Land Governance in an Interconnected World

ANNUAL WORLD BANK CONFERENCE ON LAND AND POVERTY

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HOW TO BRING HOUSING AT THE CENTRE OF URBAN POLICIES IN PERU?

Home Improvements in Peru between 2001 and 2016

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Abstract

The New Urban Agenda (NUA) proposes to bring Housing at the Centre shifting the focus from simply building houses to an approach where housing plays a key role in achieving urban sustainable development. The existing government's strategy, programs and budget in Peru are inadequate to the achievement of the goals of the NUA. In this paper we propose an operational definition of housing deficit that could help housing policies to increase its efficacy and efficiency. We do so by using the National Household Surveys from 2001-2016. With this information base, we have been able (i) to characterize the process of housing improvement and assess the importance of the State intervention on it and (ii) to identify the proportion in which the increase in real income during the period contributed to housing improvement. We conclude with recommendations of how to improve the design, targeting and implementation of housing programs in Peru.

Key Words:

Housing, Home Improvement, Household Surveys, Peru, New Urban Agenda

1. Background

Historically, governments have used grants, subsidies and other types of interventions as mechanisms to ameliorate the living conditions of the poorest populations. When first implemented in the 19th Century, housing subsidies belonged to the supply-side group, with heavy government intervention (Cigdem and Wood 2012). This shifted in the 1980s, when deregulation became the favored norm. Table 1 shows the some of the different kinds of housing subsidies used to satisfy the needs of families unable to compete in the housing market.

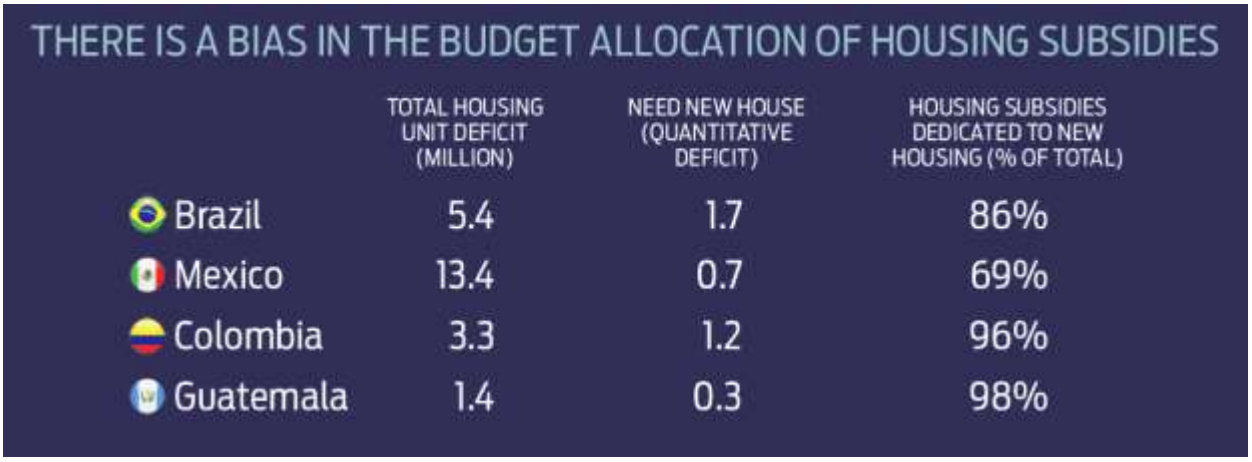
Table 1: Examples of Common Types of Housing Subsidies

	Supply-side Subsidies	Demand-side Subsidies
Direct Intervention	Cash transfers from governments to reduce production costs of housing.	Efforts to increase affordability, such as housing allowances and housing vouchers given directly to tenants. They allow the purchase of new housing, the improvement of existing structures or retrofitting.
Indirect Intervention	Regulations or controls to incentivize certain housing services. For example, caps on interest rates that lower cost of production.	Housing allowances paid through landlords or mortgage lenders, rent controls, tax expenditures, low-interest-rate mortgages.

Source: Cigdem and Wood 2012

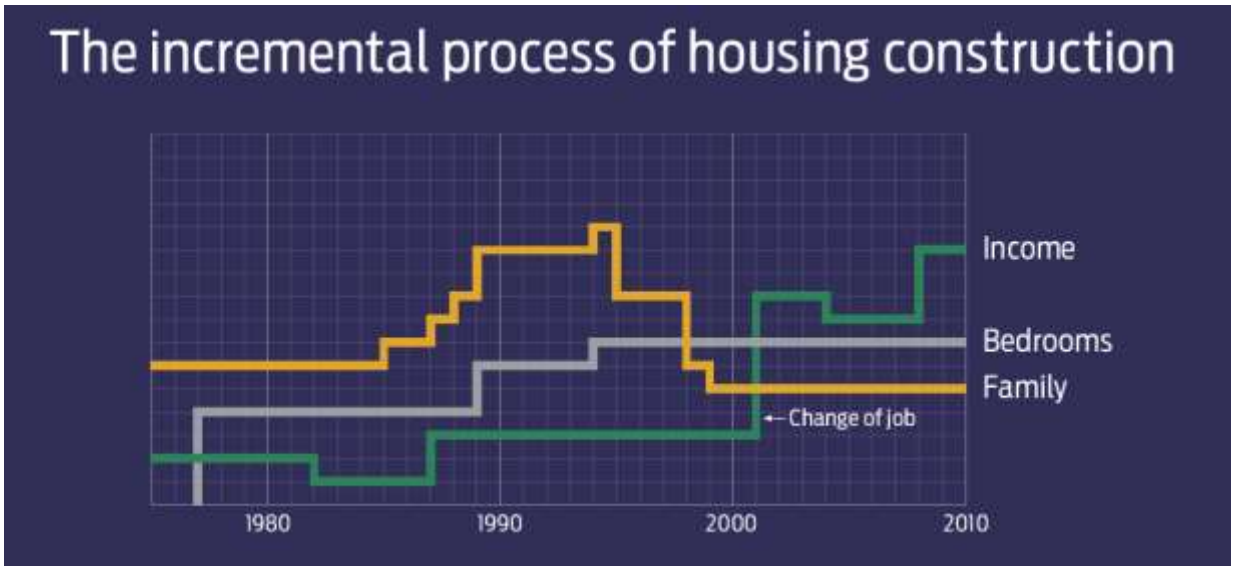
Government in Latin America now exhibits a clear preference for promoting the acquisition of new housing units in the mortgage market. This despite of the fact that, on average, out of those families living in housing deficit, only 20% need a new house while 80% need simply need a better house.

Figure 1



Having little or no direct support from the government, the informal sector is closing the housing gap with incremental housing. Factors that contribute to a faster expansion of informal incremental housing are the steady increase of real income, remittances and housing microloans. On the downside, the lack of technical standards and the unsafe locations that are picked for these developments. For example, between 1970 and 2010, while the world population grew 87%, the population in flood plains increased by 114%. In cyclone-prone areas, the population increase was 192%.

Figure 2



However, urban infrastructure investments could be indirectly promoting private household investments as it was suggested by Strassmann (1984). Public investments on servicing land with access to services such as water, sewerage and electricity could be incentivizing occupants to invest in their homes. Moreover, regular payment of utilities could be interpreted by informal occupants as a path to formality. This impact, nonetheless, is generally limited in the bottom 40 of the population in the absence of public or private options to finance the improvements.

2. The Objective

The objective of the paper is double: first, to evaluate if monetary income plays a role in the reduction of the qualitative deficit; and second, to evaluate the role of government investments in urban infrastructure on private home improvement investments.

3. The Data

The data comes from household surveys made in Peru since year 2001 with a homogenous questionnaire. The years chosen are 2001, 2006, 2011 and 2016, covering the presidential terms of Alejandro Toledo, Alan Garcia and Ollanta Humala.

