A Universal Measure of Household Wealth from Global Census Microdata

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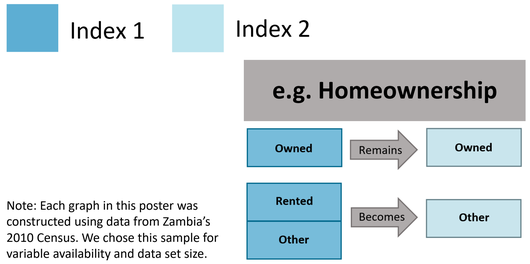
Building the Wealth Indices

Index 2 has fewer levels of factor detail than Index 1.



Note: Each graph in this poster was constructed using data from Zambia's 2010 Census. We chose this sample for variable availability and data set size.

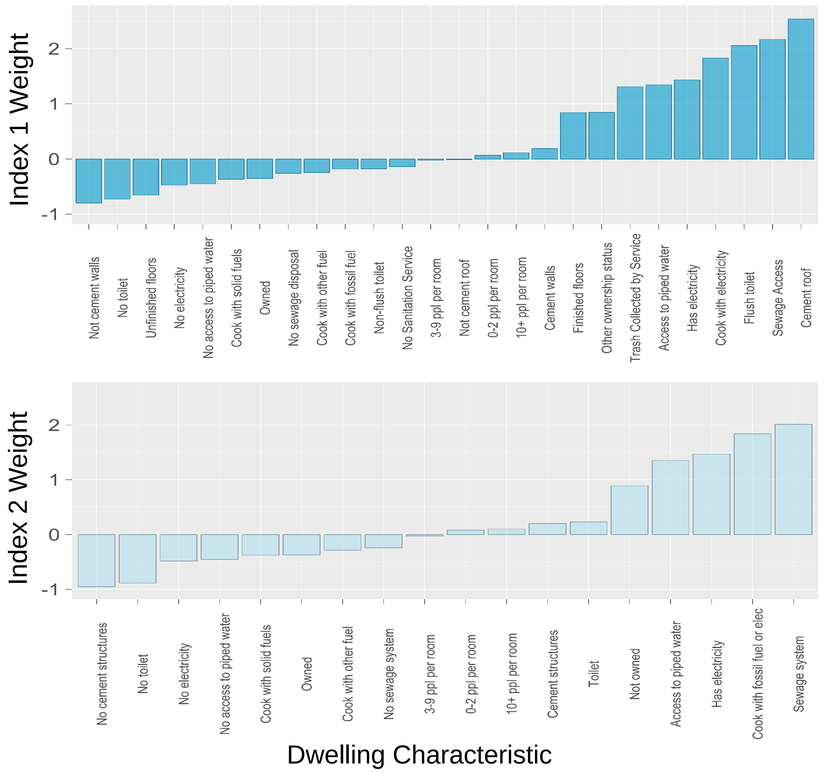
By collapsing the levels of detail, we increase the likelihood that the variable is available across many years and countries.

Machine Learning Recommendations

Multiple Component Analysis

We built the indices using Multiple Component Analysis (M.C.A.), a variant of Principal Component Analysis designed for use with categorical data. While Index 1 has more levels for each factor than Index 2, we see that M.C.A. gives similar weight to comparable factors across both indices. Levels representing the number of people per room in the household receive negligible weights, while access to sewage has a high positive weight and lack of access to electricity has a high negative weight. This M.C.A. behavior makes sense given what we know about wealth.

Index 1 and 2 Loadings



Overview

The International Public Use Microdata Series – International (IPUMS-I) database stores individual person records from 305 Censuses conducted in 85 countries over the last 70 years. In areas with limited economic data, can these Census records be used to create a reliable tool to measure household wealth? Further, given the irregularity in available data from Census to Census, can we intelligently choose factor combinations that allow for comparisons between years and countries? Building on the work of Minnesota Population Center (M.P.C.) researchers, we constructed a set of wealth indices using Multiple Component Analysis. Each wealth index employs a different number of factor levels. We then compared the wealth index rankings with other generally accepted measures of wealth to assess the performance of each index both in predicting wealth and matching the performance of other indices we constructed.

