

Solutions Problem Set Broad and Policy Issues

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Question 1 - Broad Framing Questions

1) Ends (Results) Approach

Similarly to what we have done to CCTs, discuss the impact of high school policies on end results (prosperity, equality, sustainability and sensibility). Explore the relationship between students' motivations to evade high-school and returns to education.

Solution

Education, as any public policy of a structural nature, affects the lives of individuals through the improvement in their access conditions and/or returns from these actions, which brings us to the traditional dilemma between equality and efficiency through public actions.

Equality - We begin with the analysis of educational policies through the prism of equality: the greater the respective pro-poor indicator of a given policy, the greater the ability of each allocated real (R\$) to reach the poor. Regular basic education has an index of 1.57, against 0.63 of secondary education and 0.07 of higher education. This means that an additional real spent in basic education has 2.5 more times the ability of reaching the poor than one spent in secondary education, but the later has 9 times the same property than higher education.

Prosperity - It is obvious that educational policies should not be solely concerned with equality. It is necessary to evaluate the efficiency of the policy in transforming the lives of those who receive the educational benefit. Otherwise, a school for the poor of doubtful reputation and high cost could be chosen as the ideal, which is not the case. An impact of educational policies that we will analyze refers to the changes in labor market insertion and the general conditions of the job market. We now look at the individual returns when leaving school, given the impact of learning on the individual's employability and wage-earning potential. Using a standard mincerian-type regression and binomial logistic model for occupation to compare individuals with the same socio-demographic characteristics such as gender, age, range and geography, except for education, the following occurs: the salaries of those with a high school degree are 125% higher than that of illiterates, and their employability odds is 229% larger. Therefore, higher levels of education lead to better job placement.

Sustainability - Going beyond the pragmatism of income generation, the greater education of the population impacts other elements in the life of individuals, such as fertility, criminality, and health, among others. In these cases, education potentially affects interest variables through the direct and indirect effect on the function of higher income. 95% of the effect of perceived improvements in health with associated changes in education and income are given by the direct effect of education (i.e. maintaining income constant).

Sensibility - When we analyse students' motivation to evade high-school, we have that the main alleged motivation is lack of interest (that is, a demand motivation), which corresponds to 40.3% of the drop-out alleged motivations. The second main motivation is income and work, also related to demand, totalizing 27.1% of the alleged motivations. Supply motivations are not so important as demand motivations. For example, lack of schools corresponds to only 10.9% of the alleged motivations. This results are not so intuitive if we connect with the high returns to education found in Brazil. If education generates such a high private return, why do young Brazilians invest so little in it, or why do they have such a lack of interest even though the potential returns are pretty high?

2) Shared Productivity

i) Discuss the relationship between GDP growth and mean household income growth in Brazil and their possible causes and consequences.

ii) Organize and discuss policies that may generate shared productivity.

Solution

i) We have a strong dissonance between GDP growth and mean household income growth in Brazil in the last decade. While real per capita aggregate GDP growth was 29.6% from 2003 to 2013, real household per capita income growth using PNAD data was 57%. This difference is actually explained by the use of different deflators. When we compare the two series in nominal terms, mean growth rates are similar. Therefore, the differences between mean growth rates are basically differences in real terms because of the deflators. While GDP implicit deflator grew 84% between 2003 and 2012, the CPI deflator (INPC) used to calculate real income in PNAD grew only 60%.