The ENAHO (Encuesta Nacional de Hogares) is a survey that, besides measuring poverty, has become the flagship tool for public policy in social issues. This explains why it sample size has increased more than twice in the last 15 years. The databases and metadata are available to general public at http://iinei.inei.gob.pe/microdatos/ . The data for dwelling characteristics comes from Module 100 and monetary income comes from "Sumaria" (summary). All databases have expansion factors based in 2007 population census, which is the latest available. The income was spatially deflated from the whole country to the capital, so intertemporal comparisons are possible using the CPI (Consumer Price Index) from Lima.

The 2001 survey covered 16,515 households, the 2006 survey covered 20,577 households, the 2011 survey covered 24,809 households, and 2016 survey covered 35,785 households; with a total of 97,686 households in 4 years. Eventually, if surveys from every year are accumulated, there is nearly half a million observations.

4. The Results

Two operational definitions are made in this paper. First, the characteristics from walls, floor and roof determine the quality of a house. Second, the access to water, sewerage and electricity determine the quality of a neighborhood and is the result of government investments.

4.1 Evolution of Housing Quality between 2001 and 2016

In order to make a comparison over time, the materials of walls, floor and roof were collapsed in homogeneous categories. The main objective was to distinguish between pre-industrial materials and industrial materials. Fortunately, the wall, floor and roof options were relatively similar throughout the years. Only options with very small number of observations were taken out of the analysis.

The simplified set of options identified was the following:

Table 2

Wall	**Floor**	**Roof**
Adobe	Dirt	Zinc plates
Bricks	Cement	Concrete
Wood	Any tiles	Straw, Leaf, etc.
Stone	Wood	Terracotta
Other	Other	Other

Given 5 options for 3 structures, 125 different configurations of dwellings are possible. A threshold of 2% of the sample was introduced to limit this set of options. With this threshold, for 2001 76% of the original total of households was selected; for 2006 78%; for 2011 77%; and for 2016 78%. In Annex 1, all the possible combinations are presented.

The next step is to calculate median income –to avoid biases from extreme values- for households in categories above 2%. Then, this income is allocated in the centile for the income distribution of that year. The decision to work with centiles in the distribution is for highlighting where in the income pyramid each house belongs.

With this information, four tables are presented in Annex 2 for years 2001, 2006, 2011 and 2016. The total number of significant categories –above 2%- varies from 10 to 12, but a pattern appears for this time frame. A first element is material of floor, lowest income groups have pre-industrial materials, and highest income groups have industrial materials. Then the lowest of the lowest, the material of roof is pre-industrial; and then inside the highest of the highest the material of roof is concrete. To conclude, an elite who has floor made of tiles instead of concrete.

Another pattern starts to appear over time, assuming as a first category for welfare on dwellings the material of floor, to have a industrial material implied: in 2001 to be above 62th centile, in 2006 to be above 55th centile, in 2011 to be above 52th centile, and in 2016 to be above 49th centile; which clearly shows how households in lower centiles find more affordable to have industrial material floor.

Assuming a higher welfare defined as floor made from industrial material and roof made of concrete, the evolution is: in 2001 to be above 74th centile, in 2006 to be above 76th centile, in 2011 to be above 70th

centile, and in 2016 to be above 68th centile; which shows a slight reduction in affordability between 2001 and 2006, and an increase of affordability for 2006-2011-2016. But from end to end, the affordability increases in 6 points, while in previous paragraph affordability increases in 13 points, around twice.

If the top category is analyzed, which is floor made of tiles and roof of concrete, the evolution is quite similar evolving for 2001-2006-2011-2016, 88%-90%-85%-83% respectively. Affordability increases in 5 points, which is not substantially different with the value found in previous paragraph. In the other end, households with floor and roof made from pre-industrial material show a slight reduction of 4 points from end to end with value for 2001-2006-2011-2016 of 28%-24%-22%-24%.

Figure 3

PERU: QUALITY OF HOUSING INCREASES WITH INCOME

ABOVE WHICH PERCENTILE DO FAMILIES NEED TO BE TO LIVE IN A HOUSE WITH...	2001	2016
Floor with tiles and roof of concrete	>88%	>83%
Floor with industrial material and roof of concrete	>74%	>68%
Floor with industrial material	>62%	>49%
Floor and roof made of pre-industrial materials	>28%	>24%
Increase in real income		39.2%

This improvement in affordability is explained by the increase of monetary income in real terms. During President Toledo's tenure (2001-2006), the increase was 7.6%; during President Garcia's, (2006-2011), 24.2%; and finally during President Humala's, 4.3%. It is important to notice the boom on commodity prices that started during the final years of Toledo and lasted until the early years of President Humala's term. In any case, real income increased 39.2% between 2001 and 2006.

The increase in real income was accompanied by a reduction in inequality. The most common inequality measure, the Gini Index, shows a permanent reduction for years 2001, 2006, 2011, 2016 with values 0.58, 0.57, 0.53, 0.52, respectively. But as any value obtained from a sample there is an error margin. In order to identify if this reduction is real or it is only statistical noise, an evaluation is carried out with the Lorenz Curve of each year, with confidence intervals of 99.9% (equivalent an error of 1 in 1,000).

Between 2001 and 2006 –Toledo's tenure–, it's found only first the 2 deciles showed an increase of nominal income. Between 2006 and 2011 –Garcia's tenure–, the first 8 deciles showed an increase of income. Between 2011 and 2016 –Humala's tenure–, the finding is only the first decile showed an

increase of income. In conclusion, a steady increase of income happened for the lowest deciles in these 3 presidential tenures. For the 15 years between 2001 and 2016, every decile of the distribution benefitted from an increase of nominal income. The graphs with the results are available in Annex 3.

4.2 The role of the Government in upgrading urban infrastructure

In Peru, government intervention in housing can be divided in two parts. The most important and better know is the effort to promote the acquisition of a new house in mortgage markets. The demand subsidy program has played a key role in expanding the access to new formal housing to a large portion of the middle class in recent years. This effort, however, won't be the focus of this paper. In this paper, we will analyze how the investments in urban infrastructure have played a role in the housing quality improvement. To simplify the investments under analysis will be those related to basic service provision. Three utilities were considered: 1) Piped water inside the dwelling, 2) Piped drainage inside dwelling, and 3) Electric lighting. With this three dichotomy concepts there is a total of 8 possible combinations for utilities access.

In order to reduce the number of combinations, for the categories of wall, floor and roof developed in previous section with 5 categories each; a reduction is made for industrial materials or pre-industrial materials. In this way, it's possible to have a dwelling made completely with industrial materials and full access to utilities in one end, and a dwelling made completely with pre-industrial materials and no access to utilities at all in other end, with 2 intermediate results.

The evolution of a dwelling completely made with industrial materials evolved from 36% in 2001 to 46% in 2016, while the evolution of dwelling with full access to utilities evolved from 46% in 2001 to 63% in 2016; the intermediate values for 2006 and 2011 are available in Annex 4. So if a proper dwelling consists in being made of industrial material and to have access to industrial utilities; it is possible to analyze the joint evolution of both characteristics.

When observing the extreme cases of: A) a dwelling made completely with industrial materials and full access to utilities and B) a dwelling made completely with pre-industrial materials and no access to utilities at all. The results for 2001 are 30% and 48% and the results for 2016 are 40% and 31%, respectively. The largest reduction of dwellings on the worst conditions is explained by the aggressive government policy of providing utilities to households, while the building of dwellings was left to individual initiative.

Figure 4

Also, it is important to notice how the percentage of dwellings made of industrial materials and no access to utilities is constant along time with values of 7%, 6%, 7%, and 6% for 2001, 2006, 2011 and 2016, respectively. The detailed results are in Annex 5.

With previous concepts of dwelling materials and utilities access, an aggregate concept of housing deficit could be made where extreme deficit happens when the dwelling is completed made of pre-industrial materials and has no access at all to utilities, partial deficit when one condition is fulfilled and the other not, and no deficit when the dwelling is completed made of industrial materials and has full access to utilities.

