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Decentralization and Poverty Reduction in Bolivia: Challenges and Opportunities[⊗]

by

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La Paz, February 2016

Abstract:

This paper presents an analysis of the decentralization process that has been taking place in Bolivia over the last couple of decades. It starts with a review of the legal framework that determines the distribution of responsibilities and financial resources to the sub-national governments (9 departments and 339 municipalities), and continues with an analysis of the evolution and distribution of financing to these entities between 2001 and 2013. It then proceeds to describe the resulting progress in social indicators between 2001 and 2012 at the municipal level, and identifies the main remaining gaps in basic services by 2012. Finally, the paper offers an analysis of the factors that are most closely associated with progress in the main social indicator used by the Bolivian government – the Unsatisfied Basic Needs index. This provides the basis for a final section on recommendations for public investment in Bolivia.

JEL classifications: H70, H71, I38, O54, R11, R58

Keywords: Decentralization, poverty reduction, basic needs, Bolivia.

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1. Introduction

During the last couple of decades, Bolivia has been engaged in a far-reaching process of administrative decentralization, which some observers consider “Latin America’s most significant and innovative effort ever to extend and complement the institutions of representative democracy through decentralization” (Mayorga, 1997: 152-153). After centuries of neglect, local authorities were democratically elected throughout the country, and, for the first time, thousands of social, ethnic and grassroots organisations were recognised by the state and were assigned specific roles, confirming the participatory and inclusive spirit of this reform (Mendoza-Botelho, 2013).

The process was designed to create a newly empowered local level of government with a strong focus on the accountability of local government officials to citizens (Hiskey & Seligson, 2003). It was based on the assumption that the devolution of political powers and resources to the local level would not only increase efficiency in the public sector but would also improve governance and strengthen democracy (Mendoza-Botelho, 2013). As this paper will show, the decentralization process was furthered by a dramatic increase in transfers to the sub-national governments, which was made possible initially by HIPC debt relief and more recently by the large increase in revenues from the export of natural gas.

In the process, the political map of Bolivia was entirely redrawn, creating 311 new municipalities, which encompassed previously excluded rural areas (Hiskey & Seligson, 2003). The number of municipalities keeps increasing, though, and this study works with the 339 municipalities in existence at the time of the latest population census (2012).

The purpose of this paper is to analyze the decentralization process in Bolivia, including the legal framework, the financing, and the results achieved at the local level. It is hoped that this analysis will help inform future public investment decisions, so that Bolivia can continue to make substantial progress on social indicators even under less favourable external conditions than those experienced during the last decade.

The remainder of the paper is organized as follows: Section 2 presents the methodology and data used in the paper. Section 3 describes the trends in government revenues and analyzes their distribution across government entities and geographical areas, and also shows how these revenues are converted into public investment. Section 4 analyses how social indicators have changed between 2001 and 2012 in response to national and local level public investments, and shows where important gaps remain by 2012. It also contains an analysis of the factors associated with more progress between 2001 and 2012 and with the level of poverty in 2012. Section 5 summarizes some important development challenges and critical gaps that have been identified throughout the study, and discusses where there are particular opportunities for high-return interventions. Section 6 concludes.

2. Data and methodology

To analyze the decentralization process in Bolivia quantitatively, this paper uses time series data at the national and departmental level from 2001 to 2013 and cross section data at the municipal level in 2001 and 2012.

The time series data used come from either UDAPE (Unidad de Análisis de Políticas Económicas, the Bolivian government's socio-economic analysis unit under the Ministry of Development Planning) or the Ministry of Economics and Finance, and are mainly related to government revenues and transfers between different levels of government.

The municipal level data base has been put together from various different sources, but mostly UDAPE, INE and UNDP-Bolivia. The two years, 2001 and 2012, have been chosen because they were census years, which mean that reasonably reliable social indicators could be calculated at the municipal level¹. Appendix A lists all the variables included in the municipal level data base, together with summary statistics and source for each variable. The data covers all 339 municipalities in existence at the time of the 2012 census.

In 2001, there were only 314 municipalities in Bolivia, so for the municipalities that have split between 2001 and 2012, we have imputed the values for 2001 in the most logical way possible. Thus, for most variables (such as poverty rates and education levels) we simply assumed that values in 2001 were identical in both parts of a municipality that later split, and both values are therefore identical to the value in the original data for the original municipality. Variables in absolute numbers, however, had to be split, rather than repeated. Thus, in the case of population, we know the population in the two parts of the split municipality in 2012 from the census, and we derive the populations in 2001, by assuming that population growth rates were identical in the two parts of the split municipality.

The main outcome indicators used in this document are the officially calculated Unsatisfied Basic Needs (UBN) index in each of the municipalities in Bolivia in 2012 and the changes in this index between 2001 and 2012. This index is a composite of unsatisfied basic needs in four areas: 1) Housing (construction materials and rooms); 2) Basic services (water, sanitation, electricity, and cooking fuel); 3) Education (school attendance for children, years of schooling for adults, and literacy rates); and 4) Health (medical services). Section 6 shows the evolution of the main indicator, as well as its sub-components between 2001 and 2012 and highlight some of the main gaps that still remain in 2012.

¹ The National Statistical Institute (INE) warns that population counts in small rural municipalities may be somewhat distorted because people temporarily go to their rural communities to be counted in the census (municipal funds depend on the population count). They also admitted to having problems when trying to reconcile school attendance figures with the registers from schools (the RUDE form that all school children, or their parents, have to fill by the beginning of each school year). Despite these problems, we consider the data of sufficiently high quality to be useful for the analysis presented in this report.

In order to assess which factors are most strongly related to either the level or the changes in the Unsatisfied Basic Needs Index, we run simple OLS regressions and Fields' Decompositions (Fields et al., 1998) using the variables compiled in the municipal level data base. We take care not to include explanatory variables that are already part of the UBN index, and we also take care to avoid problems of multi-co-linearity by not including explanatory variables that are highly correlated. Appendix C presents the regression results in both changes and levels, while section 7 of the main text discusses the implications of the results. It is important to highlight that these regressions only identify correlations, and are unable to make conclusions about causality. In order to truly identify the impacts of different types of investments, much more sophisticated impact evaluation studies are needed, but this is beyond the scope of the present study.

3. Government revenues at national and sub-national levels

The current distribution of funds to sub-national government entities is the results of a series of laws and decrees enacted since the beginning of the decentralization process in 1994. The most important laws that have affected the availability of funds to sub-national government entities are the following:

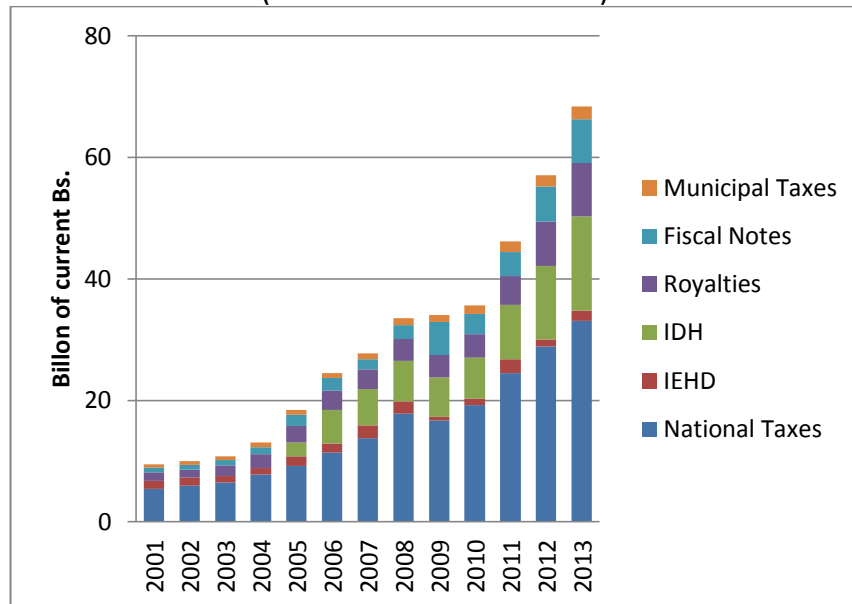
- The Popular Participation Law 1551 of 1994
- The Administrative Decentralization Law 1654 of 1995
- The National Dialogue Law of 2001
- The Hydrocarbon Law 3058 of 2005
- The Decentralization and Regional Autonomies Law 031 of 2010
- Law No. 154 of 2011, for the Classification and Definition of Taxes, and for the Regulation of the Creation and/or Modification of Taxes.

Each of these laws, and the distributional rules they have introduced, are discussed in detail in Appendix B. In this section we will show how the actual distribution of funds has turned out during the period 2001-2013. The section discusses the distribution across government categories, i.e. central government, departmental governments and municipalities, and across regions. The analysis shows that there are large vertical disparities—between government levels—and horizontal disparities—between regions—in the distribution of fiscal resources.

3.1 The trends in and distribution of government revenues, 2001-2013

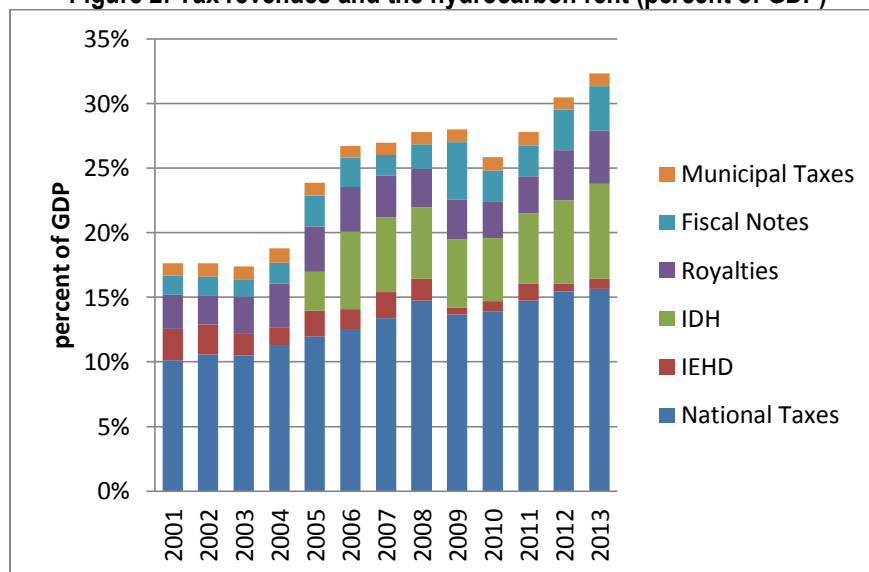
During the last decade, Bolivia has experienced an economic bonanza due to favourable world commodity prices, which benefited most of Bolivia's key export sectors, i.e. hydrocarbons, minerals and agriculture. As a result, external incomes and fiscal revenues have skyrocketed. The General Government's tax revenues, including national taxes, hydrocarbon rents, and municipal taxes, more than tripled in the last 9 years, increasing from Bs. 13.1 billion (18.8 percent of GDP) in 2004 up to Bs. 68.4 billion (32.3 percent of GDP) in 2013, representing a 3.3 time increase (see Figures 1 and 2).

**Figure 1: General Government revenues, 2001-2013
(billions of current Bolivianos)**



Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

Figure 2: Tax revenues and the hydrocarbon rent (percent of GDP)



Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

Government revenues went up mainly due to the improved collection of national taxes, and due to the increase in hydrocarbon rents.

General national tax revenues (also called Popular Participation revenues or co-participated revenues) presented the largest absolute increase in government revenues, owing to increased

economic activity and efficiency improvements in tax collection, as tax rates have remained unchanged throughout this period. National taxes include the value added tax (IVA), transaction taxes (IT), excise taxes (ICE), import tariffs (GA), tax on corporate profits (IUE), personal income taxes (RC-IVA), and the special regimen taxes for small businesses. General national tax revenues went up from Bs. 9.2 billion (12 percent of GDP) in 2005 up to Bs. 33.1 billion (16 percent of GDP) in 2013 (see Figure 3).

The improved overall economic conditions, due mainly to the export commodity boom, brought about increased growth rates and larger tax revenues. Bolivia's nominal GDP went up from US\$ 9.5 billion in 2005 up to US\$ 30.4 billion in 2013. However, there was also an improvement in the collection efficiency, owed to greater enforcement efforts, and to an increased willingness to comply with their tax duties, by the private sector. This explains why tax collection increased as a percent of GDP as well.

Hydrocarbon rents comprise royalties, a sales tax called the Special Tax on Hydrocarbon and its Derivatives (IEHD), and a production tax known as the Direct Tax on Hydrocarbons (IDH) created in 2005. Total hydrocarbon rents went up from Bs. 3.4 billion (4.8 percent of GDP) in 2004 to Bs. 26.0 billion (12.3 percent of GDP) in 2013. Three factors explain the large increase in the hydrocarbon rent: i) larger export volumes to Brazil and Argentina, starting from 2002; ii) higher oil prices, which brought about higher prices for natural gas exports; and iii) the creation of the Especial Tax on Hydrocarbons (IDH) in 2005, consisting of 32 percent of total hydrocarbon output.

IEHD tax collection did not increase significantly over the last decade. IEHD is a tax applied to the domestic sale of refined oil products. Since domestic prices of fuels have been kept constant in the last decade, IEHD revenues have stayed at a low level. Additionally, IEHD revenues have to be netted out with the subsidy paid by the government to the domestic consumption of imported oil sub-product, which have to be bought at international prices and sold domestically at the low subsidized prices.

Revenues from hydrocarbon royalties and the IDH, on the other hand, presented the largest relative increases, since they depend mainly on the total production of hydrocarbons, including natural gas exported to Brazil and Argentina, at prices that are fixed based on the international prices of oil. As discussed previously, the large increase in the hydrocarbon rent are the result of larger export volumes, higher oil prices, and the creation of the IDH². Medinaceli (2007 and 2014) shows that very little of the increase is due to the so-called “nationalization” which took place in 2006 when President Evo Morales passed a supreme decree forcing oil and gas companies to renegotiate exploration and exploitation contracts in light of the substantial

² Law 3058, passed by Congress in 2005, created the Direct Tax on Hydrocarbons (IDH). The IDH was conceived as a tax on the production of hydrocarbons, measured at the wellhead, amounting to 32 percent of the gross value of hydrocarbon production, including oil, natural gas and Liquefied Petroleum Gas (GLP), whether exported or sold in domestic markets

increase in oil prices and resulting increase in profitability. The nationalization introduced an additional tax on profits, and since profits vary greatly by the size of the oil field, the contribution of the nationalization to the increase in government revenues was largest for the biggest oil fields, and negligible for small and medium sized fields. Even for large fields, the IDH tax implemented before the nationalization is much more important than the additional tax from nationalization.

A drop in oil prices is likely to directly and proportionally affect IDH revenues and royalties, although with a lag. Natural gas export prices to Brazil and Argentina, Bolivia's main hydrocarbon export markets, are quarterly adjusted based on the trends followed by the international prices of a basket of fuels. In the case of Brazil, the average price corresponds to the last quarter, while in the case of Argentina, it corresponds to the last semester.

Tax collection by the Central Government through fiscal notes, which are not co-participated, increased from Bs. 1.1 billion (1.6 percent of GDP) in 2004 to Bs. 7.2 billion in 2013 (3.4 percent of GDP). The Central Government increasingly resorted to this means of collecting taxes, in order to increase its share in total fiscal revenues.