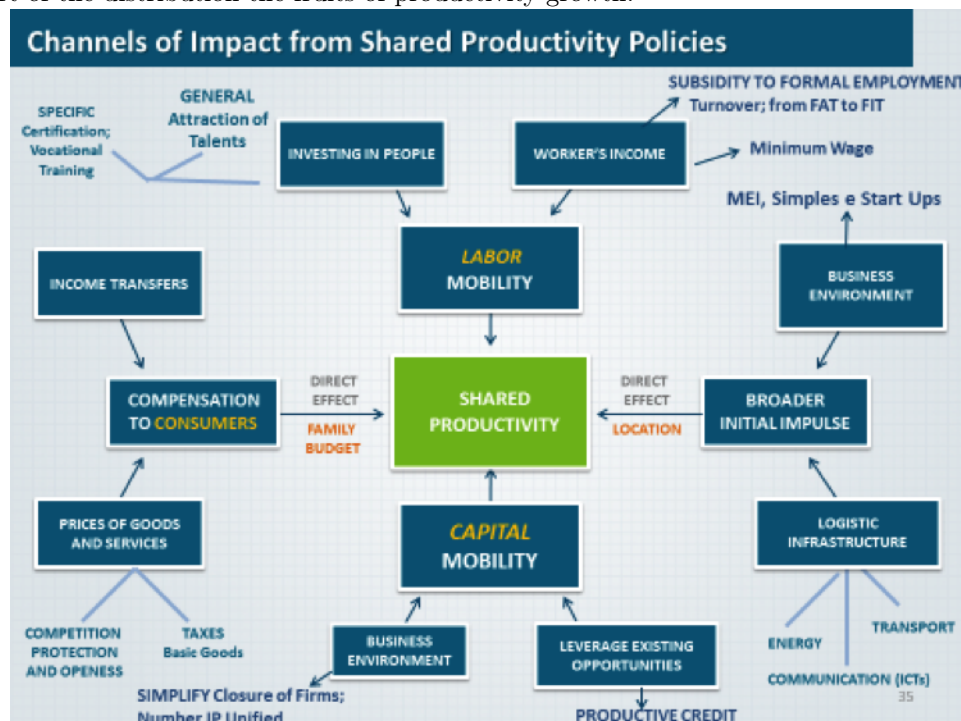
ii) The inclusiveness of growth hinges on the adoption of certain policies, particularly those geared toward creating productive employment to achieve poverty reduction. However, there are many other policies that can be implemented to reduce poverty. Thus, it may not be beneficial to restrict the policy space to only the generation of productive employment. There could be many poor who are not in the labor force such as elderly and disabled, for whom the employment nexus is of little relevance. Furthermore, the focus on productive employment could result in a high level of unemployment among the poor, which may in turn increase poverty. World Bank has more recently proposed a new development model that focuses on the bottom 40% of the population. Under this new paradigm, it aims to:

- (i) lower extreme or absolute poverty in the world to 3% by 2030;
- (ii) foster economic growth that benefits the bottom 40% of the population.

The goal of targeting the bottom 40% of the population is built on the concept of shared prosperity. Economic growth fosters shared prosperity if the bottom 40% of the population could benefit from it. The idea of shared prosperity appeals to various stakeholders because it has a well-defined but simple social welfare function. It is closely related to the notion of inclusive growth because it ensures that the bottom part of the population can participate in and benefit from growth. As a consequence, the idea of shared prosperity is present in goal number 10 (related with inequality within and between countries) of the so-called Sustainable Development Goals (SDGs).

We present a policy oriented framework further below focused on the idea of shared productivity, emphasizing the role of productivity induced by inclusive (and sustainable) growth. The main point is to look not only at the first moment of income and productivity growth (mean) but also on the second moment of these distributions (inequality).

The right part explores the location of the policies that generate the initial impulse on productivity. The middle channels explore the fact that labor and capital mobility are also key in the diffusion of productivity. The left part of the diagram explores policies that are not related to the diffusion of productivity but that shares with the bottom part of the distribution the fruits of productivity growth.



The framework can be synthesized through four channels of impact for innovation and shared productivity policies. First, the initial location of the policy is important for us to think of the agents first responsible for the innovative disruption process and the breadth of their performance on productivity. Therefore, the decision of the location involves not only the horizontality or verticality of the policy, but also the sectors of interest and their geographic reach. For the success of a policy aimed at a more comprehensive initial location, it is also necessary to think about the obstacles to facilitating the business environment and the basic logistics infrastructure for its operation. Here comes the question of factor mobility. On the workers' side, it requires not only investments in basic and vocational education, but also a set of policies aimed at attracting talents from abroad, given the medium term horizon required for the success of an educational program on a national scale. As for the capital, the revision of the business environment together with a credit facilitation plan are fundamental, aiming at a greater leverage of the existing opportunities. Finally, productivity and innovation are shared when they are appropriated by the people. Brazil was characterized by the construction of compensation policies that were effective in sharing the gains generated, notwithstanding the inefficiency and distortion of incentives observed in the sectoralized and verticalized stimulus in few companies. The revision of these stimulus must pay attention to the success obtained in social innovation, guaranteeing the maintenance of the recent social achievements and seeking to deepen the process of evolution of the population's well-being.