With this generic definition of housing deficit, a statistical test was carried out to verify if in each presidential tenure exists or not a reduction of housing deficit. The test is the Pearson Chi Square for contingency tables; it shows in every presidential tenure, a reduction of housing deficit. The reduction of extreme deficit is 4 points for Toledo, 7 points for Garcia and 6 points for Humala; and the increase of no deficit is 3 points for Toledo, 4 points for Garcia and 3 points for Humala. The overall evolution for 15 years of analysis is 17 points of reduction for extreme deficit and 10 points increase for no deficit. The detailed results are in Annex 6.

Conclusions

1. It is possible to use household surveys and census to produce detailed analysis of the housing deficit in a country, with the operational definition described previously.
2. Housing quality improved in Peru in the last 15 years, mainly because of households' investments during a period of consistent increase of real income.
3. Government intervention focused on servicing land with water, sewerage and electric lights, is playing a key role in improving neighborhoods and is incentivizing households to invest on their properties.
4. There is gap generated by the mismatch between the government intervention and the private initiative which translate in neighborhoods with services and substandard housing. This gap could be closed with better housing microfinance products and other financial products that incentivize the use of remittances for home improvement.

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Annex 1

Household Survey 2001

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Bricks	Cement	Concrete	5683	16.06%	16.06%
Adobe	Dirt	Zinc Plates	5400	15.26%	31.33%
Bricks	Any Tiles	Concrete	4896	13.84%	45.17%
Bricks	Cement	Zinc Plates	3018	8.53%	53.70%
Adobe	Cement	Zinc Plates	2292	6.48%	60.17%
Adobe	Dirt	Terracotta	2108	5.96%	66.13%
Wood	Cement	Zinc Plates	1193	3.37%	69.50%
Wood	Dirt	Zinc Plates	1147	3.24%	72.75%
Wood	Wood	Zinc Plates	998	2.82%	75.57%
Adobe	Dirt	Straw, Leaf, etc	823	2.33%	77.89%
Adobe	Cement	Straw, Leaf, etc	696	1.97%	79.86%
Adobe	Wood	Zinc Plates	626	1.77%	81.63%
Other	Dirt	Zinc Plates	567	1.60%	83.23%
Bricks	Dirt	Zinc Plates	561	1.59%	84.82%
Adobe	Cement	Terracotta	515	1.46%	86.27%
Bricks	Any Tiles	Zinc Plates	411	1.16%	87.44%
Bricks	Cement	Straw, Leaf, etc	403	1.14%	88.58%
Other	Cement	Zinc Plates	364	1.03%	89.60%
Adobe	Wood	Terracotta	328	0.93%	90.53%
Wood	Wood	Straw, Leaf, etc	275	0.78%	91.31%
Other	Dirt	Straw, Leaf, etc	239	0.68%	91.98%
Bricks	Wood	Zinc Plates	218	0.62%	92.60%
Stone	Dirt	Zinc Plates	185	0.52%	93.12%
Wood	Dirt	Straw, Leaf, etc	174	0.49%	93.61%
Bricks	Dirt	Concrete	150	0.42%	94.04%
Adobe	Cement	Other	149	0.42%	94.46%
Bricks	Cement	Other	124	0.35%	94.81%

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Stone	Cement	Zinc Plates	100	0.28%	95.09%
Stone	Dirt	Straw, Leaf, etc	99	0.28%	95.37%
Adobe	Cement	Concrete	95	0.27%	95.64%
Adobe	Dirt	Other	86	0.24%	95.88%
Other	Wood	Zinc Plates	85	0.24%	96.12%
Other	Other	Straw, Leaf, etc	79	0.22%	96.35%
Bricks	Wood	Concrete	74	0.21%	96.56%
Adobe	Any Tiles	Zinc Plates	73	0.21%	96.76%
Bricks	Dirt	Straw, Leaf, etc	72	0.20%	96.97%
Stone	Cement	Concrete	62	0.18%	97.14%
Wood	Cement	Other	57	0.16%	97.30%
Adobe	Wood	Other	54	0.15%	97.46%
Bricks	Cement	Terracotta	46	0.13%	97.59%
Wood	Other	Straw, Leaf, etc	44	0.12%	97.71%
Other	Wood	Straw, Leaf, etc	43	0.12%	97.83%
Adobe	Any Tiles	Other	42	0.12%	97.95%
Wood	Cement	Straw, Leaf, etc	42	0.12%	98.07%
Wood	Any Tiles	Zinc Plates	42	0.12%	98.19%
Other	Dirt	Terracotta	42	0.12%	98.31%
Stone	Any Tiles	Concrete	35	0.10%	98.41%
Adobe	Any Tiles	Terracotta	34	0.10%	98.50%
Other	Cement	Straw, Leaf, etc	34	0.10%	98.60%
Stone	Dirt	Terracotta	33	0.09%	98.69%
Bricks	Any Tiles	Other	29	0.08%	98.77%
Bricks	Any Tiles	Terracotta	27	0.08%	98.85%
Adobe	Any Tiles	Straw, Leaf, etc	26	0.07%	98.92%
Adobe	Other	Zinc Plates	26	0.07%	99.00%
Adobe	Any Tiles	Concrete	24	0.07%	99.06%
Bricks	Any Tiles	Straw, Leaf, etc	23	0.07%	99.13%
Adobe	Dirt	Concrete	22	0.06%	99.19%

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Other	Other	Zinc Plates	22	0.06%	99.25%
Other	Dirt	Other	20	0.06%	99.31%
Adobe	Wood	Straw, Leaf, etc	19	0.05%	99.36%
Stone	Wood	Zinc Plates	19	0.05%	99.42%
Wood	Other	Zinc Plates	18	0.05%	99.47%
Bricks	Dirt	Other	17	0.05%	99.52%
Bricks	Wood	Other	16	0.05%	99.56%
Bricks	Wood	Terracotta	15	0.04%	99.60%
Wood	Wood	Other	15	0.04%	99.65%
Wood	Dirt	Other	13	0.04%	99.68%
Stone	Cement	Other	11	0.03%	99.71%
Other	Cement	Other	10	0.03%	99.74%
Bricks	Dirt	Terracotta	8	0.02%	99.77%
Wood	Any Tiles	Other	8	0.02%	99.79%
Stone	Dirt	Other	8	0.02%	99.81%
Stone	Cement	Straw, Leaf, etc	8	0.02%	99.83%
Stone	Cement	Terracotta	8	0.02%	99.86%
Stone	Wood	Terracotta	7	0.02%	99.88%
Adobe	Other	Terracotta	6	0.02%	99.89%
Bricks	Wood	Straw, Leaf, etc	5	0.01%	99.91%
Wood	Dirt	Terracotta	5	0.01%	99.92%
Stone	Wood	Concrete	5	0.01%	99.93%
Bricks	Other	Concrete	4	0.01%	99.95%
Adobe	Wood	Concrete	3	0.01%	99.95%
Adobe	Other	Straw, Leaf, etc	3	0.01%	99.96%
Stone	Dirt	Concrete	3	0.01%	99.97%
Other	Cement	Terracotta	3	0.01%	99.98%
Bricks	Other	Zinc Plates	2	0.01%	99.99%
Wood	Cement	Terracotta	1	0.00%	99.99%
Wood	Wood	Terracotta	1	0.00%	99.99%

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Wood	Other	Other	1	0.00%	99.99%
Stone	Wood	Straw, Leaf, etc	1	0.00%	100.00%
Stone	Wood	Other	1	0.00%	100.00%

