INF554 Data Visualization Project Report

Nestor Diaz, Soravis Taekasem, and Wendi Ma

University of Southern California
Team Go Banana

Abstract. This report shows how the significant imbalance has been happening among economy, inequality and poverty all over the countries around the globe. Various visualization tools are demonstrated to help elaborate the circumstances ...

Keywords: Data Visualization, Poverty, Inequality, Economics

1 Overview

Despite substantial progress in economic prosperity in the last century, the world still suffer from substantial inequalities and persistence poverty. In recent years, the gap between the rich and the poor is widened. Income inequality remained at historically high levels worldwide. Wealthiest 20 percent enjoyed nearly 83 percent of total global income compared to the poorest 20 percent, which had exactly a single percentage point. Rising affluence in rich countries coexists, in a number of such countries, with the persistence of poverty. Today, about 1 billion living on less than $2 per day (or about 11 percent of the world population).

The motivation and concern of this study is poverty with growing inequalities. Because inequality and poverty not only affect economic prosperity, but also generate social consequences such as social and political burdens and barriers, violates principles of social justice and fairness and distorts social cohesion. We focused on both inequality and poverty concepts since they are interrelated in a manner that a more rapid decline in inequality is needed to end poverty.

1.1 Topic and Audience

Understanding poverty and inequality is the main stance of this project. Poverty is pronounced deprivation in well-being. Poor people often lack key capabilities which mainly arise from inequality of opportunities and initial endowments in the society. For this reason, they have inadequate income or education, or be in poor health, feel powerless, low self-confidence, lack political freedoms. Since they have limited command over commodities, they are unable to put themselves above some adequate minimum threshold to survive. In that sense, poverty is a multidimensional phenomenon and less amenable to simple solutions. Although higher average incomes will certainly help reduce poverty, these may need to be accompanied by measures to empower the poor, or insure them against risks, or to address specific weaknesses such as inadequate availability of schools, education or a corrupt health service.

Poverty is a related concept with inequality-it is the situation of individuals or households who find themselves at the bottom of the income distribution. Inequality is a broader concept than poverty in that it is defined over the entire population, not just for the portion of the population below a certain poverty line. Focusing on the income side, income inequality is the extent to which income is distributed in an uneven manner among individuals in a society. Reducing deprivations among the poorest, increasing their living standards, leveling the notions of fairness and progressing in poverty reduction and shared prosperity can not be achieved if there is no significant shifts in inequalities. If poverty reduction is to be achieved, more equitable income distribution will be required.

This circumstance draws a great attention amongst the world, and well-known academies, organizations and corporations, taking Stanford Center for Poverty and Inequality from Stanford University for example, have put a great efforts trying to solve, predict, understand, or at least broadcast the latent influences of this problem.

The potential audience of this project is general public, especially those in economic or social study fields. The widespread increases in income inequality have raised concerns about their potential impact on our societies and economies (OECD, 2014). New OECD research shows that when income inequality rises, economic growth falls. One reason is that poorer members of society are less able to invest in their education. Therefore reducing inequality can make our societies fairer and our economies stronger.

1.2 Data Gathering

GINI index (World Bank estimate). The indicators represent the wealth distribution and it can be found in country level. This is the most common indicator used to measure inequality.

Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population). This indicator presents the ratio (%) of the population living in extreme poverty. The ratio can be found in country or region level.

Population. Represent the number of people living in a specific country. The indicator can be used with other basic social indicators such as poverty to calculate number of poor people.

Life expectancy at birth, total (years). The indicator provides the life expectancy (in years) based on the country.

Average years of schooling age 15plus. The indicator measures how many years are invested in schooling after the age of 15. It can be found by country and it can be used to find trends related to poverty.

GDP per capita. This is a key indicator when comparing countries, showing their performances. Per capita GDP measures the total output of a country(GDP) and divides it by the number of people.