This framework also deals with the difficulty of internalizing part of the social gains emanating from innovation in companies, concluding that the beauty of innovation is found in young, not small, companies ("The new, not the small, is beautiful").

It is interesting to note that despite the stagnation in the growth of the Brazilian business innovation rate, the country has seen a continuous growth in terms of social innovation policies. Brazil has become a benchmark in sharing productivity and prosperity with the conditional cash transfer policies (CCTs).

Policies aimed at economic growth through greater business innovation cannot be done without the movement towards equity, thinking not only of planting the good seeds of incentives for innovation but also of how to distribute the fruits harvested from it. Since the start of the new millennium, Brazil has been able to share the productivity increases observed but it ended up stagnating with regard to the private internalization of these gains, which in the end ended up compromising the process of productivity gains given that it has innovated less than what was socially expected. Therefore, changes needed to untie the innovation node should not happen to the detriment of deepening social inclusion in Brazil.

3) Means (Input) Approach

Discuss, from a generic model of aggregation between different individuals and moments of time/states of nature, as well as schemes seen along the course, the channels (intermediate variables) through which such as education, conditional cash transfer (CCTs) policies, and microcredit impact the level of social welfare in a society over time.

Solution

A generic model like the one proposed would have a social welfare function of the type

$$W = \int_0^T \int_0^\infty [u(c)w(c)f(c)dc]g(t)dt$$

s.t

$$A_{t+1} = [A_t + F(r; education; physicalassets; socialcapital; health; ...) - T_t + Transf_t - C_t](1 + r)$$

$$A_t \geq 0, \forall t$$

Education positively impacts the labor income of the individuals, shifting the short term production function $F(.)$ and expanding the possibilities of consumption. It may also raise individuals aspirations. Remember that the evidence does not support a positive relationship between education and happiness.

Conditional cash transfer policies affect not only the current and future fiscal constraint through the term $Transf_t$, but the required conditionalities can also affect the education and health of the individual (the Bolsa Família Program requires vaccination and school attendance, for example), shifting the production function $F(.)$.

Microcredit relaxes the liquidity constraint $A_t \geq 0$, allowing the individuals to borrow to finance investments, which in turn will affect their physical assets and enable higher future incomes. It is also possible that the individuals borrow for the purpose of smoothing consumption intertemporally, which will give them useful gains. In addition, microcredit stimulates the formation of physical and social capital.

Free medicine programs directly increase the well-being of the individuals because the current budget constraint would be affected by the reduction of food expenditures and therefore could provide higher future labor incomes via productivity increases (efficiency wages).

Extra reflection: departing from the list of the main topics of the course, discuss the main empirical facts related to design (channels) and impacts (results) in the case of the Brazilian experience (Brazilian high school reform, Bolsa Família, overall inclusive production like CrediAmigo or broader initiatives in rural areas like Embrapa, sectoral productivity and compensatory social policies are some examples). Develop one of these topics of your choice in more detail.

4) Social Tensions (Atkinson's Approach)

Discuss the application of extracting social indicators from their respective Social Welfare Functions (choose two: Inequality, Poverty, Polarization (Alienation, Identification), Volatility (Aggregate) and Mobility).

Solution

We will follow Kakwani and Neri (201) . For more details, see the full paper on the website of the course. We start with **Inequality and Poverty**, which are not our emphasis in the later stage of the course (**it won't be in the A2 exam**). Then, we move to the concepts of **Polarization, Volatility and Mobility (which may be in the A2 exam)**.