Household Survey 2006

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Bricks	Cement	Concrete	5683	16.06%	16.06%
Adobe	Dirt	Zinc Plates	5400	15.26%	31.33%
Bricks	Any Tiles	Concrete	4896	13.84%	45.17%
Bricks	Cement	Zinc Plates	3018	8.53%	53.70%
Adobe	Cement	Zinc Plates	2292	6.48%	60.17%
Adobe	Dirt	Terracotta	2108	5.96%	66.13%
Wood	Cement	Zinc Plates	1193	3.37%	69.50%
Wood	Dirt	Zinc Plates	1147	3.24%	72.75%
Wood	Wood	Zinc Plates	998	2.82%	75.57%
Adobe	Dirt	Straw, Leaf, etc	823	2.33%	77.89%
Adobe	Cement	Straw, Leaf, etc	696	1.97%	79.86%
Adobe	Wood	Zinc Plates	626	1.77%	81.63%
Other	Dirt	Zinc Plates	567	1.60%	83.23%
Bricks	Dirt	Zinc Plates	561	1.59%	84.82%
Adobe	Cement	Terracotta	515	1.46%	86.27%
Bricks	Any Tiles	Zinc Plates	411	1.16%	87.44%
Bricks	Cement	Straw, Leaf, etc	403	1.14%	88.58%
Other	Cement	Zinc Plates	364	1.03%	89.60%
Adobe	Wood	Terracotta	328	0.93%	90.53%
Wood	Wood	Straw, Leaf, etc	275	0.78%	91.31%
Other	Dirt	Straw, Leaf, etc	239	0.68%	91.98%
Bricks	Wood	Zinc Plates	218	0.62%	92.60%
Stone	Dirt	Zinc Plates	185	0.52%	93.12%
Wood	Dirt	Straw, Leaf, etc	174	0.49%	93.61%
Bricks	Dirt	Concrete	150	0.42%	94.04%
Adobe	Cement	Other	149	0.42%	94.46%
Bricks	Cement	Other	124	0.35%	94.81%
Stone	Cement	Zinc Plates	100	0.28%	95.09%
Stone	Dirt	Straw, Leaf, etc	99	0.28%	95.37%

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Adobe	Cement	Concrete	95	0.27%	95.64%
Adobe	Dirt	Other	86	0.24%	95.88%
Other	Wood	Zinc Plates	85	0.24%	96.12%
Other	Other	Straw, Leaf, etc	79	0.22%	96.35%
Bricks	Wood	Concrete	74	0.21%	96.56%
Adobe	Any Tiles	Zinc Plates	73	0.21%	96.76%
Bricks	Dirt	Straw, Leaf, etc	72	0.20%	96.97%
Stone	Cement	Concrete	62	0.18%	97.14%
Wood	Cement	Other	57	0.16%	97.30%
Adobe	Wood	Other	54	0.15%	97.46%
Bricks	Cement	Terracotta	46	0.13%	97.59%
Wood	Other	Straw, Leaf, etc	44	0.12%	97.71%
Other	Wood	Straw, Leaf, etc	43	0.12%	97.83%
Adobe	Any Tiles	Other	42	0.12%	97.95%
Wood	Cement	Straw, Leaf, etc	42	0.12%	98.07%
Wood	Any Tiles	Zinc Plates	42	0.12%	98.19%
Other	Dirt	Terracotta	42	0.12%	98.31%
Stone	Any Tiles	Concrete	35	0.10%	98.41%
Adobe	Any Tiles	Terracotta	34	0.10%	98.50%
Other	Cement	Straw, Leaf, etc	34	0.10%	98.60%
Stone	Dirt	Terracotta	33	0.09%	98.69%
Bricks	Any Tiles	Other	29	0.08%	98.77%
Bricks	Any Tiles	Terracotta	27	0.08%	98.85%
Adobe	Any Tiles	Straw, Leaf, etc	26	0.07%	98.92%
Adobe	Other	Zinc Plates	26	0.07%	99.00%
Adobe	Any Tiles	Concrete	24	0.07%	99.06%
Bricks	Any Tiles	Straw, Leaf, etc	23	0.07%	99.13%
Adobe	Dirt	Concrete	22	0.06%	99.19%
Other	Other	Zinc Plates	22	0.06%	99.25%
Other	Dirt	Other	20	0.06%	99.31%

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Adobe	Wood	Straw, Leaf, etc	19	0.05%	99.36%
Stone	Wood	Zinc Plates	19	0.05%	99.42%
Wood	Other	Zinc Plates	18	0.05%	99.47%
Bricks	Dirt	Other	17	0.05%	99.52%
Bricks	Wood	Other	16	0.05%	99.56%
Bricks	Wood	Terracotta	15	0.04%	99.60%
Wood	Wood	Other	15	0.04%	99.65%
Wood	Dirt	Other	13	0.04%	99.68%
Stone	Cement	Other	11	0.03%	99.71%
Other	Cement	Other	10	0.03%	99.74%
Bricks	Dirt	Terracotta	8	0.02%	99.77%
Wood	Any Tiles	Other	8	0.02%	99.79%
Stone	Dirt	Other	8	0.02%	99.81%
Stone	Cement	Straw, Leaf, etc	8	0.02%	99.83%
Stone	Cement	Terracotta	8	0.02%	99.86%
Stone	Wood	Terracotta	7	0.02%	99.88%
Adobe	Other	Terracotta	6	0.02%	99.89%
Bricks	Wood	Straw, Leaf, etc	5	0.01%	99.91%
Wood	Dirt	Terracotta	5	0.01%	99.92%
Stone	Wood	Concrete	5	0.01%	99.93%
Bricks	Other	Concrete	4	0.01%	99.95%
Adobe	Wood	Concrete	3	0.01%	99.95%
Adobe	Other	Straw, Leaf, etc	3	0.01%	99.96%
Stone	Dirt	Concrete	3	0.01%	99.97%
Other	Cement	Terracotta	3	0.01%	99.98%
Bricks	Other	Zinc Plates	2	0.01%	99.99%
Wood	Cement	Terracotta	1	0.00%	99.99%
Wood	Wood	Terracotta	1	0.00%	99.99%
Wood	Other	Other	1	0.00%	99.99%
Stone	Wood	Straw, Leaf, etc	1	0.00%	100.00%

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Stone	Wood	Other	1	0.00%	100.00%

Household Survey 2011

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Bricks	Cement	Concrete	3,215	15.95%	15.95%
Adobe	Dirt	Zinc Plates	3,198	15.87%	31.82%
Adobe	Dirt	Terracotta	1,765	8.76%	40.58%
Bricks	Any Tiles	Concrete	1,556	7.72%	48.31%
Bricks	Cement	Zinc Plates	1,319	6.55%	54.85%
Adobe	Dirt	Straw, Leaf, etc	1,242	6.16%	61.01%
Adobe	Cement	Zinc Plates	930	4.62%	65.63%
Wood	Dirt	Zinc Plates	701	3.48%	69.11%
Adobe	Cement	Straw, Leaf, etc	521	2.59%	71.69%
Other	Dirt	Zinc Plates	449	2.23%	73.92%
Wood	Wood	Zinc Plates	436	2.16%	76.09%
Wood	Cement	Zinc Plates	411	2.04%	78.13%
Bricks	Dirt	Zinc Plates	342	1.70%	79.82%
Other	Dirt	Straw, Leaf, etc	336	1.67%	81.49%
Adobe	Cement	Terracotta	322	1.60%	83.09%
Other	Other	Straw, Leaf, etc	322	1.60%	84.69%
Adobe	Wood	Zinc Plates	308	1.53%	86.21%
Wood	Dirt	Straw, Leaf, etc	257	1.28%	87.49%
Wood	Wood	Straw, Leaf, etc	243	1.21%	88.70%
Bricks	Cement	Straw, Leaf, etc	216	1.07%	89.77%
Bricks	Dirt	Concrete	171	0.85%	90.62%
Adobe	Wood	Terracotta	156	0.77%	91.39%
Other	Cement	Zinc Plates	151	0.75%	92.14%
Stone	Dirt	Straw, Leaf, etc	141	0.70%	92.84%
Bricks	Wood	Zinc Plates	136	0.67%	93.51%
Adobe	Cement	Other	123	0.61%	94.12%
Stone	Dirt	Zinc Plates	95	0.47%	94.60%
Bricks	Cement	Other	86	0.43%	95.02%
Wood	Other	Straw, Leaf, etc	83	0.41%	95.43%