Finally, municipal taxes, comprising taxes on rural property, urban real estate, vehicles, transactions of these goods, and patents went up from Bs. 0.8 billion (1.1 percent of GDP) in 2004 to Bs. 2.1 billion in 2013 (1.0 percent of GDP).

3.2 Distribution of revenues across government categories

Government resources are distributed to the different government categories, i.e. central government, departmental governments and municipalities, and to 10 regional universities. Revenues are distributed across different government categories based on the different criteria defined by the laws and decrees summarized Appendix B.

Table 2 presents the distribution of the different revenue types to the different government levels as set out by the law. The Central Government, through the TGN, has the largest share in all types of revenues, except royalties and municipal taxes. The TGN receive funds from all revenue sources. Departmental governments, however, only receive funds from IEHD revenues and royalties, and are thus entirely dependent on extractive rents. Municipal governments obtain the bulk of their funds from both national taxes in general and the IDH specifically. Besides, they are also entitled to collect some municipal taxes, including taxes on rural property, urban real estate, vehicles, and transactions of these goods, as well as incomes from patents approved within the framework of the Political Constitution of the State and the Organic Law of Municipalities.

Table 1: Current distribution of revenues across different government categories, by revenue type (percent)

| | National Taxes | IEHD | HIPC II | IDH | Royalties ³ | Municipal Taxes |
|--------------------------|----------------|------|---------|------|------------------------|-----------------|
| Central Government | 75 | 75 | | 34.4 | 33 | |
| Departmental Governments | | 20 | | 15.8 | 67 | |
| Municipalities | 20 | | 100 | 43.4 | | 100 |
| Universities | 5 | 5 | | 6.4 | | |
| Total | 100 | 100 | 100 | 100 | 100 | 100 |

Source: Authors' elaboration based on distributional arrangements currently in force.

Table 3 presents how each tax group is effectively distributed in practice across the different government categories, calculated based on data for 2013. The main stylized facts are:

- At an aggregated level, the central government takes the largest share of total revenues (59.4 percent of total). Municipalities take 24.1 percent, including taxes collected at the municipal level, departmental governments 12.1 percent and universities 4.3 percent of total revenues.
- National taxes are distributed approximately in accordance to what is established by law, i.e. 73.9 percent to the TGN, 20.6 percent to municipalities and 5.5 percent to regional public universities.
- The same applies to IEHD revenues and royalties: 70.3 percent of IEHD incomes went to the TGN, 24.8 percent to departmental governments and 5.0 percent to universities. Likewise, 65.4 percent of hydrocarbon royalties went to departmental governments and 34.6 percent to the TGN.
- Resources available from the HIPC debt relief initiative went entirely to municipalities.
- The bulk of IDH revenues (46.6 percent) went to municipalities, 32.5 percent to the TGN, 14.2 percent to departmental governments and 6.7 percent to universities.
- Taxes paid by means of fiscal notes, which are not shared with sub-national governments, were entirely appropriated by the TGN.
- Finally, municipal taxes are entirely received by municipal governments.

³ Only hydrocarbon royalties are included in the data presented in this paper, as data on mining and forestry royalties could not be obtained.

Table 2: Government categories' shares, by revenue type, 2013 (percent)

| | National | | | | | Fiscal | Municipal | |
|-------------------------|----------|------|---------|------|-----------|--------|-----------|-------|
| | Taxes | IEHD | HIPC II | IDH | Royalties | Notes | Taxes | Total |
| Central | | | | | | | | |
| Government | 73.9 | 70.3 | | 32.5 | 34.6 | 100 | | 59.4 |
| Departmental | | | | | | | | |
| Governments | | 24.8 | | 14.2 | 65.4 | | | 12.1 |
| Municipalities | 20.6 | | 100 | 46.6 | | | 100 | 24.1 |
| Universities | 5.5 | 5.0 | | 6.7 | | | | 4.3 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Total (% of GDP) | 15.6 | 0.8 | 0.2 | 7.4 | 4.1 | 3.4 | 1.0 | 32.5 |

Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

The above described distribution of tax incomes across the various government categories, brings about an uneven distribution structure of resources. Table 4 presents the income structure for each of the government categories calculated based on 2013 data. It presents how the above distribution affects the income structure of each government level, in terms of diversification and concentration of revenue streams. The main stylized facts are:

- At an aggregated level, the bulk of general government revenues comes from national taxes (48.1 percent of total). HIPC resources represent only 0.6 percent of revenues. The hydrocarbon rent comprises 37.7 percent of revenues, including the IDH (22.6 percent of total revenues), royalties (12.7 percent), and IEHD (2.4 percent). Municipal taxes comprise 3.1 percent, and taxes paid through fiscal notes represent 10.4 percent of total tax incomes⁴.
- The central government has the most diversified income structure, compared to those of other government categories: 59.8 percent of TGN's incomes come from national taxes, 17.6 percent from fiscal notes, 12.3 percent from IDH, 7.4 percent from royalties and 2.9 percent from IEHD revenues. A more diversified income structure reduces the risk of a generalized income drop, because incomes depend on a more diversified set of sources.
- Municipalities' incomes come in almost equal shares from national taxes (41 percent) and IDH revenues (43.6 percent). Municipal taxes contribute with 12.9 percent of municipal revenues.
- Departmental governments' incomes are entirely dependent on hydrocarbon rents: 68.6 percent of revenues come from royalties, which are mainly received by Tarija's departmental government, 26.4 percent come from IDH and only 5 percent from IEHD revenues.

⁴ Figures of national taxes include only taxes paid in cash, which thus are co-participated by regional governments. On the other hand, figures of fiscal notes include taxes, i.e. national taxes and IEHD, paid by means of fiscal notes, which thus are not co-participated by regional governments.

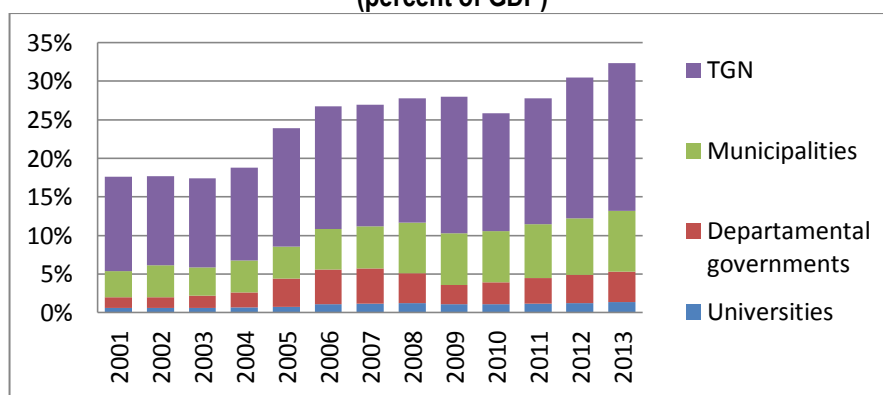
Table 3: Revenue structure, by government category, 2013 (percent)

| | National Taxes | IEHD | HIPC | IDH | Royalties | Fiscal Notes | Municipal Taxes | Total | Total (% of GDP) |
|---------------------------------|-------------------|------|------|------|-----------|-----------------|--------------------|-------|---------------------|
| Central Government | 59.8 | 2.9 | | 12.3 | 7.4 | 17.6 | | 100 | 19.3 |
| Departmental Governments | | 5.0 | | 26.4 | 68.6 | | | 100 | 4.0 |
| Municipalities | 41.0 | | 2.5 | 43.6 | | | 12.9 | 100 | 7.9 |
| Universities | 61.9 | 2.8 | | 35.3 | | | | 100 | 1.4 |
| Total | 48.1 | 2.4 | 0.6 | 22.6 | 12.7 | 10.4 | 3.1 | 100 | 32.5 |

Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

Figure 3 presents the trends in total revenues received by the different government categories. The TGN and municipalities receive the largest shares of total revenues. In 2013, the TGN received 59.2 percent of total public revenues, including fiscal notes, and municipalities received 24.3 percent. Departmental governments received 12.2 percent and universities the remaining 4.3 percent.

Figure 3: Distribution of revenues, by government category, 2001-2013 (percent of GDP)



Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

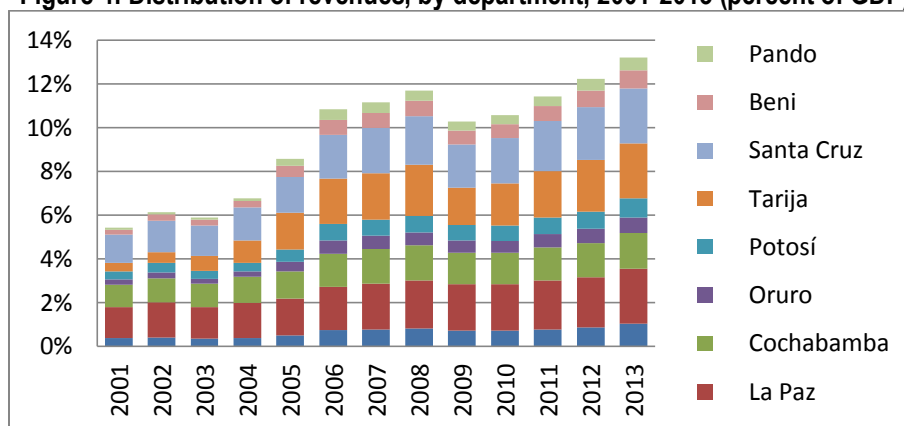
Not all government categories have seen their resource availability increased in the same proportions. The General National Treasury's incomes went up from Bs. 8.4 billion (12 percent of GDP) in 2004 to Bs. 40.5 billion (19 percent of GDP) in 2013, representing a 4.8 fold increase. Municipalities saw their revenues increase from Bs. 2.9 billion (4.2 percent of GDP) in 2004 to Bs. 16.6 billion (7.9 percent of GDP) in 2013 (5.7 fold increase). Departmental governments experienced a smaller growth in their incomes, increasing from Bs. 1.3 billion in 2004 to Bs. 8.4 billion in 2013 (6.3 fold increase). Relative to GDP, departmental government's revenues went up from 1.9 to 4.0 percent of GDP between these two years. Finally, universities saw their

incomes increase from Bs. 0.5 billion in 2005 (0.7 percent of GDP) to Bs. 2.9 billion (1.4 percent of GDP) in 2013 (6.2 fold increase) (see Figure 3).

3.3 Distribution of revenues across regions

The revenues of local governments, both at the departmental and municipal levels, including regional universities, have increased considerably since 2005. Figure 4 shows that total revenues transferred to or collected by sub-national governments have increased from less than 6.7 percent of GDP in 2004 to more than 13.2 percent of GDP in 2013. However, there are large disparities in the distribution of resources across the nine departments into which Bolivia is administratively divided. There are various criteria to evaluate how equal resource distribution across regions is.

Figure 4: Distribution of revenues, by department, 2001-2013 (percent of GDP)

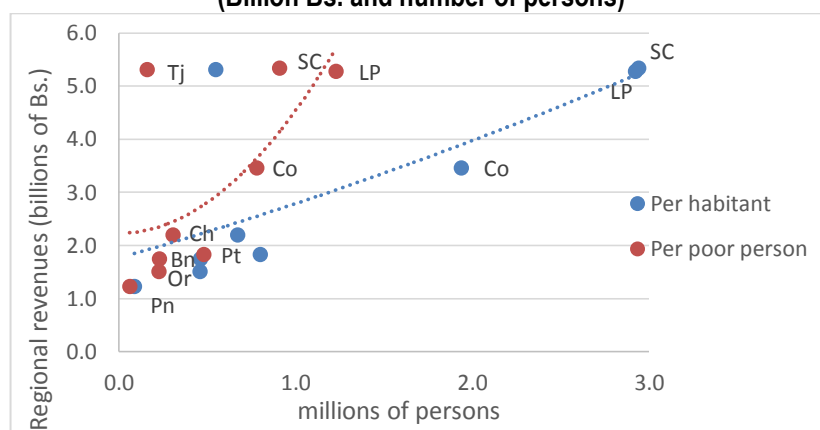


Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

Figure 5 shows that resources are roughly distributed based on a population criterion. The most populated departments, i.e. La Paz (LP), Santa Cruz (SC) and Cochabamba (Co), also obtain the largest share of resources. Conversely, Chuquisaca (Ch), Potosi (Pt), Oruro (Or), Beni (Bn) and Pando (Pd), which have smaller shares in total population, obtain smaller shares of resources. The exception being Tarija (Tj), which with a relatively small population, has one of the largest shares in total resources. This is so because of the large share Tarija has in the hydrocarbon taxes, especially in royalties and IDH, since Tarija is the largest producer of hydrocarbons in the country.

There is also a positive relationship between the number of people considered as being poor and the amount of distributed resources, for each of the departments. Again, La Paz, Santa Cruz and Cochabamba, which are the departments with the largest poor populations, receive the largest share of resources. Conversely, Chuquisaca, Potosi, Oruro, Beni and Pando, departments with smaller populations of poor, receive smaller shares of resources. Again, the exception is Tarija, which with a relatively smaller number of poor people, has one of the largest share in total resources.

**Figure 5: Revenue and population, by department, 2013
(Billion Bs. and number of persons)**

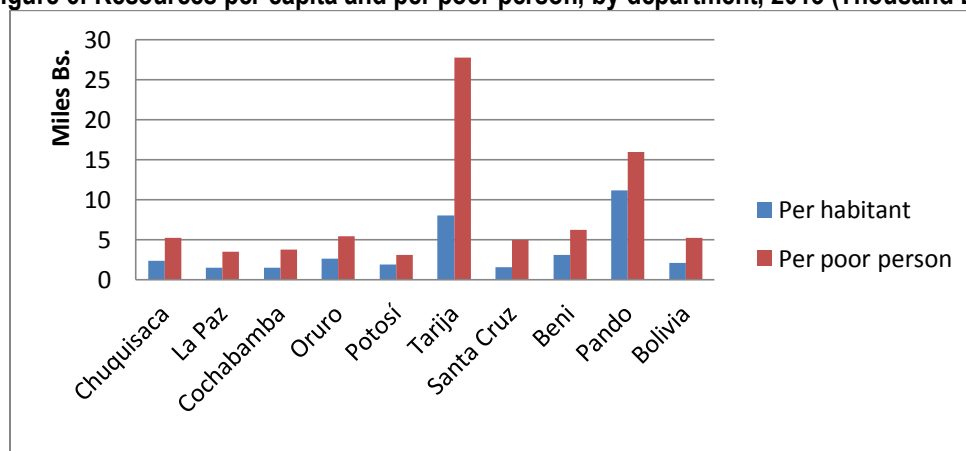


Source: Authors' calculation based on data from UDAPE, INE and the Ministry of Economics and Public Finance (MEFP).

Although resources are distributed to regions roughly based on the population size criteria, there are large disparities in the per capita amounts received by each of the regions. Figure 6 shows that, in per capita terms, Pando receives 5.7 times more resources than the country average does, and 9.2 times more than La Paz, which is the Bolivian region receiving the lowest amount of resources in per capita terms. The most populated departments, i.e. La Paz, Cochabamba and Santa Cruz, comprising 72 percent of the population according to the 2012 National Census, are the regions receiving the smallest amounts of resources in per capita terms.

The distribution is even more un-equal if we consider it in terms of population considered as poor. In this case, Tarija receives 5.7 times more resources per poor person than the national average, and 9.5 times more resources, also per poor person, than La Paz, which is the most populated department in Bolivia, and the one with the largest population considered as poor in the country.