Inequality

Following Sen (1974), the idea is that individuals suffer loss of welfare when they find that their income is lower than others. Suppose an individual with income x compares his income with all other individuals. Suppose he selects an individual with income y and feels deprived upon discovering his income is lower, therefore suffering a loss of welfare. If his income is equal or higher, he suffers no loss. His welfare is given by Kakwani (1986)

$$u(x, y) = x, \text{ if } x \geq y$$

$$u(x, y) = x - (y - x), \text{ if } x < y$$

Suppose the income of an individual is a continuous random variable with mean μ and probability density function $f(x)$. Then, in all pair wise comparisons the expected welfare is

$$u(x) = x - \mu[1 - F_1(x)] + x[1 - F(x)] \quad (1)$$

where $F(x)$ is the distribution function interpreted as the proportion of population with income less than x and $F_1(x)$ is defined as

$$F_1(x) = \frac{1}{\mu} \int_0^x xf(x)dx$$

which is the proportion of income enjoyed by individuals with income less than or equal to x .

The average welfare of the society is

$$W_G = \int_0^\infty u(x)f(x)dx = 2 \int_0^\infty x[1 - F(x)]f(x)dx = \mu(1 - G)$$

where G is the Gini index and $\mu(1 - G)$ is the Gini social welfare function proposed by Sen (1974). Note that the Gini SWF is the weighted average of incomes of all individuals with weight given by $v(x) = 2[1 - F(x)]$, where the total weights add to 1. The weights are functions of the whole distribution of incomes (different from an additive SWF).

Poverty

The idea is to derive social welfare functions corresponding to the class of Goster, Greer and Thorbecke (1984) or FGT measures. It is assumed that the poor individuals suffer deprivation when they find that their income is less than the poverty line, which results in loss of welfare. The welfare of an individual with income x is given by

$$w(x) = x - g(x, z), \text{ if } x < z$$

$$w(x) = x, \text{ if } x \geq z$$

where z is the poverty line and

$$g(x, z) > 0, \text{ if } x < z$$

$$g(x, z) = 0, \text{ if } x \geq z$$

is the deprivation function suffered by the poor.

The average welfare of the society is given by

$$W = \mu - \int_0^z g(z, x) f(x) dx$$

where μ is the mean income of the society and the second term is the social deprivation due to the existence of poverty. Clark, Hemming and Ulph (1981) introduced the idea of "equality distributed equivalent poverty gap", which is specified as

$$\bar{g}^\alpha = \frac{1}{H} \int_0^z (z - x)^\alpha f(x) dx$$

where H is the headcount measure of poverty. Social deprivation is given by

$$\int_0^z g(z, x) f(x) dx = H \bar{g}$$

The average welfare of the society is then given by

$$W_\alpha = \mu - H z \left(\frac{\theta_\alpha}{H} \right)^{\frac{1}{\alpha}}$$

where θ_α is the FGT class of poverty measures.

Polarization

- Alienation

The notion of alienation is measured by the degree of spread from the middle position (median) to the tails of the income distribution. The larger spread from the median implies smaller middle class and larger polarization, which is the case where the rich become richer and the poor become poorer. This causes social tension. The social welfare function that incorporates the idea of alienation is derived as following.

A person is assumed to be alienated if his or her income spreads from the middle. Suppose m is the median income of the society. Then, her alienation is given by the difference of the individual income from the median. The utility that takes account of the alienation from the median may be defined as

$$u(x, y) = x - (m - x), \text{ if } x < m$$

$$u(x, y) = x - (x - m), \text{ if } x > m$$

The average welfare of the society is then obtained as

$$W_A = \mu - \frac{(m_2 - m_1)}{2}$$

where m_1 and m_2 are the mean incomes of the population having income below and above the median income, respectively. W_A is the social welfare that takes into account alienation in the society. The proportional loss of social welfare due to alienation is given by

$$A = \frac{(m_2 - m_1)}{2\mu}$$

A is the proposed measure of social alienation, so that the larger the A the greater is the alienation in the society.