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Bricks	Any Tiles	Zinc Plates	73	0.36%	95.80%
Stone	Cement	Concrete	72	0.36%	96.15%
Bricks	Dirt	Straw, Leaf, etc	68	0.34%	96.49%
Adobe	Dirt	Other	58	0.29%	96.78%
Stone	Cement	Zinc Plates	57	0.28%	97.06%
Other	Dirt	Other	46	0.23%	97.29%
Bricks	Wood	Concrete	43	0.21%	97.50%
Wood	Cement	Straw, Leaf, etc	38	0.19%	97.69%
Adobe	Wood	Other	37	0.18%	97.88%
Bricks	Cement	Terracotta	36	0.18%	98.05%
Bricks	Any Tiles	Terracotta	24	0.12%	98.17%
Other	Cement	Straw, Leaf, etc	24	0.12%	98.29%
Stone	Dirt	Terracotta	23	0.11%	98.41%
Other	Other	Zinc Plates	23	0.11%	98.52%
Adobe	Any Tiles	Zinc Plates	19	0.09%	98.62%
Wood	Dirt	Terracotta	19	0.09%	98.71%
Adobe	Other	Zinc Plates	18	0.09%	98.80%
Wood	Wood	Other	18	0.09%	98.89%
Wood	Cement	Other	15	0.07%	98.96%
Adobe	Any Tiles	Other	14	0.07%	99.03%
Wood	Dirt	Other	14	0.07%	99.10%
Adobe	Any Tiles	Terracotta	13	0.06%	99.17%
Wood	Other	Zinc Plates	13	0.06%	99.23%
Adobe	Other	Straw, Leaf, etc	12	0.06%	99.29%
Bricks	Dirt	Terracotta	12	0.06%	99.35%
Bricks	Any Tiles	Other	12	0.06%	99.41%
Stone	Wood	Zinc Plates	12	0.06%	99.47%
Stone	Any Tiles	Concrete	11	0.05%	99.52%
Bricks	Wood	Terracotta	9	0.04%	99.57%
Bricks	Dirt	Other	8	0.04%	99.61%

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Adobe	Wood	Straw, Leaf, etc	7	0.03%	99.64%
Other	Cement	Other	7	0.03%	99.68%
Bricks	Other	Concrete	6	0.03%	99.71%
Wood	Any Tiles	Zinc Plates	6	0.03%	99.74%
Stone	Wood	Terracotta	6	0.03%	99.77%
Adobe	Other	Terracotta	5	0.02%	99.79%
Bricks	Wood	Other	5	0.02%	99.82%
Wood	Cement	Terracotta	5	0.02%	99.84%
Stone	Cement	Straw, Leaf, etc	5	0.02%	99.87%
Stone	Cement	Terracotta	5	0.02%	99.89%
Bricks	Any Tiles	Straw, Leaf, etc	4	0.02%	99.91%
Adobe	Other	Other	3	0.01%	99.93%
Stone	Dirt	Concrete	3	0.01%	99.94%
Stone	Cement	Other	3	0.01%	99.96%
Stone	Other	Zinc Plates	2	0.01%	99.97%
Wood	Any Tiles	Terracotta	1	0.00%	99.97%
Wood	Any Tiles	Other	1	0.00%	99.98%
Wood	Other	Other	1	0.00%	99.98%
Stone	Wood	Other	1	0.00%	99.99%
Stone	Other	Concrete	1	0.00%	99.99%
Stone	Other	Straw, Leaf, etc	1	0.00%	100.00%
Other	Other	Other	1	0.00%	100.00%

Household Survey 2016

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Bricks	Cement	Concrete	5683	16.06%	16.06%
Adobe	Dirt	Zinc Plates	5400	15.26%	31.33%
Bricks	Any Tiles	Concrete	4896	13.84%	45.17%
Bricks	Cement	Zinc Plates	3018	8.53%	53.70%
Adobe	Cement	Zinc Plates	2292	6.48%	60.17%
Adobe	Dirt	Terracotta	2108	5.96%	66.13%
Wood	Cement	Zinc Plates	1193	3.37%	69.50%
Wood	Dirt	Zinc Plates	1147	3.24%	72.75%
Wood	Wood	Zinc Plates	998	2.82%	75.57%
Adobe	Dirt	Straw, Leaf, etc	823	2.33%	77.89%
Adobe	Cement	Straw, Leaf, etc	696	1.97%	79.86%
Adobe	Wood	Zinc Plates	626	1.77%	81.63%
Other	Dirt	Zinc Plates	567	1.60%	83.23%
Bricks	Dirt	Zinc Plates	561	1.59%	84.82%
Adobe	Cement	Terracotta	515	1.46%	86.27%
Bricks	Any Tiles	Zinc Plates	411	1.16%	87.44%
Bricks	Cement	Straw, Leaf, etc	403	1.14%	88.58%
Other	Cement	Zinc Plates	364	1.03%	89.60%
Adobe	Wood	Terracotta	328	0.93%	90.53%
Wood	Wood	Straw, Leaf, etc	275	0.78%	91.31%
Other	Dirt	Straw, Leaf, etc	239	0.68%	91.98%
Bricks	Wood	Zinc Plates	218	0.62%	92.60%
Stone	Dirt	Zinc Plates	185	0.52%	93.12%
Wood	Dirt	Straw, Leaf, etc	174	0.49%	93.61%
Bricks	Dirt	Concrete	150	0.42%	94.04%
Adobe	Cement	Other	149	0.42%	94.46%
Bricks	Cement	Other	124	0.35%	94.81%
Stone	Cement	Zinc Plates	100	0.28%	95.09%
Stone	Dirt	Straw, Leaf, etc	99	0.28%	95.37%

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Adobe	Cement	Concrete	95	0.27%	95.64%
Adobe	Dirt	Other	86	0.24%	95.88%
Other	Wood	Zinc Plates	85	0.24%	96.12%
Other	Other	Straw, Leaf, etc	79	0.22%	96.35%
Bricks	Wood	Concrete	74	0.21%	96.56%
Adobe	Any Tiles	Zinc Plates	73	0.21%	96.76%
Bricks	Dirt	Straw, Leaf, etc	72	0.20%	96.97%
Stone	Cement	Concrete	62	0.18%	97.14%
Wood	Cement	Other	57	0.16%	97.30%
Adobe	Wood	Other	54	0.15%	97.46%
Bricks	Cement	Terracotta	46	0.13%	97.59%
Wood	Other	Straw, Leaf, etc	44	0.12%	97.71%
Other	Wood	Straw, Leaf, etc	43	0.12%	97.83%
Adobe	Any Tiles	Other	42	0.12%	97.95%
Wood	Cement	Straw, Leaf, etc	42	0.12%	98.07%
Wood	Any Tiles	Zinc Plates	42	0.12%	98.19%
Other	Dirt	Terracotta	42	0.12%	98.31%
Stone	Any Tiles	Concrete	35	0.10%	98.41%
Adobe	Any Tiles	Terracotta	34	0.10%	98.50%
Other	Cement	Straw, Leaf, etc	34	0.10%	98.60%
Stone	Dirt	Terracotta	33	0.09%	98.69%
Bricks	Any Tiles	Other	29	0.08%	98.77%
Bricks	Any Tiles	Terracotta	27	0.08%	98.85%
Adobe	Any Tiles	Straw, Leaf, etc	26	0.07%	98.92%
Adobe	Other	Zinc Plates	26	0.07%	99.00%
Adobe	Any Tiles	Concrete	24	0.07%	99.06%
Bricks	Any Tiles	Straw, Leaf, etc	23	0.07%	99.13%
Adobe	Dirt	Concrete	22	0.06%	99.19%
Other	Other	Zinc Plates	22	0.06%	99.25%
Other	Dirt	Other	20	0.06%	99.31%