Figure 6: Resources per capita and per poor person, by department, 2013 (Thousand Bs.)



Source: Authors' calculation based on data from UDAPE, INE and the Ministry of Economics and Public Finance (MEFP).

Table 5 shows how revenues collected both at the national and municipal levels are distributed across departments. At an aggregated level, Santa Cruz (19.1 percent), Tarija (19.0 percent), La Paz (18.9 percent) and Cochabamba (12.4 percent) are the regions with the biggest shares in total resources and transfers. La Paz, Santa Cruz and Cochabamba are the most populated departments in Bolivia, and thus are entitled to receive more resources from national taxes, IEHD and IDH. They also receive the largest shares of municipal taxes, because of the size of their economies and their better capacity to collect taxes. Tarija is the largest hydrocarbon producer in the country and it is entitled to take the largest share of the hydrocarbon rent, especially from IDH and royalties. Other smaller departments, in terms of their populations, have smaller shares in total resource transfers, such as Chuquisaca (7.9 percent), Potosí (6.6 percent), Beni (6.3 percent), Oruro (5.4 percent) and Pando (4.4 percent).

Table 4: Distribution of revenues across departments, by revenue type, 2013 (percent)

| | National | | | | | Municipal | |
|-------------------------|----------|------|------|------|-----------|-----------|-------|
| | Taxes | IEHD | HIPC | IDH | Royalties | Taxes | Total |
| Chuquisaca | 6.3 | 8.8 | 8.8 | 9.3 | 9.0 | 3.9 | 7.9 |
| La Paz | 29.4 | 19.8 | 26.9 | 15.4 | | 42.5 | 18.9 |
| Cochabamba | 17.3 | 14.4 | 15.0 | 11.8 | 4.4 | 15.9 | 12.4 |
| Oruro | 4.7 | 7.9 | 6.6 | 9.3 | | 3.2 | 5.4 |
| Potosí | 8.4 | 9.8 | 12.9 | 9.3 | | 1.3 | 6.6 |
| Tarija | 4.7 | 7.9 | 5.3 | 12.2 | 61.0 | 3.3 | 19.0 |
| Santa Cruz | 24.2 | 17.8 | 14.7 | 14.3 | 17.2 | 28.8 | 19.1 |
| Beni | 4.3 | 7.7 | 6.7 | 9.3 | 5.6 | 0.9 | 6.3 |
| Pando | 0.6 | 5.9 | 2.9 | 9.3 | 2.8 | 0.2 | 4.4 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Total (% of GDP) | 4.1 | 0.2 | 0.2 | 5.0 | 2.7 | 1.0 | 13.2 |

Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

Table 5: Revenue structure, by department, 2013 (percent)

| | National | | | | | Municipal | | Total (% of GDP) |
|-------------------|----------|------|------|------|-----------|-----------|-------|------------------|
| | Taxes | IEHD | HIPC | IDH | Royalties | Taxes | Total | |
| Chuquisaca | 24.9 | 2.0 | 1.7 | 44.1 | 23.6 | 3.8 | 100 | 1.0 |
| La Paz | 48.1 | 1.9 | 2.1 | 30.6 | | 17.3 | 100 | 2.5 |
| Cochabamba | 43.3 | 2.1 | 1.8 | 35.6 | 7.4 | 9.9 | 100 | 1.6 |
| Oruro | 26.7 | 2.6 | 1.8 | 64.3 | | 4.6 | 100 | 0.7 |
| Potosí | 39.8 | 2.7 | 2.9 | 53.0 | | 1.6 | 100 | 0.9 |
| Tarija | 7.6 | 0.7 | 0.4 | 24.2 | 65.8 | 1.3 | 100 | 2.5 |
| Santa Cruz | 39.1 | 1.7 | 1.1 | 28.1 | 18.4 | 11.6 | 100 | 2.5 |
| Beni | 21.3 | 2.2 | 1.6 | 55.5 | 18.2 | 1.1 | 100 | 0.8 |
| Pando | 4.4 | 2.4 | 1.0 | 79.0 | 12.9 | 0.3 | 100 | 0.6 |
| Total | 30.9 | 1.8 | 1.5 | 37.6 | 20.5 | 7.7 | 100 | 13.2 |

Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

Royalties are the least equally distributed resources, because they are entirely transferred to hydrocarbon producer regions, based on their share in the total produced volumes of oil and natural gas. Thus, Tarija, the main hydrocarbon producer in the country, obtains 61 percent of royalties, Santa Cruz, 17.2 percent, Chuquisaca 9.0 percent, and Cochabamba 4.4 percent. Beni and Pando, although they are not hydrocarbon producing regions, obtain respectively 5.6 percent and 2.8 percent of hydrocarbon royalties as less favored regions (see Table 5).

Departments with the largest population receive the largest shares of municipal taxes. La Paz receives 42.5 percent of municipal taxes, Santa Cruz 28.3 percent and Cochabamba 15.9 percent. Municipalities in the capital cities of these three departments, together with the municipality of El Alto in the La Paz department, are the biggest cities in Bolivia and better equipped to collect taxes more efficiently.

The distribution structure of the various tax categories across regions outlined above brings about a very different income structures for each of the departments (see Table 6). The incomes of La Paz, for instance, depend more on general tax revenues, which comprise 48.1 percent of total resources transferred to this department, and less on hydrocarbon revenues, which represent 32.5 percent of its revenues, i.e. 30.6 percent from IDH and 1.9 percent from IEHD. HIPC resources represent 2.1 percent of revenues transferred to La Paz and municipal taxes 17.3 percent.

Conversely, Tarija's revenues depend almost exclusively on hydrocarbon rents, of which 65.8 percent comes from royalties, 24.2 percent from IDH and 0.7 percent from IEHD. General tax revenues only represent 7.6 percent of Tarija's incomes and municipal taxes 1.3 percent. Pando's revenues are also almost entirely dependent on hydrocarbon rents (94.3 percent of this region's total revenues), although Pando is not a hydrocarbon producing region. IDH represents 79.0 percent of the Pando's revenues, hydrocarbon royalties 12.9 percent and IEHD 2.4 percent.

Besides La Paz, other departments with relatively large share of general tax revenues are Cochabamba (43.3 percent of total departmental revenues), Santa Cruz (39.1 percent), and Potosí (39.8 percent).

The uneven patterns of resource distribution across regions, entails very uneven structures in the distribution of resources across government categories within each of the regions.

The largest disparities in the distribution of resources to departmental governments occur because they largely depend on royalties and IDH. Two departments, Tarija and Santa Cruz, take more than 61.5 percent of total resources transferred to departmental governments (table 7), while 4 regions, La Paz, Oruro, Potosí and Pando only take 15.3 percent of these resources. This is equivalent to what Santa Cruz alone takes from the total resources transferred to departmental governments.

Resources transferred to municipalities are more evenly distributed, because they are more dependent on general tax revenues. The most populated departments, La Paz, Santa Cruz and

Cochabamba, which together comprise 72 percent of the total population, obtained jointly 60.4 percent of total resources transferred to municipalities.

Table 6: Distribution of government categories' incomes, by department (percent)

| | Departmental | | | |
|-------------------------|---------------------|-----------------------|---------------------|--------------|
| | Governments | Municipalities | Universities | Total |
| Chuquisaca | 9.5 | 7.3 | 6.8 | 7.9 |
| La Paz | 3.8 | 25.0 | 27.4 | 18.9 |
| Cochabamba | 6.6 | 14.8 | 15.2 | 12.4 |
| Oruro | 3.2 | 6.4 | 5.8 | 5.4 |
| Potosí | 3.3 | 7.9 | 8.1 | 6.6 |
| Tarija | 46.0 | 7.7 | 6.7 | 19.0 |
| Santa Cruz | 15.5 | 20.6 | 21.1 | 19.1 |
| Beni | 7.0 | 6.0 | 5.6 | 6.3 |
| Pando | 5.0 | 4.3 | 3.4 | 4.4 |
| Total | 100 | 100 | 100 | 100 |
| Total (% of GDP) | 4.0 | 7.9 | 1.4 | 13.2 |

Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

Table 7: Distribution of departmental incomes, by government categories (percent)

| | Departmental | | | | Total (% of GDP) |
|-------------------|---------------------|-----------------------|---------------------|--------------|-------------------------|
| | Governments | Municipalities | Universities | Total | |
| Chuquisaca | 36.0 | 54.9 | 9.1 | 100 | 1.0 |
| La Paz | 6.0 | 78.7 | 15.3 | 100 | 2.5 |
| Cochabamba | 15.9 | 71.1 | 12.9 | 100 | 1.6 |
| Oruro | 17.9 | 70.8 | 11.3 | 100 | 0.7 |
| Potosí | 15.2 | 71.9 | 13.0 | 100 | 0.9 |
| Tarija | 72.3 | 24.0 | 3.7 | 100 | 2.5 |
| Santa Cruz | 24.2 | 64.1 | 11.7 | 100 | 2.5 |
| Beni | 33.6 | 57.0 | 9.4 | 100 | 0.8 |
| Pando | 34.2 | 57.7 | 8.1 | 100 | 0.6 |
| Total | 29.9 | 59.5 | 10.6 | 100 | 13.2 |

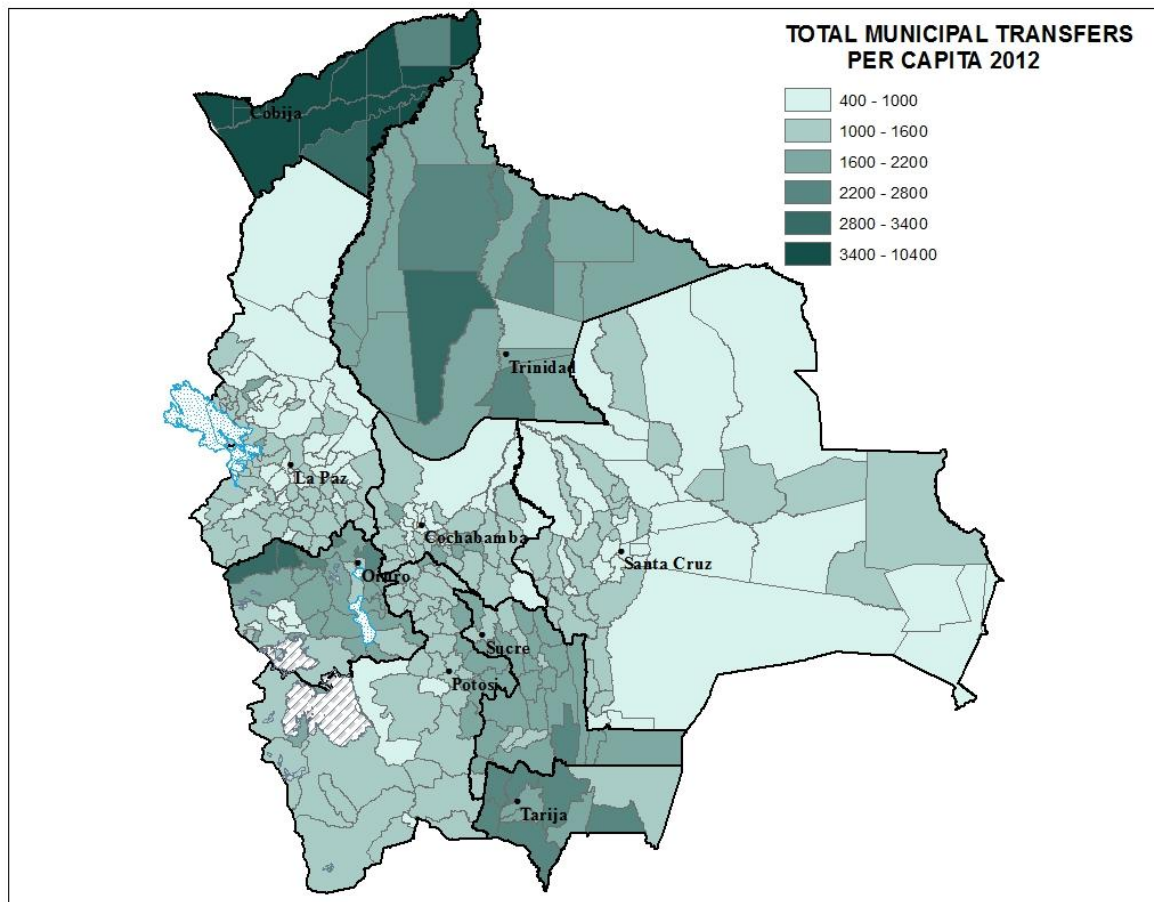
Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

Due to these distributional rules, there are considerable differences in the distribution of funds across government categories within each department (see Table 8). In the department of La Paz, for example, the bulk of revenues (78.7 percent) go directly to the municipalities, while the departmental government only obtains 6.0 percent of the total resources transferred to this department. The remaining 15.3 percent goes to the department's public universities. This is in sharp contrast to Tarija, where the departmental government receives 72.3 percent of the total resources transferred to this region, while municipalities get only 24.0 percent and the regional state university gets 3.7 percent.

3.4 Transfers to municipalities

Map 1 shows the total municipal transfers per person in 2012. The municipalities of Pando stand out with by far the highest levels of per capita transfers, followed by Beni and Tarija. The municipalities receiving the lowest amount of transfers per capita are concentrated in the departments of Santa Cruz and La Paz.

Map 1: Total municipal transfers per capita, 2012, by municipality

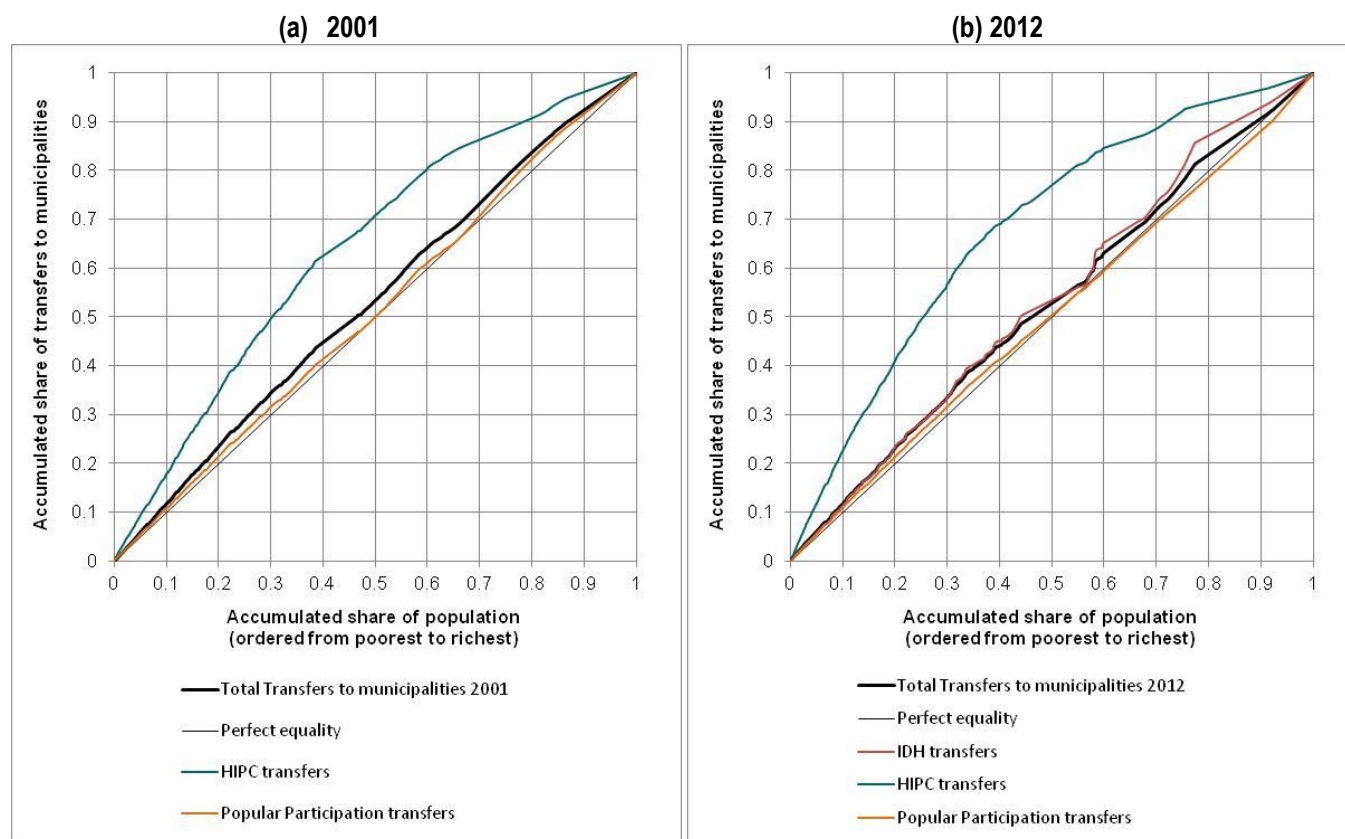


Source: Authors' elaboration based on official information from UDAPE.