Volatility (Aggregate)

The volatility in growth rates is viewed as causing social tension. Suppose μ_t is the per capita income of the society in period t and there are n time periods. Then, a simple inter temporal social welfare function may be defined as

$$\ln(\mu^*) = \frac{1}{n} \sum_{t=1}^n \ln(\mu_t)$$

where μ^* is the money metric social welfare for the entire n periods. Let r_t be the growth rate of per capita income between periods $t - 1$ and t . Then, substituting $\mu_t = \mu_{t-1}(1 + r_t)$ sequentially gives

$$\mu_t = \mu_1(1 + r_2)(1 + r_3)\dots(1 + r_t)$$

which on taking logs on both side gives

$$\ln(\mu_t) = \ln(\mu_1) + \sum_{j=2}^t \ln(1 + r_j)$$

Therefore, we have that

$$\ln(\mu^*) = \ln(\mu_1) + \frac{n-1}{2} \sum_{t=2}^n w_t \ln(1 + r_t)$$

where $w_t = \frac{2(n-t+1)}{n(n-1)}$, so that $\sum_{t=2}^n w_t = 1$. The equation above provides the relationship between the aggregate welfare level measured by μ^* and the growth rates. It can be shown that the maximum value of this money metric social welfare is obtained when there is no growth volatility, i.e. when all growth rates are equal. The loss of social welfare due to the volatility of growth rates is given by

$$V = (\mu_M^* - \mu^*)$$

where μ_M^* is the maximum value.

Mobility

In the paper, social mobility is analyzed in terms of relative movement of social groups in their economic status. If the economic status of worse off social groups is improving at a faster rate than better off social groups, then the society may be defined as socially mobile. A society lacks social mobility if the worse off social groups are never able to improve their relative economic situation, which could be due to their family circumstances or other social barriers. This lack of social mobility is viewed here as causing social tension.

Suppose a population is divided into K mutually exclusive social groups and a_i is the population share of group i . It is immediate that $\sum_{i=1}^K a_i = 1$. Average social welfare enjoyed by group i will be

$$W_i = \int_0^\infty u(x) f_i(x) dx$$

where $u(x)$ is defined in (1) and $f_i(x)$ is the pdf of group i . Suppose average social welfare enjoyed by the whole society is $W_G = \mu(1 - G)$, where G is the Gini index. It can be shown that

$$f(x) = \sum_{i=1}^K a_i f_i(x)$$

where $f(x)$ is the density function of the entire population. Using the social welfare functions for each group and for the whole society, we have that

$$W_G = \sum_{i=1}^K a_i W_i$$

which demonstrates that the social welfare enjoyed by the whole society is the weighted average of the welfare enjoyed by each social group, where the weights are the population shares of each group. The percentage contribution of group i to the total social welfare is $100 \times a_i W_i$.

The gap in economic status of different groups can be measured by the relative mean deviation (RMD)

$$RMD = \frac{1}{2W_G} \sum_{i=1}^K a_i \|W_i - W_G\|$$

Note that the RMD is equal to 0 if all groups enjoy the same welfare and equal to 1 if all groups except one have welfare equal to 0 and only one group enjoys all the welfare.