1.3 Design and Development Plan

After checking and comparing previous visualization works, a series of charts are made to demonstrate the core purpose of this project. As shown in the figure 1, this project focuses more on the complex and deep side but also maintains the easily understandable charts for readers to begin with. In detail, three types of basic charts, including line chart, bar chart and pie chart, are used to briefly display the overall trend of poverty and inequality around the world. And lack of interactivity, as found in most previous visualization works, is a shared problem, so that this project will pay more attention into in-depth interactive graphs, such as scatter plot, dynamic geographic map, parallel graph for readers to further dig, customize and explore into the data. Besides, the web page for this project is responsiveness-supported, giving readers the flexibility to read on different resolutions.

The development length for this project is 4 weeks. On the first week, a basic frame of the final web page has been designed since this is a critical first step is to design the overall look of the project to uncover and identify specific needs, and determine the feasibility of the expected software development. On the second week, massive data from Undata, World Bank, Greenpeace and USaid have been collected and then been carefully cleansed. After that, on the third week, various D3 charts have been created and strictly polished mapped with data from JSON and CSV. Finally, on the last week, what was left of this project, like assembling, debugging, presenting, demoing, have all been accomplished.

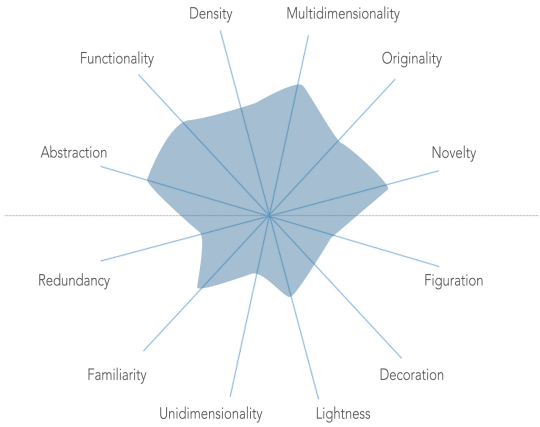

Fig. 1. Cairo's Visualization Wheel

2 Related Works

GLOBAL INEQUALITY: BEYOND THE BOTTOM BILLION. Ortiz and Cummins focused in the inequality problem, providing an overview of global, regional, and national income inequalities based on data from World Bank. The report covers analysis about the global income distribution by population quintiles from 1990 to 2013. It also analyzes the situation by income level group (ow income, middle income, high income) and provide comparisons among regions.

Tackling Poverty. This World Bank report provides valuable information about poverty, focusing on extreme poverty (less than $1.9 per day) by regions. The work included data for 11 years starting from 1900 to 2013. It also gives insight of specific groups of interest such as children, and it provides details of poor people and people living in slums for countries more affected by this problem. The report presents summary data, where countries are classified by region. It does not provide analysis for country level.

3 Visualizations

The website includes 9 charts, distributed in 3 different sections.

Section 1: Overview

The first section of the website includes a definition of Economy, Poverty and Inequality for the audience to understand key terms of the topic. In addition, this section provides two line charts to show global trends of both Poverty and Inequality indicator from 1820 to 2013. It also includes an interactive donut chart to show the distribution of poverty among regions. This distribution chart can be filtered by year dynamically to see how the distribution has change since 2002 to 2013.

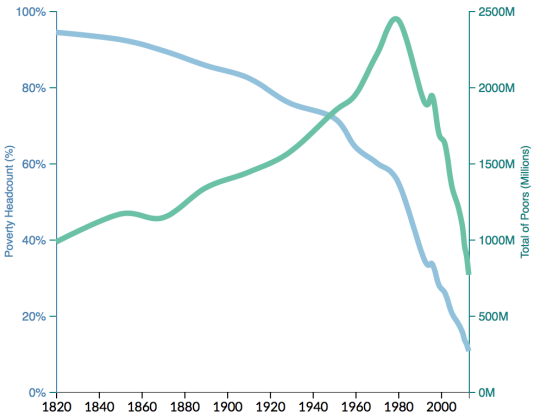

Fig. 2. Line Chart for Poverty

Considerations: Animated line charts have demonstrated to be useful to show trend over time and pie charts are one of the most common graph to provide information of distribution. Both chart types are familiar to audience.