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Adobe	Wood	Straw, Leaf, etc	19	0.05%	99.36%
Stone	Wood	Zinc Plates	19	0.05%	99.42%
Wood	Other	Zinc Plates	18	0.05%	99.47%
Bricks	Dirt	Other	17	0.05%	99.52%
Bricks	Wood	Other	16	0.05%	99.56%
Bricks	Wood	Terracotta	15	0.04%	99.60%
Wood	Wood	Other	15	0.04%	99.65%
Wood	Dirt	Other	13	0.04%	99.68%
Stone	Cement	Other	11	0.03%	99.71%
Other	Cement	Other	10	0.03%	99.74%
Bricks	Dirt	Terracotta	8	0.02%	99.77%
Wood	Any Tiles	Other	8	0.02%	99.79%
Stone	Dirt	Other	8	0.02%	99.81%
Stone	Cement	Straw, Leaf, etc	8	0.02%	99.83%
Stone	Cement	Terracotta	8	0.02%	99.86%
Stone	Wood	Terracotta	7	0.02%	99.88%
Adobe	Other	Terracotta	6	0.02%	99.89%
Bricks	Wood	Straw, Leaf, etc	5	0.01%	99.91%
Wood	Dirt	Terracotta	5	0.01%	99.92%
Stone	Wood	Concrete	5	0.01%	99.93%
Bricks	Other	Concrete	4	0.01%	99.95%
Adobe	Wood	Concrete	3	0.01%	99.95%
Adobe	Other	Straw, Leaf, etc	3	0.01%	99.96%
Stone	Dirt	Concrete	3	0.01%	99.97%
Other	Cement	Terracotta	3	0.01%	99.98%
Bricks	Other	Zinc Plates	2	0.01%	99.99%
Wood	Cement	Terracotta	1	0.00%	99.99%
Wood	Wood	Terracotta	1	0.00%	99.99%
Wood	Other	Other	1	0.00%	99.99%
Stone	Wood	Straw, Leaf, etc	1	0.00%	100.00%

Wall Material	*Floor Material*	*Roof Material*	*Total Observations*	*Percentage from Total*	*Accumulate Percentage*
Stone	Wood	Other	1	0.00%	100.00%

Annex 2

Household Survey 2001

Income Percentile	*Dwelling Type*	*Wall Material*	*Floor Material*	*Roof Material*
23	11.89%	Adobe	Dirt	Terracotta
28	7.72%	Adobe	Dirt	Straw, Leaf, etc
33	16.00%	Adobe	Dirt	Zinc Plates
46	3.28%	Wood	Dirt	Zinc Plates
60	2.02%	Bricks	Dirt	Zinc Plates
62	2.48%	Adobe	Cement	Straw, Leaf, etc
67	4.23%	Adobe	Cement	Zinc Plates
70	6.15%	Bricks	Cement	Zinc Plates
74	15.46%	Bricks	Cement	Concrete
88	6.96%	Bricks	Any Tiles	Concrete

Household Survey 2006

Income Percentile	*Dwelling Type*	*Wall Material*	*Floor Material*	*Roof Material*
23	6.16%	Adobe	Dirt	Straw, Leaf, etc
24	8.76%	Adobe	Dirt	Terracotta
30	15.87%	Adobe	Dirt	Zinc Plates
41	3.48%	Wood	Dirt	Zinc Plates
42	2.16%	Wood	Wood	Zinc Plates
50	2.23%	Other	Dirt	Zinc Plates
55	4.62%	Adobe	Cement	Zinc Plates
57	2.04%	Wood	Cement	Zinc Plates
63	2.59%	Adobe	Cement	Straw, Leaf, etc
70	6.55%	Bricks	Cement	Zinc Plates
76	15.95%	Bricks	Cement	Concrete
90	7.72%	Bricks	Any Tiles	Concrete

Household Survey 2011

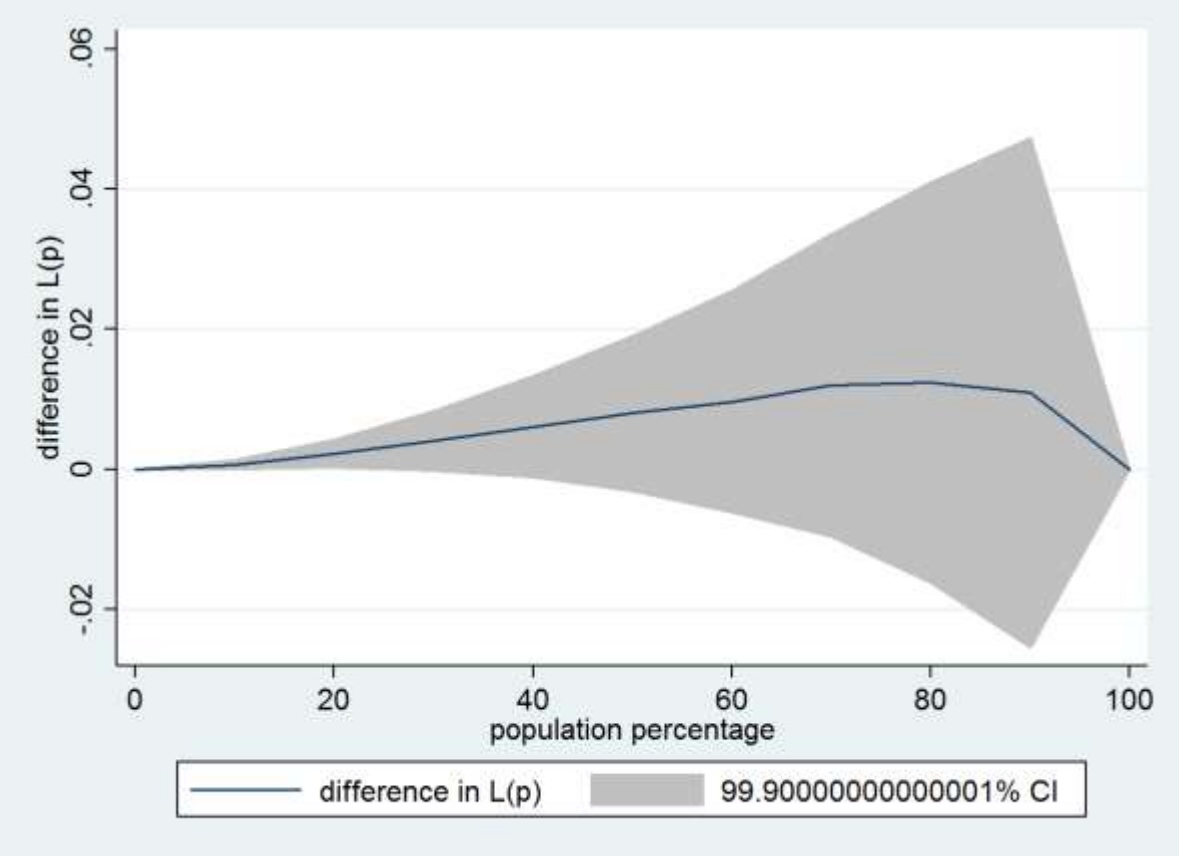
Income Percentile	*Dwelling Type*	*Wall Material*	*Floor Material*	*Roof Material*
21	8.42%	Adobe	Dirt	Terracotta
22	3.89%	Adobe	Dirt	Straw, Leaf, etc
29	15.56%	Adobe	Dirt	Zinc Plates
46	2.37%	Wood	Wood	Zinc Plates
47	2.63%	Wood	Dirt	Zinc Plates
52	5.97%	Adobe	Cement	Zinc Plates
57	2.08%	Adobe	Cement	Straw, Leaf, etc
64	2.92%	Wood	Cement	Zinc Plates
64	7.88%	Bricks	Cement	Zinc Plates
70	15.95%	Bricks	Cement	Concrete
85	9.71%	Bricks	Any Tiles	Concrete