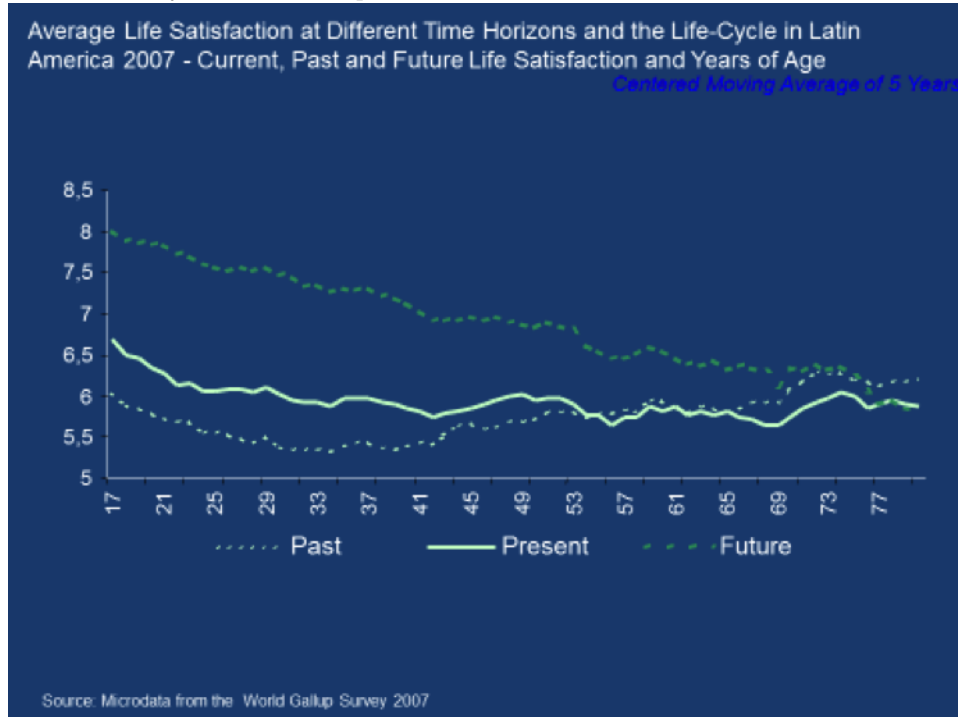
Question 2 - Discursive questions

1) Subjective Data

- Discuss possible links between temporal choice and subjective data.
- How subjective data can help to explain Brazilian dilemmas?

Solution

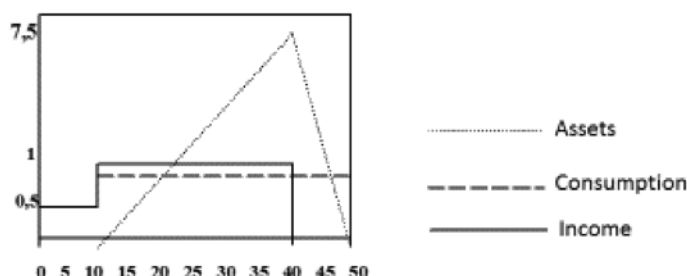
i. In economics we learn to work without observing directly the utility function $u(c)$. We only try to test some of its property implications as in the Euler equation approach, where we can empirically test for example if changes in consumption are orthogonal to information that was already available to individuals (excess sensitivity puzzle). One possibility offered by the subjective literature is to go one step further. For example, young people have very high future felicity levels with respect to current levels.



This, coupled with increasing earnings profiles at the early stages of the life-cycle, could explain why they are liquidity constrained in the credit market and its consequence on the binomial consumption/savings decisions.

If the Youth Can't Contract Loans

B – The Young are liquidity constrained



The fact that life satisfaction at low levels of income (one minimum wage) changes more for reductions of income to zero than to doubling income is consistent with precautionary savings motives. Marginal utility of consumption goes to infinity as consumption goes to minimum subsistence levels. For more details, see the temporal choice problem set.

ii. As we saw, Brazilians are very optimistic about their lives in the future (individual satisfaction) but not so optimistic if we consider overall life satisfaction with the country as a whole. This high level of individual optimism can explain some stylized facts for Brazil, for example the high interest rate or conversely the low levels of family savings observed in the country. Family savings rate for Brazil is one quarter of the Chinese and has been falling in the recent period. In 2013, only 14.75% of the individuals saved money in the previous 12 months according to a special household survey conducted by IPEA. When we look at the data disaggregated by age groups, there is no evidence that Brazilian savings follow the life cycle hypothesis.

The relatively low expectation with respect to the country as a whole indicates some sort of aggregative inconsistency where almost everybody is above the mean. The occurrence of coordination problems in Brazilian society such as high levels of inequality, informality, violence, high inflation or low coverage of sewerage may capture some of these consequences.

2) Middle Class Issues

- i) Discuss the concepts of alienation and identification.
- ii) Derive them plus polarization from a Social Welfare Function.
- iii) What is the strategy of dividing the population into absolute income classes (choose income brackets) using the between and within groups components?

Solution

i) Two elements characterize polarization, namely: alienation and identification. The identity-alienation framework relies on the presumption that individuals are 'identified' with others who are 'close' to them, while they are 'alienated' from others who are 'far away'.

Consider a particular income distribution. Suppose that the population is grouped into significantly-sized "clusters" such that each cluster is very "similar" in terms of the attributes of its members but different clusters have members with very "dissimilar" attributes. In that case, we would say that the society is "polarized."