The different kinds of transfers to municipalities have different distributive effects. The Popular Participation transfers (based on general national tax revenues) to municipalities are distributed on the basis of population size counted in the latest population census, so this transfer is neither progressive nor regressive. Every person, poor or rich, receives the same amount. HIPC transfers, on the other hand, clearly favour the poor, and Figure 7 shows that these transfers have become more pro-poor over time.

The IDH transfer is distributed according to much more complicated criteria, which in the end result in a slightly pro-poor distribution. Due to the magnitude of the IDH transfers, this component largely determines the distributional effects of total transfers, which are also slightly pro-poor. This can be seen from the fact that the Lorenz curve of Total Transfers is located slightly above the “Perfect equality” diagonal line in the Lorenz diagram of Figure 7b, indicating that poor municipalities (as defined by the Unsatisfied Basic Needs index) get slightly more than a proportional share of all transfers.

Figure 7: Lorenz curves for different types of transfers to municipalities, 2001 and 2012



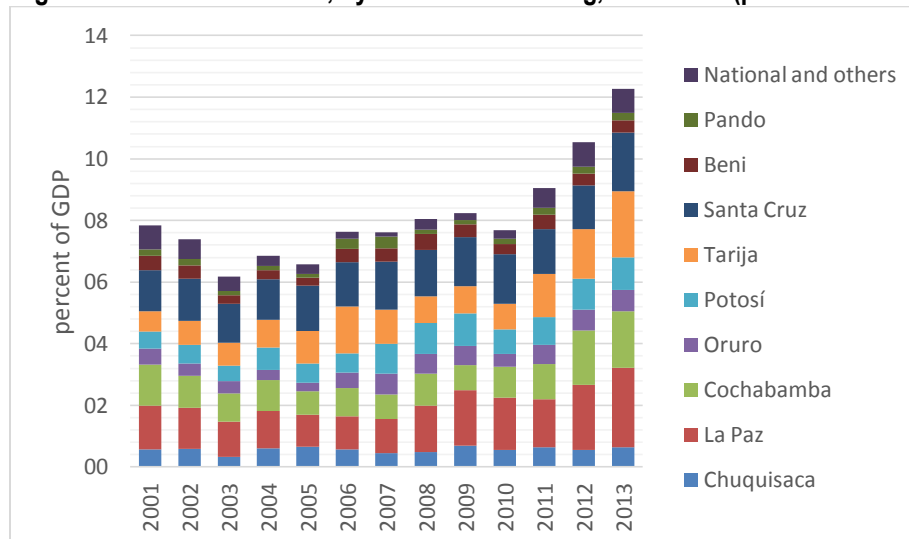
Source: Authors' estimation based on official data from UDAPE and the Ministry of Economics and Finance.

While total transfers to municipalities have increased tremendously between 2001 and 2012, the degree of pro-pooriness seems to be about the same in the two years (compare Figure 7a and 7b). Every single municipality has seen substantial increases in transfers between 2001 and 2012, but this trend is likely to soon be reverted as revenues from the Direct Hydrocarbon Tax (IDH) drops due to lower oil prices, as will be discussed further below.

3.5 Public investment by department

The large availability of resources at the regional level, resulting from the economic bonanza and from the decentralization process Bolivia embarked on in the 1990s, has resulted in increased investment at the departmental level. Figure 8 shows that all of Bolivia's departments have increased their public investment in the last decade.

Figure 8: Public investment, by source of financing, 2000-2013 (percent of GDP)

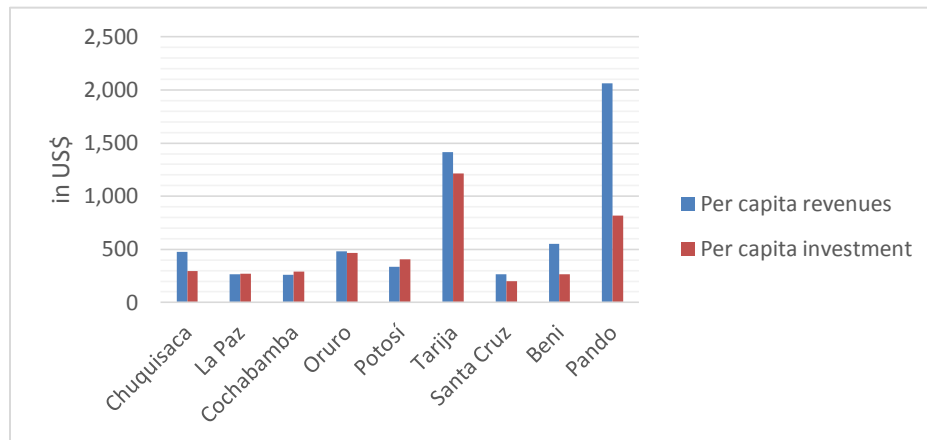


Source: Authors' calculation based on trade data from UDAPE, INE and the Ministry of Economics and Public Finance (MEFP).

In 2013, La Paz had the larger share in total public investment (21.0 percent of total public investment and 2.6 percent of GDP), followed by Tarija (17.6 percent of public investment and 2.2 percent of GDP), Santa Cruz (15.5 percent and 1.9 percent) and Cochabamba (14.9 percent and 1.8 percent). These four departments comprised almost 70 percent of total public investment, equivalent to 8.5 percent of GDP. The other smaller departments, Chuquisaca, Potosí, Oruro, Beni and Pando, comprised the remaining 30 percent of total public investment, equivalent to 3.8 percent of GDP.

There is a close link between the resource availability and the amount invested by regions. Figure 9 shows that regions with the largest per capita resources available, such as Tarija and Pando, are also the departments with the largest per capita investment levels.

Figure 9: Per capita revenues and per capita investment by department in 2013 (US\$)

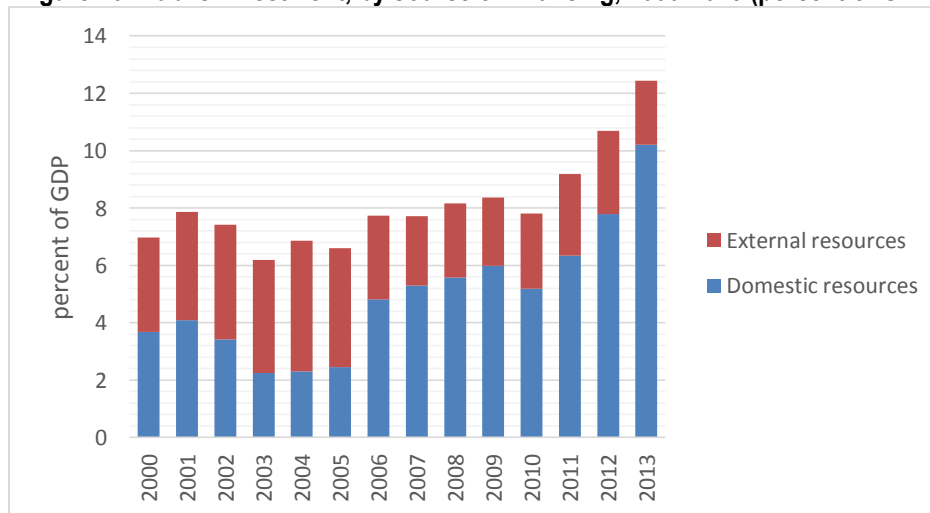


Source: Authors' calculation based on trade data from UDAPE, INE and the Ministry of Economics and Public Finance (MEFP).

3.6 Public investment by source of financing

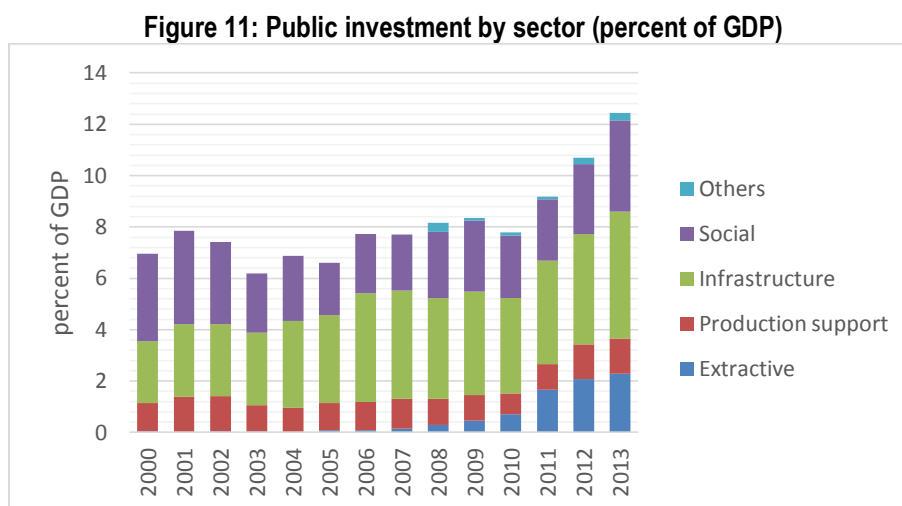
The abundant availability of public funds has made public investment less dependent on external sources of finance. Until 2005, public investment depended on external sources of finance (contributing 62.8 percent) more than on domestic sources (contributing 37.2 percent) because of the tight financial constraints the Bolivian public sector experienced at that time. The economic boom Bolivia went through starting from the second half of the 2000s significantly increased fiscal revenues. In 2013, only 18.1 percent of total public investment finance came from external sources, while 81.9 percent came from domestic sources (see Figure 10).

Figure 10: Public investment, by source of financing, 2000-2013 (percent of GDP)



Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

There were also important changes in the sectoral composition of public investment (see Figure 11).



Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

Note: Public investment is grouped in 5 sectoral categories:

- Extractive: hydrocarbons and mining, managed by public enterprises.
- Production support: agriculture, manufacturing, multi-sectoral and others.
- Infrastructure: energy, transport, communication and water resources.
- Social: health, education and culture, basic sanitation and urban development.
- Others: commerce and finance, justice and police, national defence, general administration.

In 2005, the bulk of public investment was directed at the development of public infrastructure (51.8 percent of total) of which transport infrastructure comprised 45.9 percent of total public investment and the rest went to energy, communications and water resource sectors, which together comprised 5.9 percent of the total. Social investment comprised 30.8 percent of total public investment, with equal shares for education, health, basic sanitation and urban development. Only 16.2 percent of public investment was directed at supporting entrepreneurial activities, and investment in extractive activities was non-existent, as it had been transferred to the private sector.

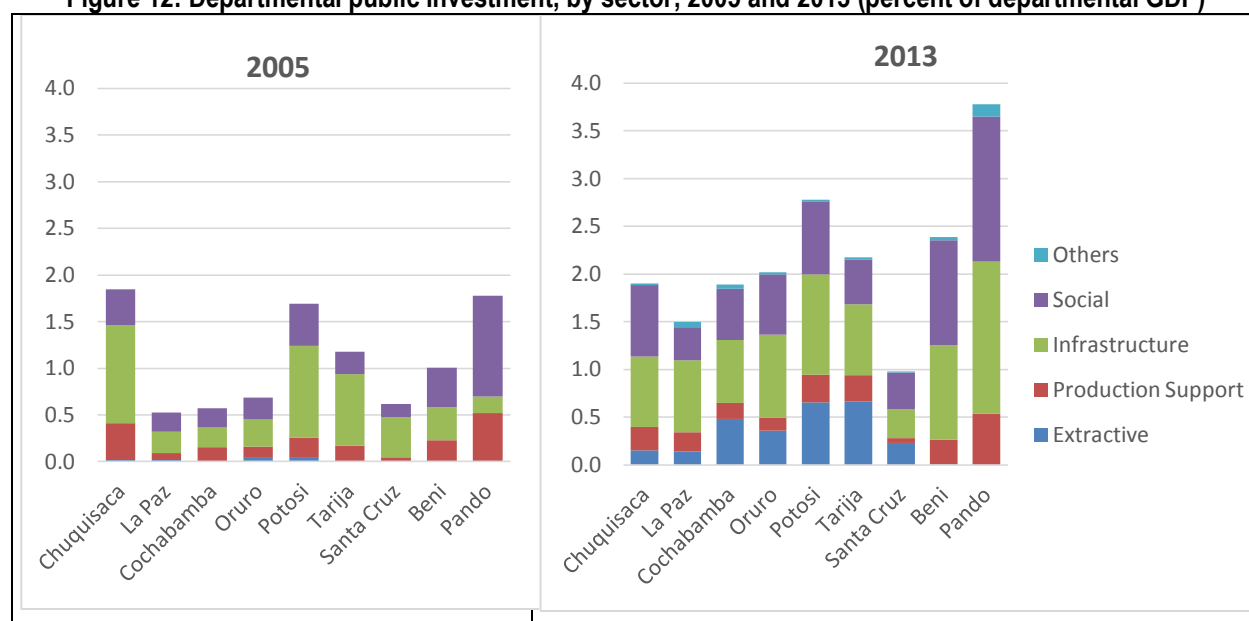
The structure of public investment in 2013 portrays the new vision about the role of the State in the economy in force since 2006. Public infrastructure is still the sector comprising the bulk of public investment, but its share in the total has been drastically reduced (39.7 percent of total). The share of social investment also went down to 28.7 percent of the total, and investment for the support of entrepreneurial activities went down to 11 percent. These reductions were compensated by a significant increase in public investment in the extractive sectors, which in 2013 accounted for 18.3 percent of the total. Investment in extractive activities was essentially undertaken by public companies, which were nationalized and re-lunched as a policy of the government's new economic model.

Figure 12 shows the changes that occurred in sectoral public investment at the departmental level, between 2005 and 2013:

First, public investment has increased, in absolute terms and as a percent of departmental GDP, in all departments of Bolivia. Chuquisaca presents the smallest increase in its public investment, which shifted from 1.85 percent to 1.90 percent of the department GDP. Santa Cruz also presents a small increase in public investment, which went up from 0.62 percent to 0.98 percent of the department GDP. On the other hand, Pando presents the largest increase in public investment, which jumped from 1.78 percent to 3.78 percent of the department GDP.

