now one of the most developed countries in Africa.

Chapter 11

References

11.1 Acknowledgement

Chapters 5 and 6 were inspired from chapters 2-4 and 8 in *The Economics of Microfinance*.

Chapter 7 is based on chapters 2-5 in *Poor Economics*

Chapters 8 and 9 are based on *The Elusive Quest for Growth*

Chapter 10 was influenced by *Why Nations Fail*

I am grateful for comments provided by Kevin Andrew and Martin Gravel.

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