Household Survey 2016

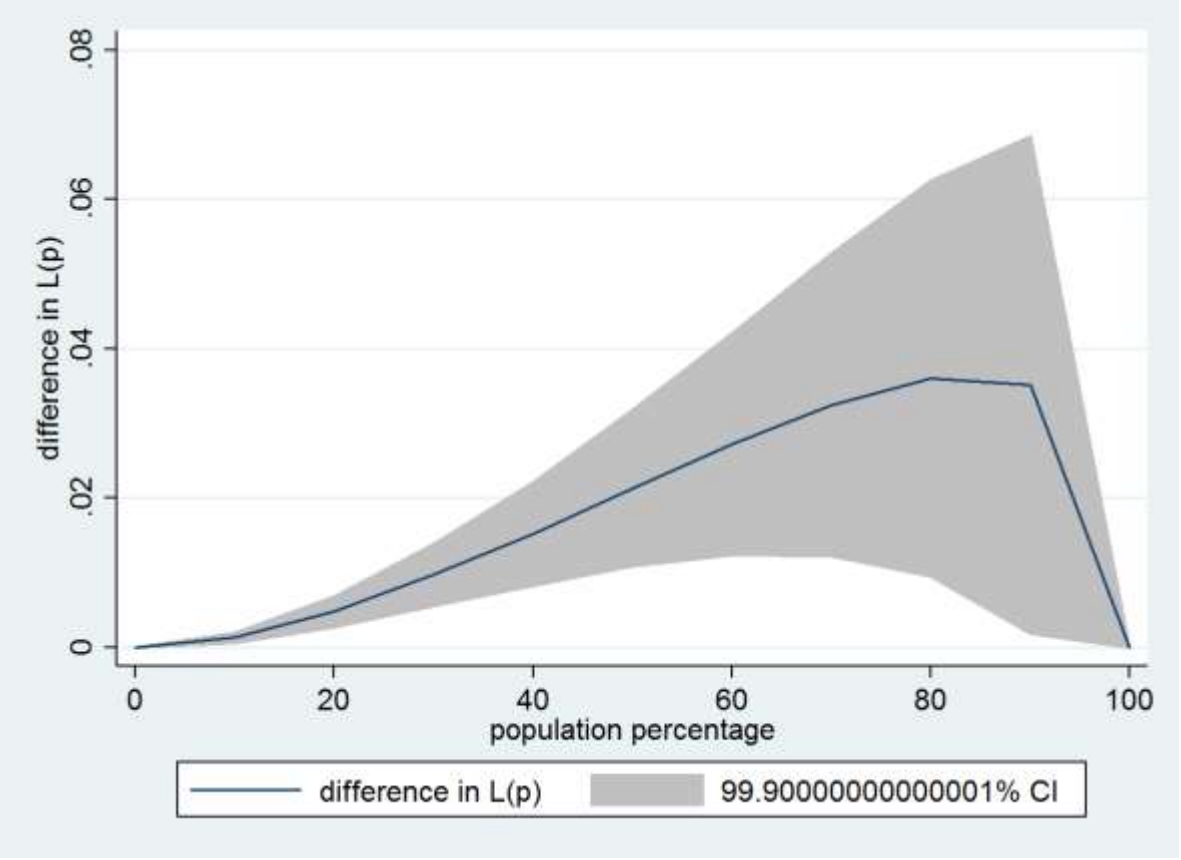
Income Percentile	*Dwelling Type*	*Wall Material*	*Floor Material*	*Roof Material*
20	5.96%	Adobe	Dirt	Terracotta
24	2.33%	Adobe	Dirt	Straw, Leaf, etc
26	15.26%	Adobe	Dirt	Zinc Plates
37	2.82%	Wood	Wood	Zinc Plates
42	3.24%	Wood	Dirt	Zinc Plates
49	6.48%	Adobe	Cement	Zinc Plates
62	3.37%	Wood	Cement	Zinc Plates
63	8.53%	Bricks	Cement	Zinc Plates
68	16.06%	Bricks	Cement	Concrete
83	13.84%	Bricks	Any Tiles	Concrete