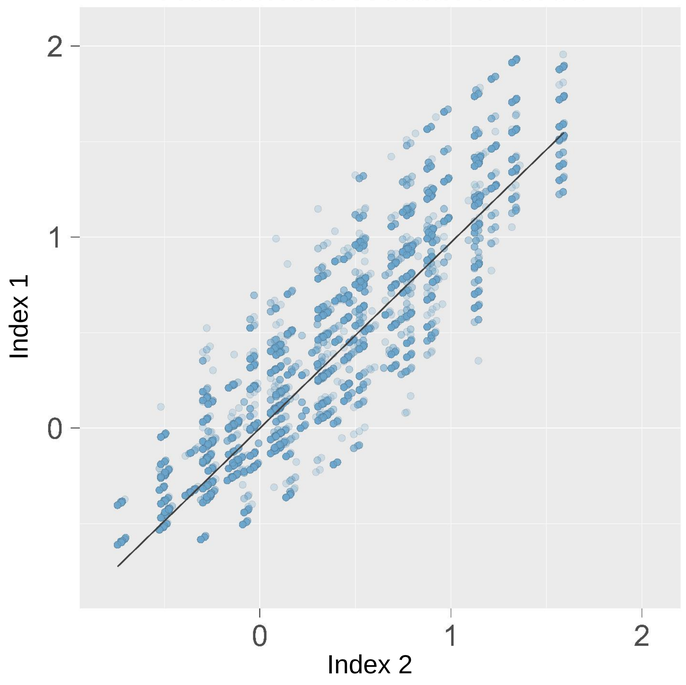
Conclusion

After assessment, we found our least detailed and most detailed wealth indices tend to rank houses similarly. Further, each wealth index compares favorably to other accepted measures of wealth. Given the wide variance in characteristics between households with the same wealth index score, we found the wealth indices unreliable when ranking individual houses. However, the wealth indices consistently identify larger group and population trends. Future research in this area may seek to apply these indices to many countries in the IPUMS-I database to identify global and regional trends.

Comparing Wealth Scores Between Indices

As the plot below demonstrates, Index 1 and Index 2 scores of household wealth are strongly correlated. Yet, the plot also shows what Index 2 loses in the pursuit of comparability across many data sets. The heavy clustering of households around the same score in Index 2 (vertical striations) where Index 1 has wider variance demonstrates the loss of household level detail caused by combining factor levels for Index 2.

Household Wealth Scores



Index Performance Compared to Accepted Wealth Indicators

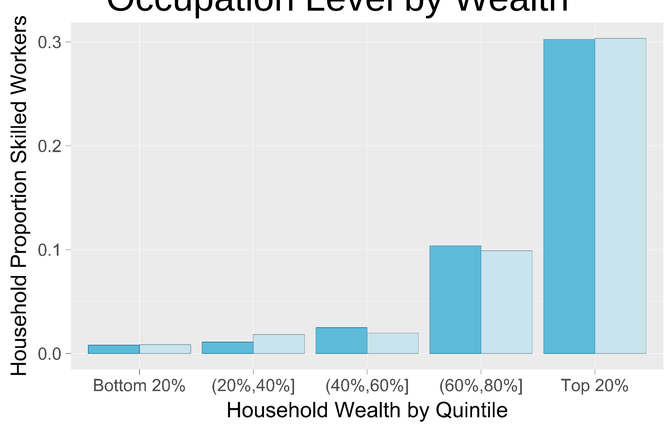
To validate the indices' efficacy in predicting wealth, we compared the wealth index scores to 4 accepted indicators of economic status:

- Educational attainment
- Current school attendance
- Fertility rates
- Occupation by industry and by skill level[1]

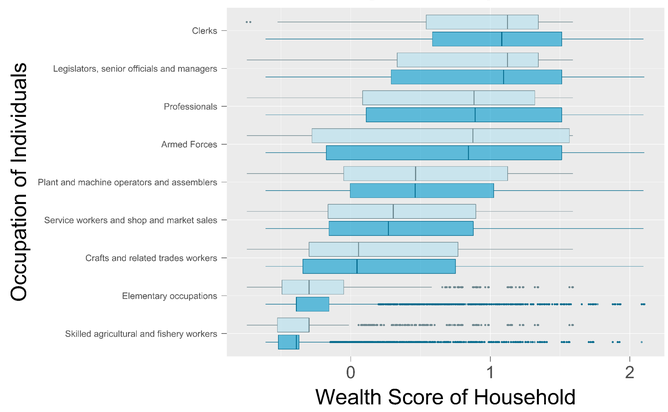
The plots below assess how our 2 wealth indices' scores compare to occupation data from the same Census. Index 1 and Index 2 ranked houses similarly by occupation level. Yet, we see the average trends between indices match our expectations more closely than some of the individual household ranks. For example, many individuals with low-level occupations were placed in high wealth households by both indices. This supports our conclusion: both indices are better suited for identifying population trends than for ranking individual households.

[1] We used M.P.C.'s interpretation of the International Standard Classification of Occupations (ISCO) to define highly skilled occupations.

Occupation Level by Wealth



Wealth Score by Occupation



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