Second, there were also significant changes in the sectoral allocation of public investment at the departmental level. Public investment in extractive sectors, i.e. mining and hydrocarbons was inexistent in 2005, but by 2013, it became prominent in Potosi, Tarija, Oruro, Cochabamba and Santa Cruz. In 2005, investment in infrastructure was very low in Pando, Beni, La Paz, Cochabamba and Oruro, but by 2013 this component had increased substantially in all departments. The abundance of resources also permitted all departments to increase their public investment in the social sectors.

Figure 12: Departmental public investment, by sector, 2005 and 2013 (percent of departmental GDP)



Source: Authors' calculation based on trade data from UDAPE and the Ministry of Economics and Public Finance (MEFP).

Note: Public investment is grouped in 5 sectoral categories:

- Extractive: hydrocarbons and mining, managed by public enterprises.
- Production support: agriculture, manufacturing, multi-sectoral and others.
- Infrastructure: energy, transport, communication and water resources.
- Social: health, education and culture, basic sanitation and urban development.
- Others: commerce and finance, justice and police, national defence, general administration.

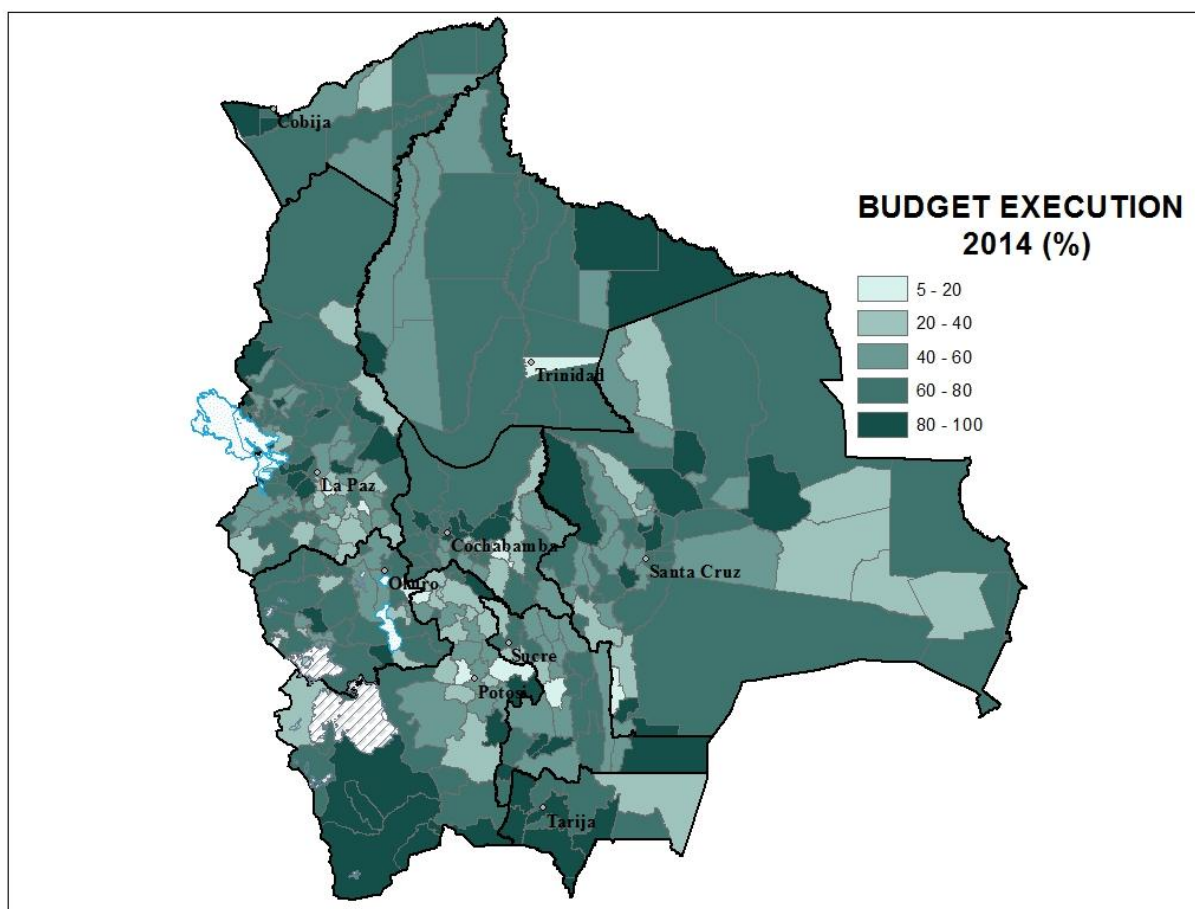
3.7 Factors that limit public investment

Departmental governments and municipalities have had problems in implementing their budgeted investment. There are various factors preventing sub-national governments from complying with their investment plans that need to be addressed (Revollo, 2013).

- **Limited time to implement additional allocated budget.** At the beginning of the budget year, sub-national governments' incomes and transfers are calculated based on an estimated oil price, which has been consistently below the eventually observed price. Thus, sub-national governments' budgets are revised and additional resources are transferred to them. Since this revision takes place later in the year, sub-national governments do not have sufficient time for spending the additional resources.
- **Excessive bureaucracy to implement projects.** The regulations in force require sub-national governments to have the approval of the municipal councils or of the departmental assemblies, for each of their investment projects. These processes are sometimes very time-consuming, especially when there is weak political governance in the sub-national government.
- **Strict legal framework to punish corruption of public servants.** Legislation on corruption is very strict, and there has been uncertainties and lack of transparency in its application. Thus, public servants are hesitant to implement investment projects, with the fear of facing corruption charges. Those charges are sometimes based more on political reasons rather than on facts.
- **Lack of institutional capabilities.** Sub-national governments, especially smaller municipalities, lack managerial and professional capabilities to implement their investment plans. This factor brings about lower levels of execution and low quality of investment projects, with reduced impact in terms of improving the standard of living of the population.

Map 2 presents a budget execution map for municipalities in 2014. Only 17 percent of municipalities had a budget execution rate above 80 percent, while 28 percent spent less than half the money available. The remaining 55 percent of municipalities executed between 50 and 80 percent of their budgets in 2014.

Map 2: Budget execution, 2014 (percent)



Source: Authors' elaboration based on data from the Ministry of Economics and Public Finance (MEFP).

There is no obvious pattern to the budget execution rates. As explained above, the low rates of execution is partly due to the budget adjustments realized late in the year, giving municipalities little time to spend the money. Fortunately, though, they do not lose the money, but rather maintain it as savings in their municipal account within the Central Bank. These funds can then be used for future investments (subject to approval by the central government, though).

4. Poverty and social indicators in Bolivia

In the previous section we have explained the system of financial transfers to sub-national entities. In this section we will analyze the effects these transfers have had on social indicators at the municipal level. The main social indicator used by the Bolivian government is Unsatisfied Basic Needs, which is a poverty indicator reflecting the lack of access to basic services, such as water, sanitation, electricity, education and health services.

We start the section with a description of the patterns of population growth, including the most important migration destinations. These patterns of population movements are important to understand, because they indicate which municipalities the population thinks are most attractive in terms of economic opportunities and living standards.

We then proceed to analyze the trends in social indicators at the municipal level, the factors associated with progress between 2001 and 2012, and the factors associated with the resulting distribution of poverty in 2012.

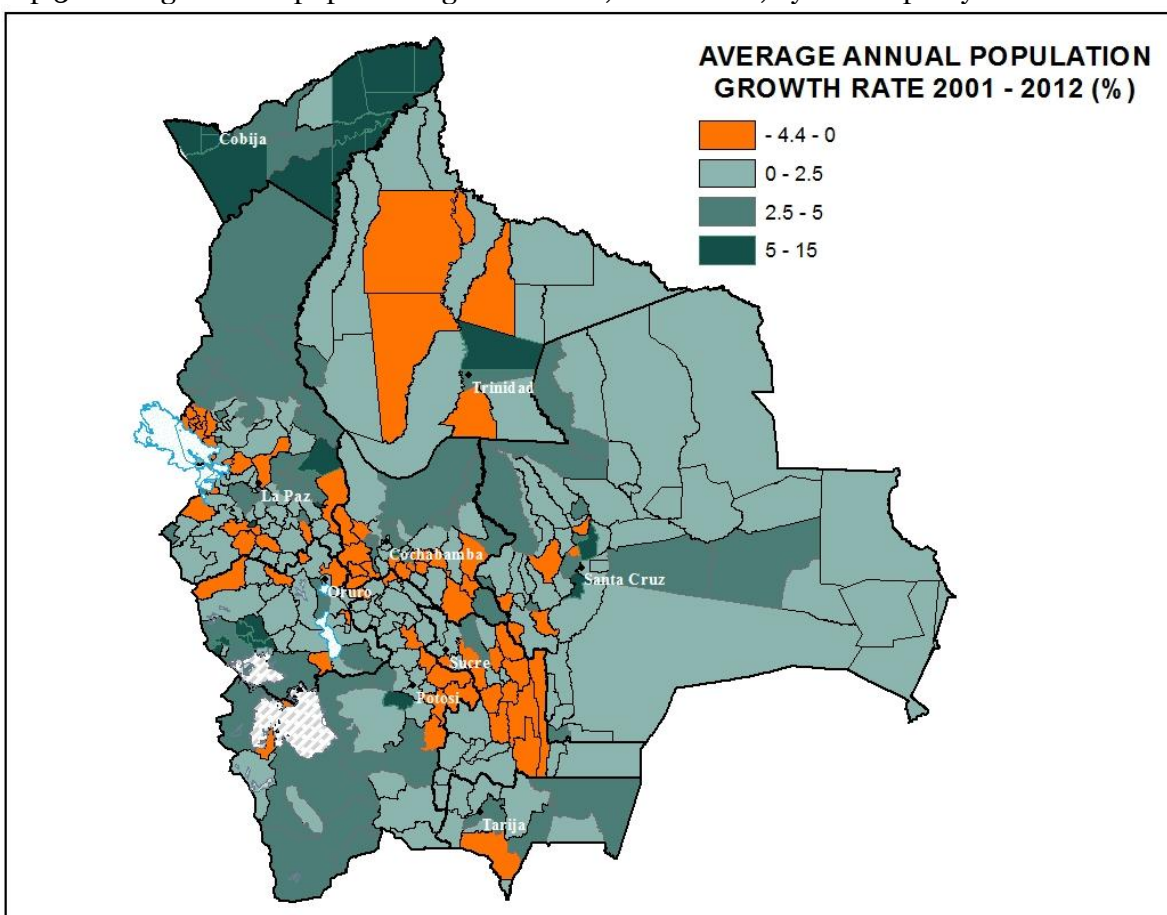
4.1 Patterns of population growth

The Bolivian population increased at an average annual rate of 1.7 percent between 2001 and 2012, reaching a total population of 10,059,856 at the time of the population census in 2012 (INE, 2014). Population growth rates vary greatly between municipalities, though, with some municipalities experiencing strong decreases in population (more than 4 percent per year) and others rapid increases (more than 14 percent per year).

Map 3 shows which municipalities are gaining population and which ones are losing people. The large differences in population growth rates between municipalities are almost entirely due to internal migration. Pando stands out with exceptionally high population growth rates (averaging 6.6 percent per year).

Municipalities neighbouring capital cities are also quite popular. This may be because these municipalities offer plenty of economic opportunities, but with lower costs of living than in the main cities. The growth of peri-urban areas is a common phenomenon across Latin America and several studies predict that the lion's share of population growth in the near future will take place in the fringes of the big cities and that peri-urban expansion is a key issue for Latin America's development agenda (Arriagada and Rodriguez, 2003; Marques and Torres, 2005; Roberts and Wilson, 2008; Torres, 2008).

Map 3: Average annual population growth rates, 2001-2012, by municipality



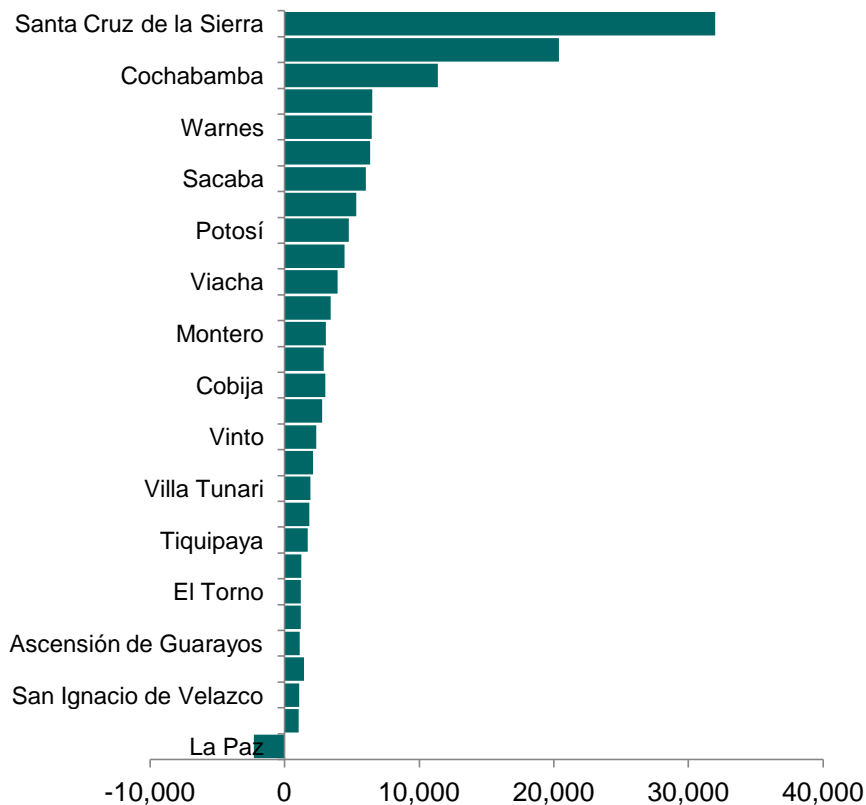
Source: Authors' elaboration based on official population growth rates calculated by UDAPE.

These patterns of population movements are important to keep in mind, because they indicate which municipalities the population thinks are most attractive in terms of economic opportunities and living standards.

Figure 13 lists all the municipalities that have population changes exceeding 1,000 persons per year. Santa Cruz de la Sierra is the most popular destination for internal migration and adds about 32,000 persons per year. If we consider also the neighboring municipalities (La Guardia, Warnes, Montero, and El Torno), this metropolitan area adds almost 50,000 persons per year.

El Alto and neighboring Viacha is the second most popular metropolitan area, adding more than 22 thousand persons per year, followed closely by the Cochabamba metropolis, consisting of Cochabamba, Quillacollo and Sacaba, which adds about 20 thousand persons per year. In contrast, La Paz is losing about 2,300 persons per year.

Figure 13: Annual population change, 2001-2012, by municipality



Source: Authors' elaboration based on population growth observed between the 2001 and the 2012 census.

Note: Only Bolivian municipalities with population changes of more than 1000 persons per year are included in this figure.