Following Esteban and Ray (Econometrica, 1994), loosely speaking every society can be thought of as an amalgamation of groups, where two individuals drawn from the same group are "similar" and from different groups are "different" in relation to some given set of attributes or characteristics. The polarization of a distribution of individual attributes must exhibit the following basic features:

FEATURE 1: There must be a high degree of homogeneity within each group.

FEATURE 2: There must be a high degree of heterogeneity across groups.

FEATURE 3: There must be a small number of significantly sized groups. In particular, groups of insignificant size (e.g., isolated individuals) carry little weight.

Polarization is closely related to the generation of social tensions, to the possibilities of revolution and revolt and to the existence of social unrest in general.

We have to take special care to distinguish their theory from the theory of inequality measurement. It is interesting to differentiate polarization from income inequality per se, consider the following useful example. Consider a simple society with six people called A, B, C, D, E and F, with incomes of R\$6.00, R\$5.00, R\$4.00, R\$3.00, R\$2.00 and R\$1.00, respectively. Suppose that one real is transferred from D to F and from A to C. Inequality indices that respect the so-called principle of transfers will necessarily decline. After these distributive changes, we will have a perfectly divided society in two internally homogeneous groups: an income of R\$2.00 for D, E and F and an income of R\$5.00 for A, B and C. Although less unequal, after these progressive transfers, society has become more polarized.

Indeed, there are a number of social and economic phenomena for which the knowledge of the degree of clustering or polarization can be more useful than a measure of inequality. Quite apart from the distribution of income, wealth, or growth rates, relevant economic examples include labor market segmentation, concepts of the dual economy in developing countries, or distribution of firms by size in a given industry. In the broader arena of the social sciences, there are issues of social class or significant problems concerning racial, religious, tribal, and nationalistic conflicts, which clearly have more to do with the clustering of attributes than with the inequality of their distribution over the population.

ii) See question 1, item 4, on social tensions.

iii) If we divide a society in three groups with exactly equal sizes (1/3 of the population in each group) and calculate the Theil-T between and within groups we explain much less existing inequality (Theil-T between groups/Total Theil-T) than if we use a more structured approach. The Esteban, Gradin & Ray (EGR) strategy generates brackets of income classes from the income distribution observed in practice. The brackets chosen are the ones which better distinguish the 3 (or more) groups in a sense that they select the lowest possible differences inside them (identification) and on the other hand maximize the differences between groups (alienation).

3) Mobility Issues

i) Discuss the concepts of volatility (aggregate) and mobility using a Social Welfare Function.

ii) Discuss the intergenerational transmission of education in Brazil. How can it be addressed empirically?

iii) What are the stylized facts in the Brazilian case of the two-sided relationship between income mobility and educational choices?

Solution

i) See question 1, item 4 on social tensions.

ii) A usual and relatively simple way of addressing the intergenerational transmission of education is through a basic Markovian econometric model such as

$$S_i = \alpha + \beta \times S_{pi} + \gamma \times X_i + u_i$$

where S_i is the level of schooling of individual i , S_{pi} is individual i 's parents (could be the father's, the mother's or both) level of education and X_i is a vector of other individual characteristics, which we use as controls. The estimate of β gives us what is called the intergenerational persistence of education, that is, the impact of the parent's education on the level of education of the individuals from the next generation.

In Brazil, we have that the intergenerational persistence of education is very high but it is falling strongly. The estimated coefficient of persistence was 0.47 in 2014, which is very high in comparison with not only developed countries but also developing ones. However, in 1996 this coefficient was 0.70, the highest found in different studies which compare developing and developed countries. Therefore, we have a strong reduction in the persistence of education in Brazil in the last two decades, even though the actual level is still high.

iii) As we know, despite having decreased significantly in the last period, inequality in Brazil is still very high. On aspect of the Brazilian inequality is the low income mobility, or in other words the high persistence of income inequality. Poor people tend to stay poor and rich ones tend to stay rich. This is reflected in the educational choices and therefore in economic outcomes. Actually, income and educational mobility are strongly correlated, as income and education are strongly positively correlated. Therefore, the high income inequality or low mobility in Brazil is reflected in a high inequality of education and high returns to education. The decrease in inequality seen in the last decades in Brazil is accompanied by a decrease in inequality of education and in the returns to education. Despite still being high, Brazil experienced a reduction in the educational premium up to 2014, in contrast with most countries, which is in turn related to the strong reduction in Brazilian income inequality for the same period (also in contrast with most countries).