Annex 3

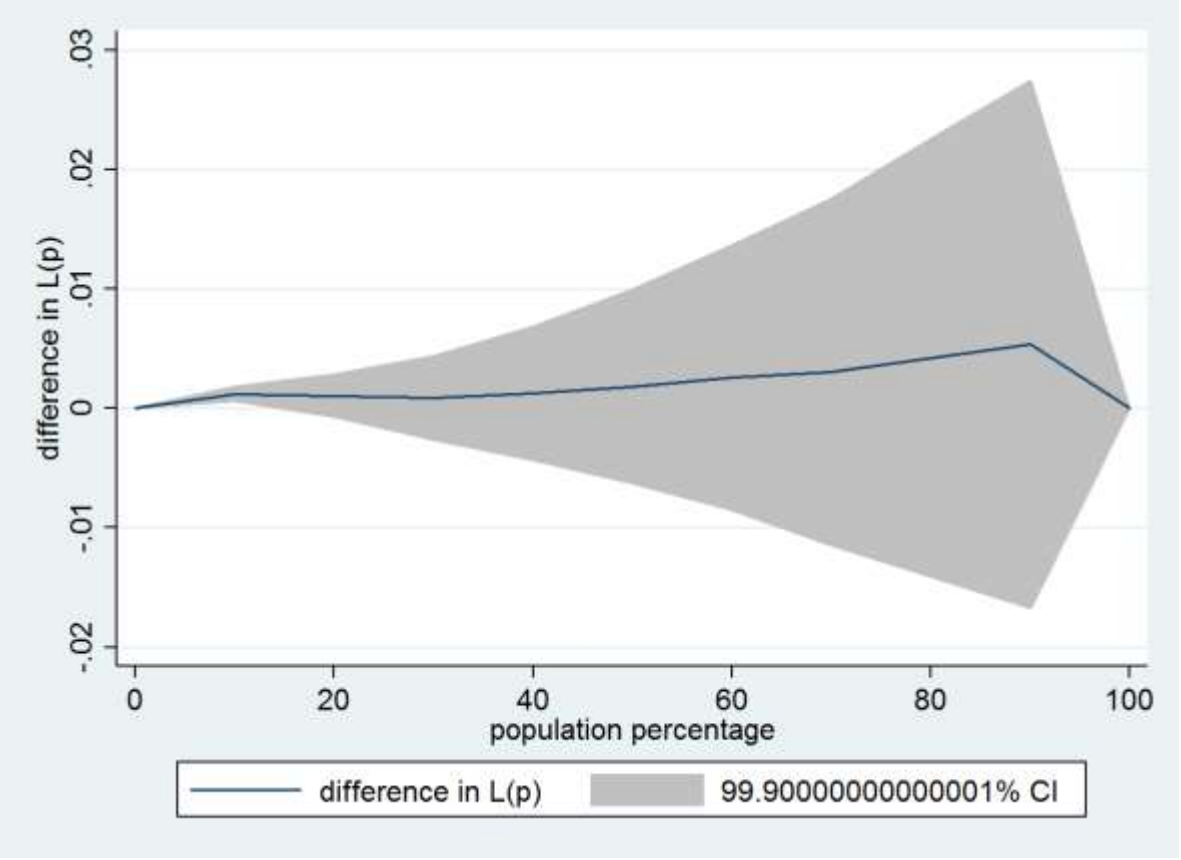
Years 2001 – 2006



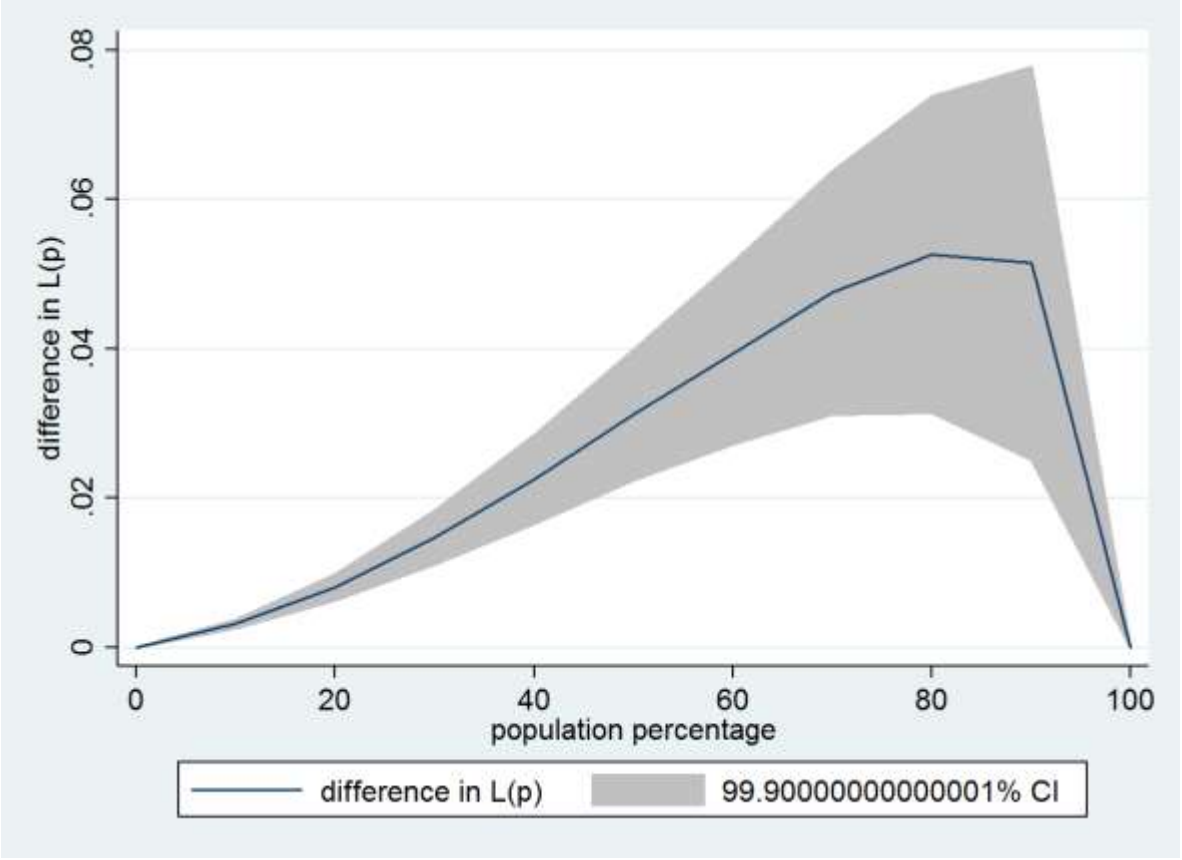
Years 2006 – 2011



Years 2011 – 2016



Years 2001 – 2016



Annex 4

Industrial materials

YEAR	Dwelling made with industrial materials: Yes	No	Total
2001	2,148,797 36.40	3,754,859 63.60	5,903,656 100.00
2006	2,577,930 38.97	4,037,124 61.03	6,615,054 100.00
2011	3,342,457 44.40	4,184,901 55.60	7,527,358 100.00
2016	3,977,285 46.16	4,639,031 53.84	8,616,316 100.00
Total	12,046,469 42.03	16,615,915 57.97	28,662,384 100.00

Industrial utilities

YEAR	Dwelling with industrial utilities		Total
	Yes	No	
2001	2,690,059	3,213,597	5,903,656
	45.57	54.43	100.00
2006	3,273,107	3,341,947	6,615,054
	49.48	50.52	100.00
2011	4,158,418	3,368,940	7,527,358
	55.24	44.76	100.00
2016	5,437,885	3,178,431	8,616,316
	63.11	36.89	100.00
Total	15,559,469	13,102,915	28,662,384
	54.29	45.71	100.00

Annex 5

Year 2001

Dwelling made with industrial materials	Dwelling with industrial utilities		
	Yes	No	Total
Yes	1,763,471 29.87	385,326 6.53	2,148,797 36.40
No	926,588 15.70	2,828,271 47.91	3,754,859 63.60
Total	2,690,059 45.57	3,213,597 54.43	5,903,656 100.00

Year 2006

Dwelling made with industrial materials	Dwelling with industrial utilities		
	Yes	No	Total
Yes	2,157,271 32.61	420,659 6.36	2,577,930 38.97
No	1,115,836 16.87	2,921,288 44.16	4,037,124 61.03
Total	3,273,107 49.48	3,341,947 50.52	6,615,054 100.00

Year 2011

Dwelling made with industrial materials	Dwelling with industrial utilities		
	Yes	No	Total
Yes	2,791,324 37.08	551,133 7.32	3,342,457 44.40
No	1,367,094 18.16	2,817,807 37.43	4,184,901 55.60
Total	4,158,418 55.24	3,368,940 44.76	7,527,358 100.00

Year 2016

Dwelling made with industrial materials	Dwelling with industrial utilities		
	Yes	No	Total
Yes	3,452,730 40.07	524,555 6.09	3,977,285 46.16
No	1,985,155 23.04	2,653,876 30.80	4,639,031 53.84
Total	5,437,885 63.11	3,178,431 36.89	8,616,316 100.00

Annex 6

Toledo

YEAR	DEFICIT Deficit E	Deficit P	No Defici	Total
2001	2,828,271	1,311,914	1,763,471	5,903,656
	47.91	22.22	29.87	100.00
2006	2,921,288	1,536,495	2,157,271	6,615,054
	44.16	23.23	32.61	100.00
Total	5,749,559	2,848,409	3,920,742	12,518,710
	45.93	22.75	31.32	100.00

Pearson chi2(2) = 1.8e+04 Pr = 0.000

Garcia

YEAR	DEFICIT Deficit E	Deficit P	No Defici	Total
2006	2,921,288	1,536,495	2,157,271	6,615,054
	44.16	23.23	32.61	100.00
2011	2,817,807	1,918,227	2,791,324	7,527,358
	37.43	25.48	37.08	100.00
Total	5,739,095	3,454,722	4,948,595	14,142,412
	40.58	24.43	34.99	100.00

Pearson chi2(2) = 6.7e+04 Pr = 0.000

Humala

YEAR	DEFICIT Deficit E	Deficit P	No Defici	Total
2011	2,817,807	1,918,227	2,791,324	7,527,358
	37.43	25.48	37.08	100.00
2016	2,653,876	2,509,710	3,452,730	8,616,316
	30.80	29.13	40.07	100.00
Total	5,471,683	4,427,937	6,244,054	16,143,674
	33.89	27.43	38.68	100.00

Pearson chi2(2) = 8.1e+04 Pr = 0.000

Overall

YEAR	DEFICIT Deficit E	Deficit P	No Defici	Total
2001	2,828,271	1,311,914	1,763,471	5,903,656
	47.91	22.22	29.87	100.00
2006	2,921,288	1,536,495	2,157,271	6,615,054
	44.16	23.23	32.61	100.00
2011	2,817,807	1,918,227	2,791,324	7,527,358
	37.43	25.48	37.08	100.00
2016	2,653,876	2,509,710	3,452,730	8,616,316
	30.80	29.13	40.07	100.00
Total	11,221,242	7,276,346	10,164,796	28,662,384
	39.15	25.39	35.46	100.00

Pearson chi2(6) = 5.2e+05 Pr = 0.000