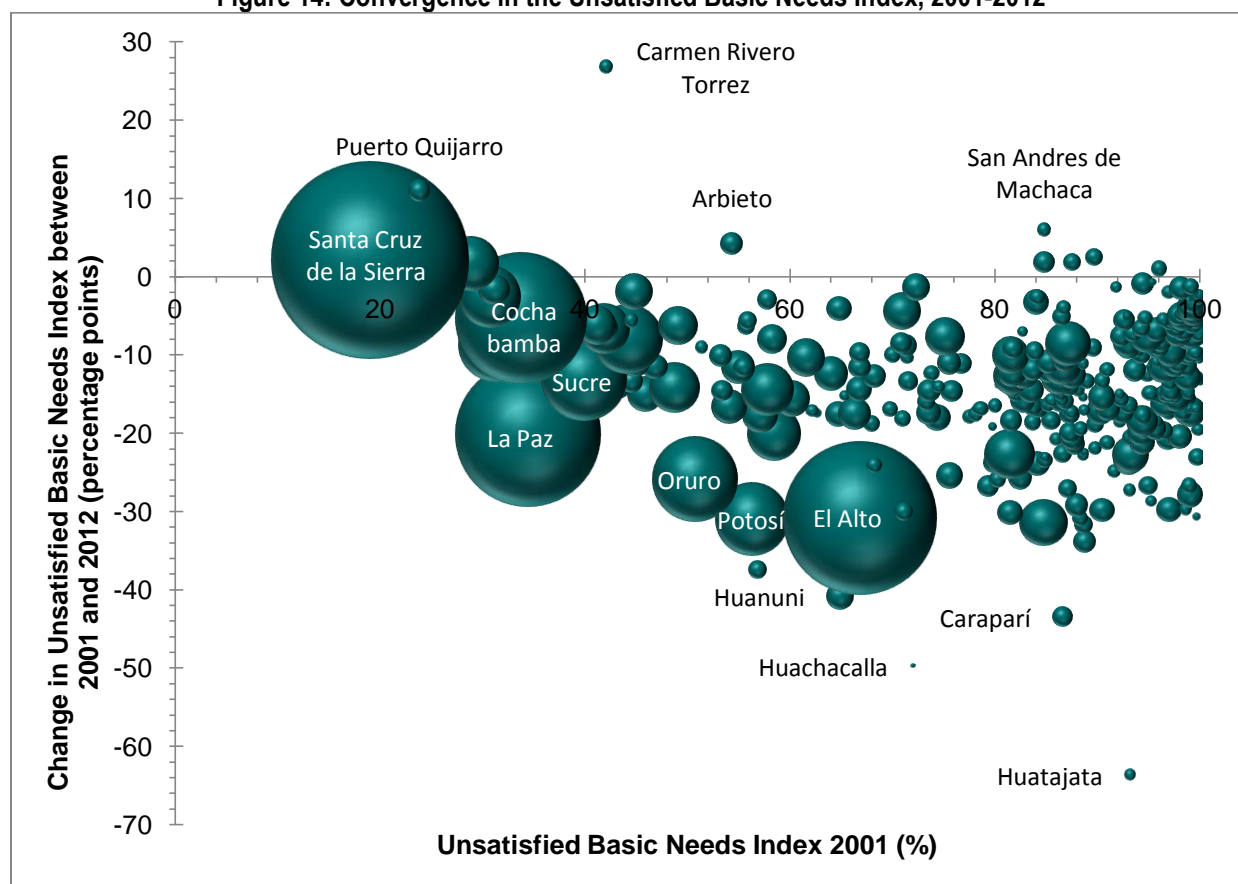
The only variables that are significant in explaining the choice of migration destination are population size and population density, indicating that economies of scale are important for the creation of economic opportunities and better living standards. All other factors, e.g. climate, natural resources, public infrastructure, public spending and level of unsatisfied basic needs are statistically insignificant in a simple cross-municipality regression with population growth rates as the dependent variable.

4.2 Convergence in the Unsatisfied Basic Needs Index, 2001-2012

Bolivia has experienced substantial improvements in all social indicators between 2001 and 2012, and the municipalities that have improved the most are the ones that were initially worse off, so we have witnessed a strong process of convergence in living standards between municipalities (see Figure 14).

Figure 14 shows that 329 out of 339 municipalities have seen reductions in their Unsatisfied Basic Needs Index⁵ between 2001 and 2012, while only 10 have seen increases in Unsatisfied Basic Needs. Increases in Unsatisfied Basic Needs is bad because it means that the local government cannot keep up with basic services such water, sanitation, electricity, education and health. The ten municipalities that have experienced a worsening of Unsatisfied Basic Needs are Santa Cruz de la Sierra, Puerto Quijarro, Carmen Rivero Torrez and Montero in the Santa Cruz department; San Andres de Machaca and Jesus de Machaca in La Paz; Arbieto and Pojo in Cochabamba; Toledo in Potosi; and Sena in Pando.

Figure 14: Convergence in the Unsatisfied Basic Needs Index, 2001-2012



Source: Authors' elaboration based on official Unsatisfied Basic Needs Indices calculated by UDAPE.

The main highland cities, La Paz, El Alto, Potosi and Oruro have all seen substantial reductions in Unsatisfied Basic Needs (between 20 and 31 percentage points reductions), while improvements in the valley cities, Cochabamba, Sucre and Tarija were much more modest

⁵ See methodological document here: <http://www.ine.gob.bo/pdf/Metodologias2004/NBI.doc>.

(reductions between 5 and 13 percentage points). These cities all had medium level UBNs in 2001, ranging from 34 percent in La Paz to 67 percent in El Alto.

Santa Cruz de la Sierra in the lowlands saw a slight increase in Unsatisfied Basic Needs. This is partly due to Unsatisfied Basic Needs already being quite low in 2001, but further progress is hindered by the combination of a very rapidly growing population, as seen in the previous sub-section, and disproportionately low transfers to the municipality. In 2012, Santa Cruz de la Sierra received transfers from the central government of only Bs. 887 per person, while the national average was Bs. 1189 per person.

4.3 Trends and gaps in the sub-components of the Unsatisfied Basic Needs Index

At the national level, the official poverty rate, as measured by the Unsatisfied Basic Needs methodology, decreased from 58.6 percent in 2001 to 44.9 percent in 2012 (see Table 8).

The Unsatisfied Basic Needs Index includes four main sub-components: 1) Housing quality; 2) Basic services; 3) Education; and 4) Health. Each of these includes one or more sub-components. Table 9 shows the evolution of the indicators for which we were able to find comparable information for 2001 and 2012.

Table 8: Trends in sub-components of the Unsatisfied Basic Needs Index, 2001-2012

| | 2001 | 2012 | Change 2001-2012 |
|---|-------------|-------------|-----------------------------|
| Poverty rate as measured by the Unsatisfied Basic Needs methodology (percent) | 58.6 | 44.9 | -13.7 |
| Gas for cooking (either by canisters or pipes) (percent of households) | 58.4 | 71.7 | 13.3 |
| Electricity coverage (percent of households) | 64.4 | 82.3 | 17.9 |
| Communication services (percent of households) | 22.7 | 65.3 | 42.6 |
| Piped water coverage (percent of households) | 62.3 | 68.3 | 6.0 |
| Sanitation coverage (percent of households) | 63.3 | 69.9 | 6.6 |
| Analphabetism (percent of population) | 13.3 | 5.1 | -8.2 |
| Share of adult population with secondary or more education (percent) | 40.3 | 61.0 | 19.7 |
| Share of latest births that took place in a health establishment (percent) | 53.1 | 69.1 | 16.0 |

Source: INE (2014).

4.3.1. Electricity and communications services

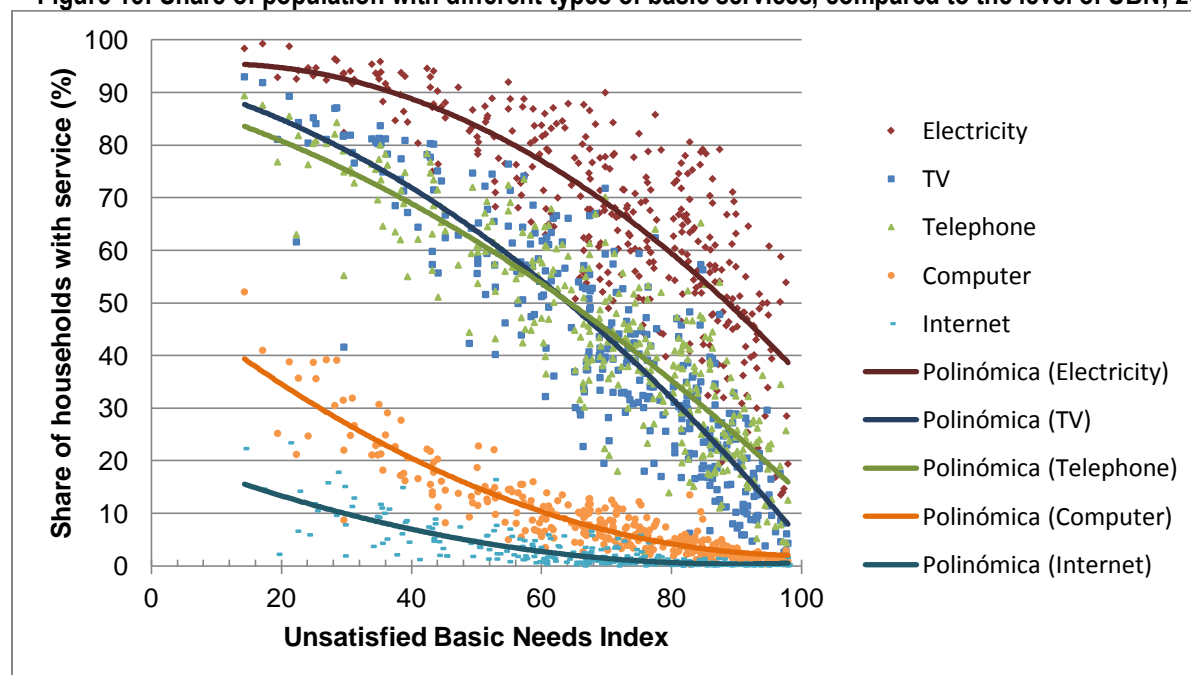
By far the biggest improvement in basic services between 2001 and 2012 is seen in the coverage of communication services (telephones, cell phones and Internet) which increased from only 22.7 percent of households in 2001 to 65.3 percent of households in 2012.

However, the coverage of electricity and communications services still varies dramatically between municipalities by 2012. Figure 15 shows the coverage of different telecommunications services, for all municipalities, ordered by their level of Unsatisfied Basic Needs. From this figure we can see the typical sequence of services. In municipalities which have almost 100 percent Unsatisfied Basic Needs (the poorest municipalities), about 40 percent do have electricity, 15 percent have a telephone, 7 percent have a TV, 2 percent have a computer, and virtually none have Internet connection.

In the municipalities with the lowest levels of UBN (the richest municipalities), on the other hand, more than 95 percent have electricity, 88 percent have a TV, 84 percent have a telephone/cell phone, 40 percent have a computer, and 15 percent have Internet.

The graph suggests that electricity, TV and telephones are considered basic services, and people acquire these as soon as the public infrastructure allows. Computers and Internet, on the other hand, only get acquired at a much more advanced level of municipal development. This, of course, has to do with the very high costs of both computers and Internet in Bolivia (see Andersen & Soria 2015).

Figure 15: Share of population with different types of basic services, compared to the level of UBN, 2012.

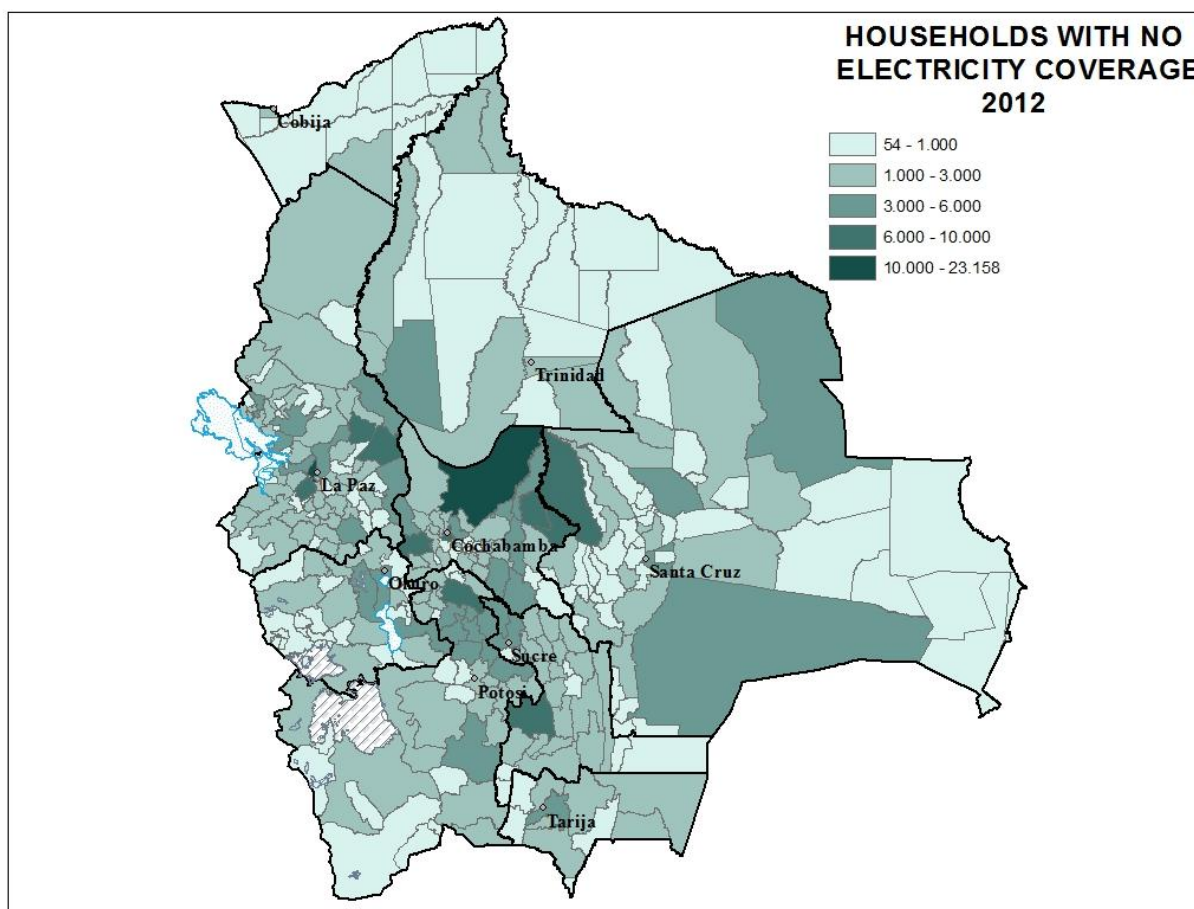


Source: Authors' elaboration based on official 2012 municipal indicators calculated by UDAPE.

Map 4 shows where the biggest gaps in electricity exist in the country. It is not expressed in percent but rather in number of households without services, as this is a better indication of the investments needed. Curiously, some of the biggest gaps are found in the department of Cochabamba, the headquarters of the national enterprise responsible for electricity (ENDE – Empresa Nacional de Electricidad). The 10 municipalities with the biggest gaps are: El Alto (23,158 households without electricity coverage), Villa Tunari (17,838), La Asunta (9,051), Puerto Villarroel (8,144), Cochabamba (7,729), San Pedro de Buena Vista (7,280), Caranavi (7,054), Viacha (6,626), Entre Rios (6,513), and Yapacaní (6,469).