Section 2: Detail

Second section includes details by country and regions. Two dynamic scatterplots are used to show relation between two set of indicators by country: Poverty to Per Capita GNI and Poverty to GINI Index. Each region can be identified by color and filtered to see pattern or clusters. A logarithmic scale is used as horizontal axis to increase insight. The charts include hover function to show detail of specific countries.

To explore the poverty and inequality of countries of certain regions, this section contains a dynamic clustered bar chart, responding to drop-down filters of regions and years. This chart makes easier to compare both indicators by country.

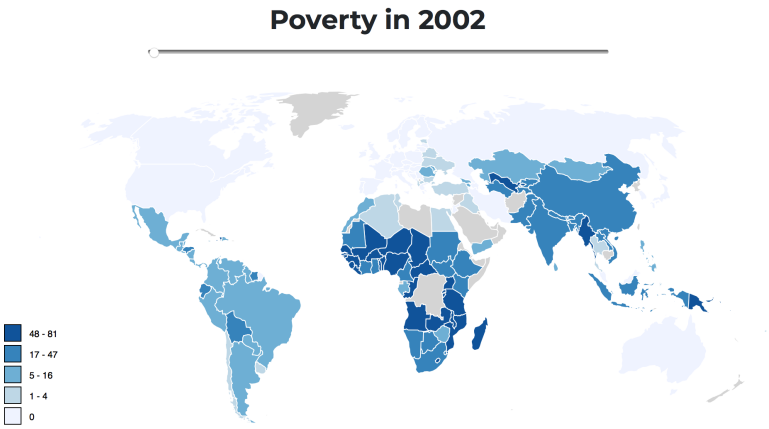

Fig. 3. Geographic Map

The dataset includes more than 150 countries by year, which makes a map a reasonable tool to analyze it. The map includes a slider to filter the year and it is colored by country, depending on the poverty level. The legend has mouse hover property and can be used to highlight similar countries. In addition, by clicking the countries, a pop out windows containing a bar chart will show details of poverty, GNI and GINI Index by year, depending on selection.

Considerations: Considerations: Scatterplot are well known to show relation between two or three variables. By adding colors to regions and dynamic filters, the reader can identify cluster and see patterns easily. Clustered bar charts are familiar graphs that help the reader to make comparisons in a single view. Maps are powerful and popular visualizations that users are familiar to. Its interactivity gives freedom to the user and makes easier to explore specific countries of interest.

Section 3: Summary

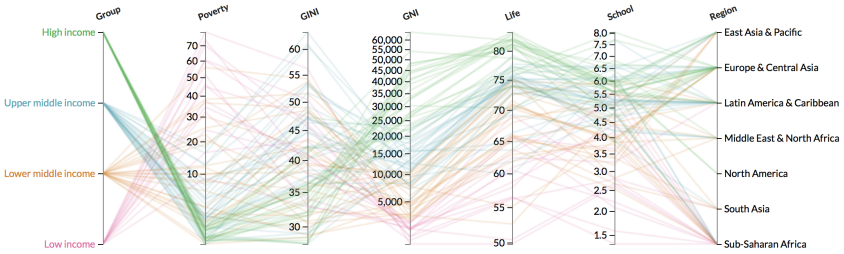

Fig. 4. Parallel Coordinated Chart

To show interconnections between poverty, income inequality, and some basic social indicators (life expectancy, year of school), a parallel coordinates chart is provided. The chart is colored according to level of income, and it allows the user to filter by any of its axis and it gives a detailed table of selected countries. This charts represent a summary where the user can see trends and pattern using all the indicators at the same time, and it also adds a region perspective.

A radio chart is presented as a summary by region with additional indicators. Colors of regions are synchronized throughout the website.

Considerations: Parallel charts are one of the most effective way to provide large amount of variables in a reduced space. Radio charts, helps to emphasize differences among regions.

4 Conclusion

The project covers poverty and inequality in a both global and detailed perspective. It also provides a valuable tool to understand the topic in an interactive way through a responsive website with nine different charts.

Related works are often formal and static reports, often read by people with specific background such as economics. This project tries to reach a general audience using familiar and interesting visualization, making the user to go from global to detail information in seconds, with a pair of click. Colors, format and chart type has been selected to increase cognition and understanding in every one of the graph.

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