We explored during the course how education affects income mobility and how income mobility affects education. The response of school enrollment to shocks in parental earnings was in the latter part, while the above mentioned long-run impact of education in income mobility was also complemented by the fact that, in the short run, upward income mobility that is normally higher for highly educated groups did in fact increased more in low educated group during the Brazilian social boom (captured by a difference in difference estimation on longitudinal data). See more details on website of the course on the Mobility section (text 6* - Mobility and Education: Double Causality - comparative advantage of longitudinal data. <http://www.cps.fgv.br/cps/bd/curso/Mobility/6-Educationand-Shocks.pdf>).

Question 3 - Techniques to think about

Besides standard mincerian regressions for income and discrete binomial logistic regression (in the case of poverty), we have applied Difference in Difference estimators in various occasions (for example comparing the performance of beneficiaries and non beneficiaries of CCTs), Cohort effects (applied to self-reported race), Markovian regression (applied to intergenerational transmission of education) and Principal Components Analysis (applied to the choice of subjective variables in the PHDI). Describe briefly the three microeconomic techniques posed below, explaining their purpose, intuition and trying to relate with concrete examples:

- 1) Quantile Regressions;
- 2) Regression Discontinuity Design;
- 3) Stepwise procedure (including externality effects).

Solution

For more details, see the material on Additional Econometric Points on the website of the course.

Quantile Regressions

Quantile regression, as introduced by Koenker and Bassett (1978), may be viewed as an extension of classical least squares estimation of conditional mean models to the estimation of an ensemble of models for several conditional quantile functions. Whereas least squares estimation results in estimates that approximate the conditional mean of the response variable given certain values of the predictor variables, quantile regression aims at estimating either the conditional median or other quantiles of the response variable. It is very useful to estimate the impacts of different variables along the income distribution. For example, in the case of the mincerian quantile regression, we can estimate the returns to schooling at the basis of the income distribution. One advantage is that the quantile regression estimates are more robust against outliers in the response measurements.

Regression Discontinuity Design (RDD)

Regression discontinuity design or RDD is a quasi-experimental design that elicits the causal effects of interventions by using a cutoff or threshold above or below which an intervention is assigned. By comparing observations lying closely on either sides of the threshold, it is possible to deal with endogeneity problems and estimate the average treatment effect or the causal effect of interventions in environments where randomization is unfeasible. The intuition behind RDD is well illustrated using the case of the evaluation of merit-based scholarships in the US. The main problem with estimating the causal effect of such an intervention is the endogeneity of performance to the assignment of treatment (scholarship award), since high-performing students are more likely to be awarded the merit scholarship and continue performing well at the same time. Therefore, comparing the outcomes of awardees

and non-recipients would lead to an upward bias of the estimates because the students that get scholarships were performing well ex-ante. Using the threshold for getting the scholarship, we can compare similar students ex-ante and estimate the causal impact of the scholarship award comparing these similar students. The idea is that the only difference between would be caused by the award as they were pretty similar ex-ante.

Stepwise Procedure (with Externality Effects)

Stepwise procedure is a selection procedure to determine which control or independent variables are more statistically important to explain some dependent variable. The choice of predictive variables is carried out by an automatic procedure where in each step some variable is considered for addition to or subtraction from the set of explanatory variables. One outcome of the stepwise procedure is to indicate the order of importance of different variables used. The variables that are not statistically important to explain some determined variable are excluded in the procedure. We can include in the selection process variables that capture externality effects. This can be done by including in the regression the mean of some variables across geographic areas. The idea is that beyond individual impacts at the household level, characteristics from neighbors and other community members are important to explain some individual outcomes.

Question 3 - Public Policies

Write a two page essay on the Brazilian case tackling one of the following public policy related topic using the material discussed in class. You are free to pick additional empirical facts and to discuss policy proposals:

- a) Conditional Cash Transfers;
- b) Education;
- c) Productive Inclusion;
- d) Microcredit.