Notice that these 100,000 households, covering almost half a million people, are all located close to the national interconnected electricity grid in relatively densely populated areas, so connecting them to the grid is relatively inexpensive. The investment required would thus not only provide half a million people with energy access-the foundation for future progress-but it would also provide very good value for the money invested.

Map 4: Gaps in electricity coverage, by municipality, 2012



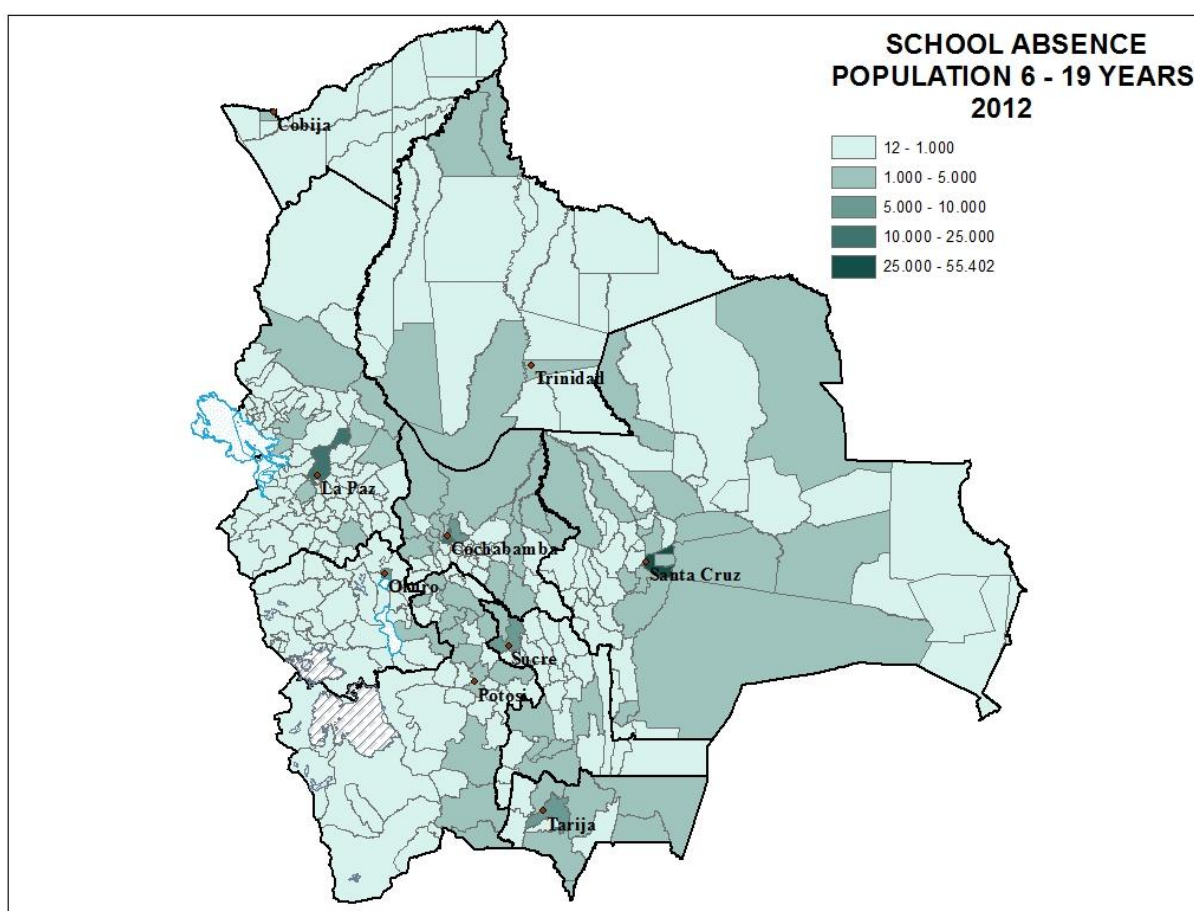
Source: Authors' elaboration based on official 2012 municipal indicators calculated by UDAPE.

4.3.2. Education

Education indicators have also improved dramatically between 2001 and 2012. Almost all children now finish primary school, so the main challenge is to keep them through high school, or some other kind of secondary education. By 2012, school attendance rates for 6-19 year olds was 87.3 percent at the national level, slightly higher for girls (87.4 percent) than for boys (87.1 percent). Map 5 shows where the largest numbers of out-of-school youth are located.

The ten municipalities with the largest numbers of out-of-school youth (6-19 years) are: Santa Cruz de la Sierra (55,402), El Alto (22,441), Cochabamba (17,006), La Paz (14,740), Sucre (7,089), Tarija (6,764), Oruro (6,447), Sacaba (5,195), Potosi (4,845), and Montero (4,611). The problem of school-drop out is thus very much an urban problem by now.

Map 5: Number of children between 6 and 19 years who are not attending school, by municipality, 2012



Source: Authors' elaboration based on official 2012 municipal indicators calculated by UDAPE.

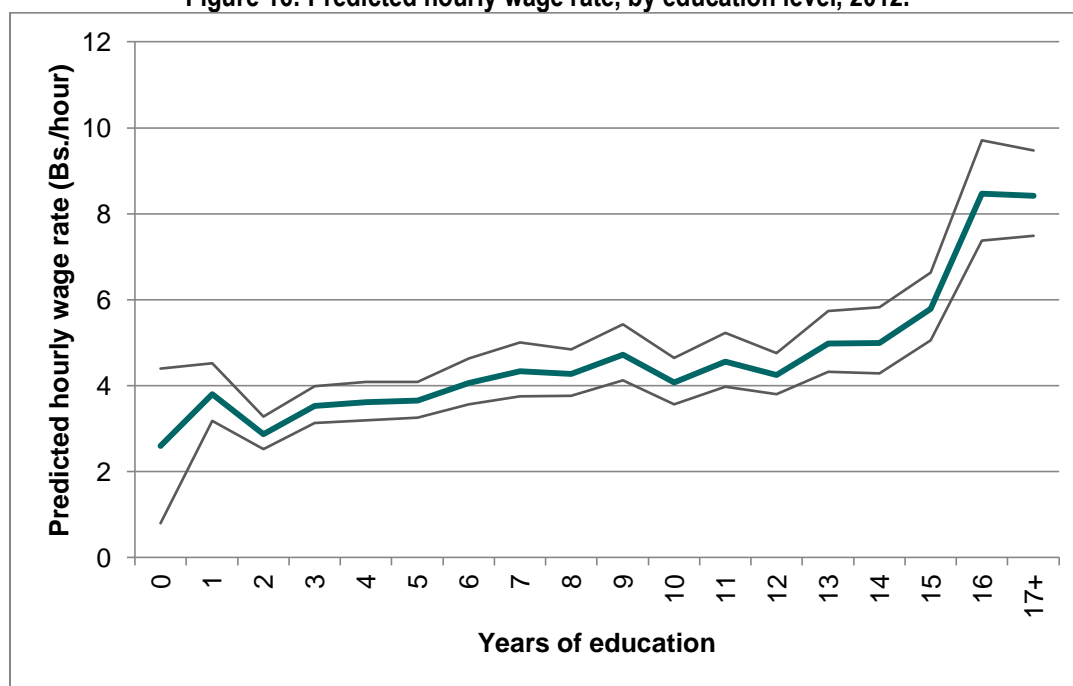
Lack of school attendance in these metropolitan areas is not a problem of lack of supply of education facilities, so it must be due to a lack of demand. The lack of interest in continued

education is due to a combination of: 1) the need to work to generate income, 2) a perceived lack of quality and relevance of continued education leading to an expectation of low returns.

The expectation of low returns is unfortunately likely to be correct. Most studies on the returns to education in Bolivia show very low returns to education below university level (e.g. Andersen and Wiebelt, 2003), and we have confirmed this by running a Mincer regression on the data from the 2012 household survey. The dependent variable is the logarithm of the hourly wage, and as explanatory variables we included dummies for each year of education (0 years of education was the excluded category), experience, experience squared, a dummy for women, a dummy for indigenous people (those who learned to speak in an indigenous language) and a dummy for urban areas. Only people between the ages of 15 and 65 who had a positive labor income and worked more than 200 hours per month were included in the regression.

Figure 16 shows the predicted hourly wage rate (in Bs./hour) by different education levels. The high-school years (9-12 years of education) stand out with a flat line, indicating that the wage you can expect with 12 years of education is no different from the wage you can expect with 8 years of education. The returns to primary education are not impressive either, but secondary education is basically only useful if you continue to complete a university education, so it is not so strange that many opt out.

Figure 16: Predicted hourly wage rate, by education level, 2012.



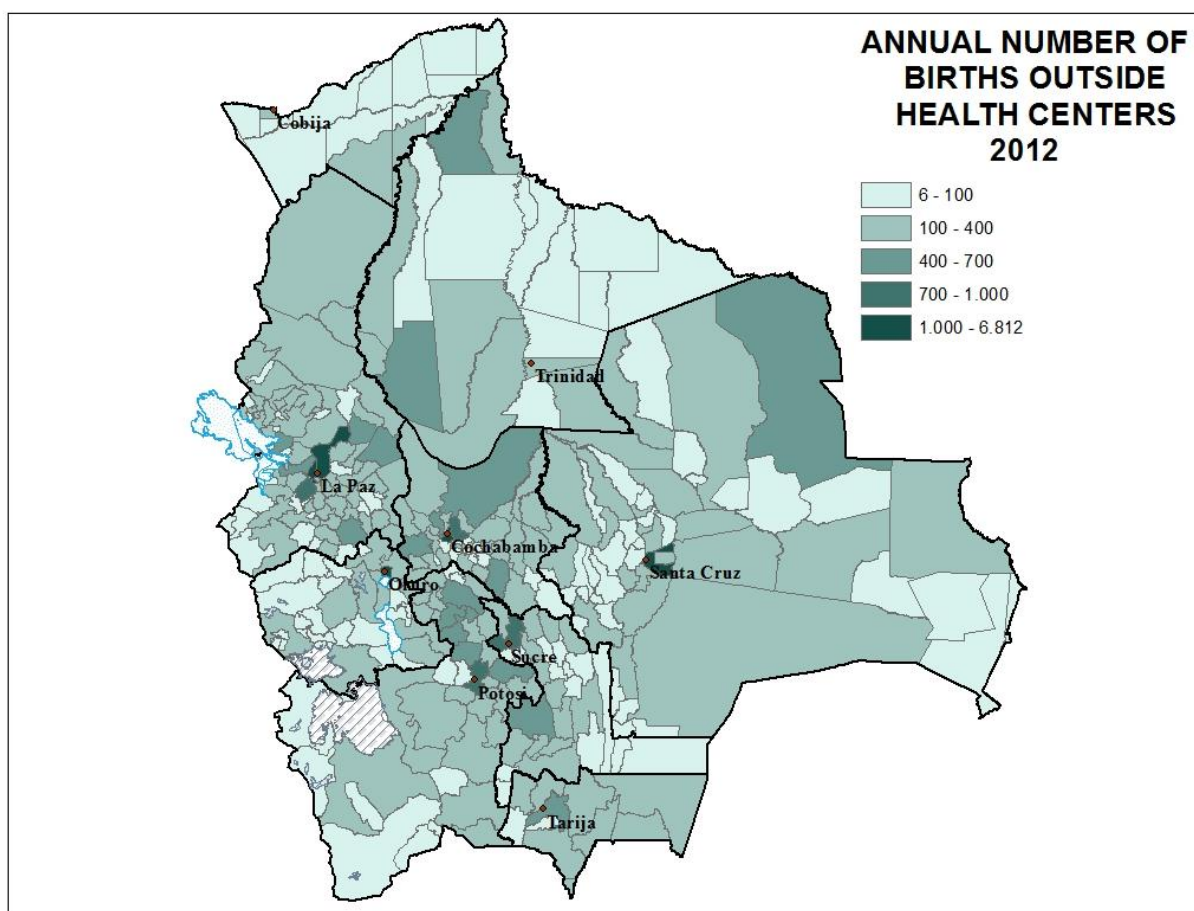
Source: Authors' estimation based on a Mincer regression using the 2012 household survey.

Notes: Includes people between 15 and 65 years of age who work more than 200 hours per month and have a positive labor income. The thin lines indicate the 95 percent confidence interval.

4.3.3. Health

Maternal health indicators have improved substantially between 2001 and 2012. In 2001, only 53.1 percent of births took place in a health facility with qualified personnel, whereas this is now the case for 69.1 percent. Still, this means that almost 70,000 births take place every year outside health establishments. Map 6 shows the distribution of these births. The ten municipalities with the most births taking place outside health centers are: El Alto (6,812), Santa Cruz de la Sierra (3,091), La Paz (2,034), Cochabamba (1,957), Oruro (1,219), Potosí (973), Sucre (928), Viacha (793), Sacaba (739), and La Asunta (677).

Map 6: Number of births taking place outside health establishments every year, 2012



Source: Authors' elaboration based on official 2012 municipal indicators calculated by UDAPE.

There is one social indicator which is deteriorating, though, and that is teenage pregnancies. According to the last three health surveys, the share of 15-19 year old women who has been pregnant at least once is on the rise. By 2008, 37 percent of 19 year old women were or had been pregnant at least once. The share of 16 year olds who are pregnant or have been pregnant has almost doubled from 4.8 percent in 1998 to 8.7 percent in 2008 (See Table 9).

Table 9: Share of young women that have been pregnant at least once, by age, years 1998, 2003 and 2008

| | Share of women who have been pregnant at least once | | |
|--------------|---|-------------|-------------|
| Age | 1998 | 2003 | 2008 |
| 15 | 3.7 | 3.8 | 5,1 |
| 16 | 4.8 | 6.9 | 8,7 |
| 17 | 13.9 | 14.3 | 17,9 |
| 18 | 21.7 | 25.7 | 23,5 |
| 19 | 29.7 | 33.9 | 37.0 |
| Total | 13.7 | 15.7 | 17.9 |

Source: Calculated by UNFPA based on ENDSA surveys.

According to the 2012 census, this upward trend has continued. Table 10 shows that, on average, 11 percent of all 16 year old girls already have a child, and this share increases to 49 percent for the 20 year olds, many of whom already have 3 children.

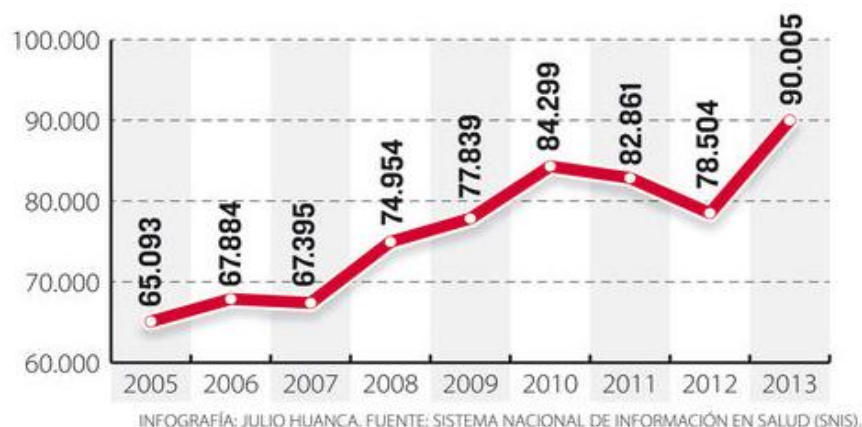
Table 10: Number of young women in the 2012 census, by age and number of children born alive

| Age of woman | Number of children born alive | | | | Percent of women with at least one child |
|--------------|-------------------------------|---------------|---------------|--------------|--|
| | 0 | 1 | 2 | 3 | |
| 15 | 45,947 | 3,705 | - | - | 7% |
| 16 | 47,715 | 5,694 | - | - | 11% |
| 17 | 48,553 | 10,145 | 3,287 | - | 22% |
| 18 | 46,402 | 15,457 | 4,240 | - | 30% |
| 19 | 38,084 | 18,208 | 5,446 | 2,677 | 41% |
| 20 | 34,859 | 22,043 | 8,825 | 3,084 | 49% |
| Total | 261,560 | 75,252 | 21,798 | 5,761 | 28% |

Source: Author's elaboration based on data from Bolivia's 2012 population census.

The upward trend in teenage pregnancies is also confirmed by the data collected from the National System of Health Information (SNIS), which reported a record number of 90,005 adolescent pregnancies in 2013, up from 65,039 in 2005 (see Figure 17).

Figure 17: Number of pregnancies in women younger than 20 years of age, 2005-2013



Source: http://www.la-razon.com/sociedad/SNIS-registran-embarazos-zonas-urbanas_o_2258774107.html

The high and increasing rates of teenage pregnancy are worrying because of the adverse dynamic effects that typically result from teenage pregnancies: less education for the mother, lower incomes for the rest of her life, fewer resources available to raise the kids, transmission of unfavorable conditions to subsequent generations, etc (UNFPA, 2011).

Table 11 shows that teenage pregnancy is most common in the Bolivian lowlands, with 62 percent of 15-20 year old women in Pando having one or more children. The table also shows that there is an inverse relationship between child bearing and school attendance, with only 41 percent of 15-20 year old women in Pando attending school, compared to 58-60 percent in the departments with the lowest rates of teenage child bearing.

Table 11: Children versus schooling, 2012

| Department | Percent of women aged 15-20 who has at least one child | Percent of women aged 15-20 who is going to school |
|----------------|--|--|
| Chuquisaca | 25 percent | 58 percent |
| La Paz | 23 percent | 59 percent |
| Cochabamba | 26 percent | 58 percent |
| Oruro | 27 percent | 60 percent |
| Potosí | 30 percent | 56 percent |
| Tarija | 25 percent | 58 percent |
| Santa Cruz | 31 percent | 54 percent |
| Beni | 48 percent | 49 percent |
| Pando | 62 percent | 41 percent |
| Bolivia | 28 percent | 56 percent |

Source: Authors' estimation based on the 2012 population census.

Teenage pregnancy is not a problem associated with poverty. It is pervasive across all social strata (Andersen, 2015) and it has been rising steadily over the last decade while Bolivia has changed status from a poor country to a lower middle-income country.

Fortunately, the Bolivian government is beginning to tackle this problem. The Ministry of Justice has just published a National Plan for the Prevention of Teenage Pregnancy 2015-2020 (Ministerio de Justicia, 2014). Priority areas for intervention would be the municipalities with the highest numbers of teenage pregnancies, which are the following: Santa Cruz de la Sierra (16,219 mothers aged 15-20 in 2012), El Alto (5,995), Cochabamba (5,010), La Paz (3,616), Sucre (2,132), Oruro (1,980), Potosi (1,762), Riberalta (1,734), Tarija (1,685), and Sacaba (1,624).

4.3.4. Water and Sanitation

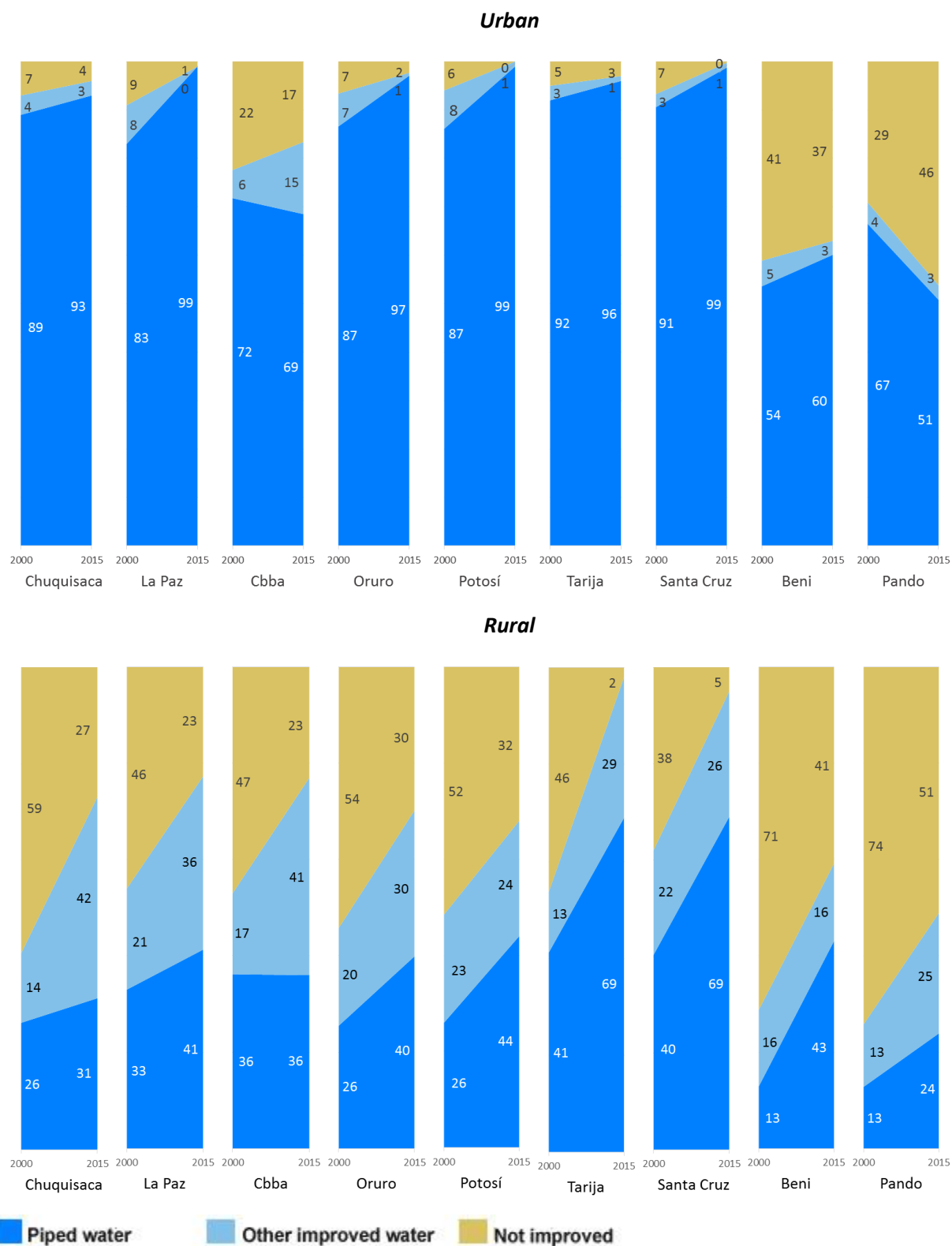
Water and sanitation apparently has not expanded as quickly as other basic services over the last decade (see Table 9 above). However, the questions on water coverage are not comparable across censuses, so it is difficult to judge progress, especially at the municipal level. However, UDAPE, in collaboration with UNICEF, has just completed a study on the trends in water and sanitation coverage in Bolivia using multiple sources (censuses, health surveys and household surveys from 1992 to 2013) and harmonizing definitions (UDAPE-UNICEF, 2015).

Water

At the national level, the share of households without an improved water source has decreased from 26 percent in 2000 to 11 percent in 2015, while the share of households with piped water has increased from 65 percent in 2000 to 77 percent in 2015. The progress is most notable in rural areas (UDAPE-UNICEF, 2015).

Figure 18 shows improvements in water coverage at the department level. Beni and Pando stand out with low coverage and slow progress. Indeed, in the urban parts of Pando, piped water coverage has decreased, reflecting the fact that the expansion of water connections is not keeping up with the extremely rapid population growth experienced in the departmental capital Cobija. Urban Cochabamba has also experienced a drop in piped water coverage.

Figure 18: Progress in access to improved water sources, by department and area, 2000-2015

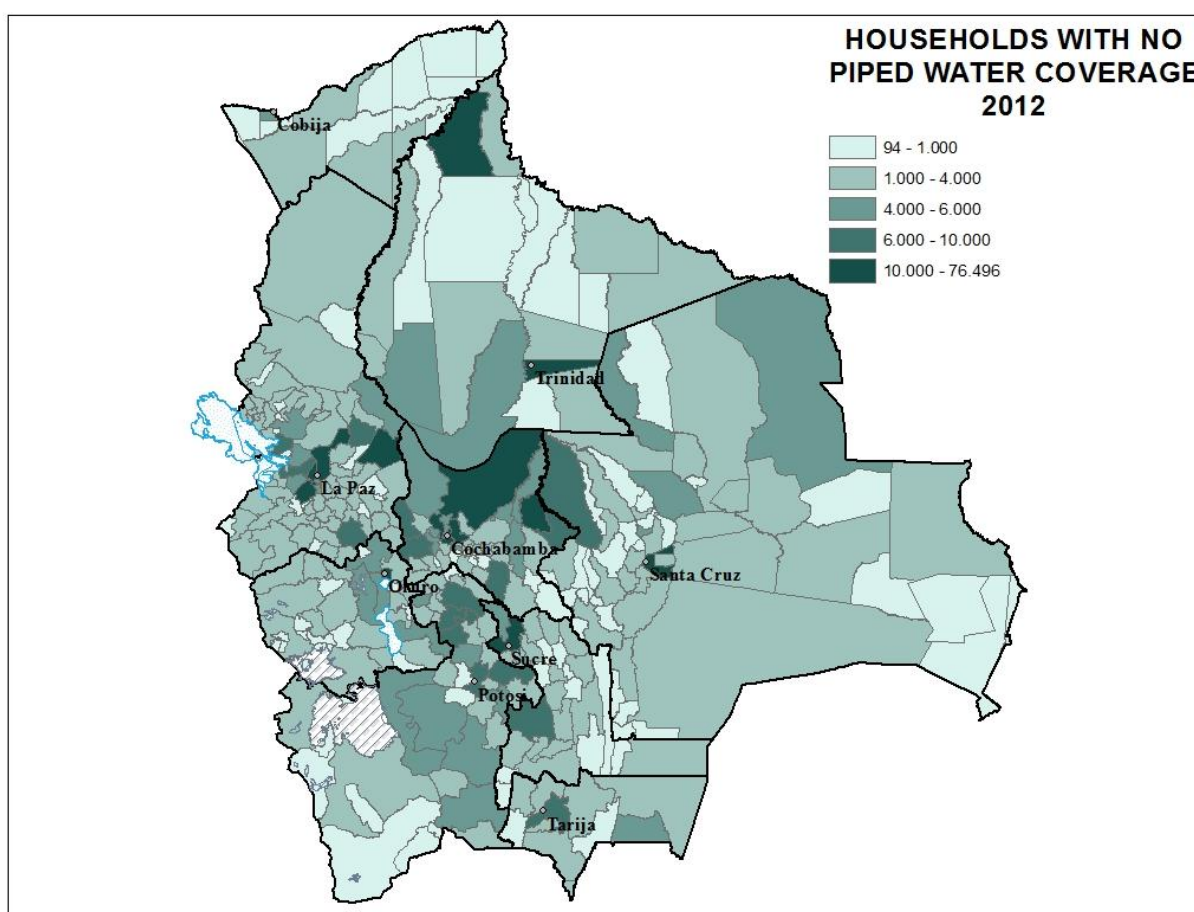


Source: UDAPE-UNICEF (2015).

In terms of the absolute numbers of households without access to piped water, the gaps are concentrated in metropolitan areas (see Map 7). The ten municipalities with the largest numbers of households without piped water are the following: Cochabamba (76,496 households without piped water), El Alto (32,537), Villa Tunari (26,060), Santa Cruz de la Sierra (23,793), Sacaba (22,094), La Paz (20,743), Riberalta (17,983), Viacha (13,717), Sucre (13,105), and Trinidad (11,849).

These are all metropolitan areas with dense populations, so it is relatively easy to provide these households with another one of the most fundamental public services. Investments in this area and in these municipalities would provide very good value for the money.

Map 7: Number of households without piped water, by municipality, 2012



Source: Authors' elaboration based on official 2012 municipal indicators calculated by UDAPE.

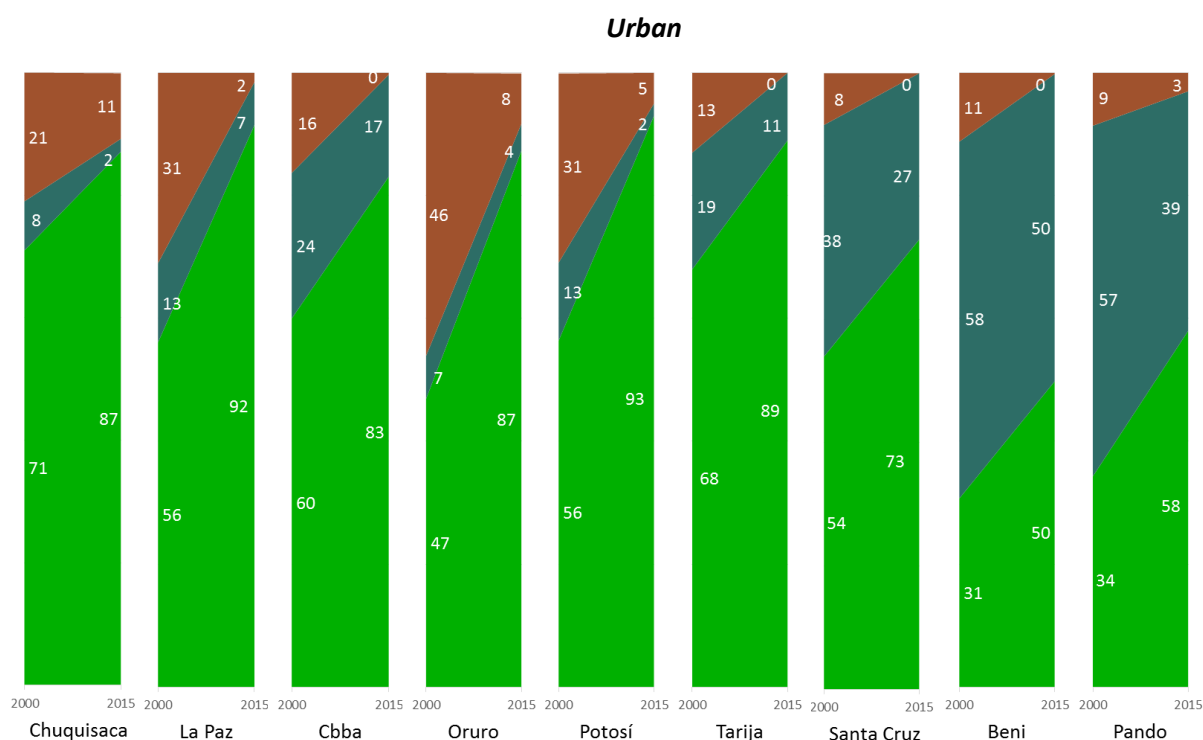
Sanitation

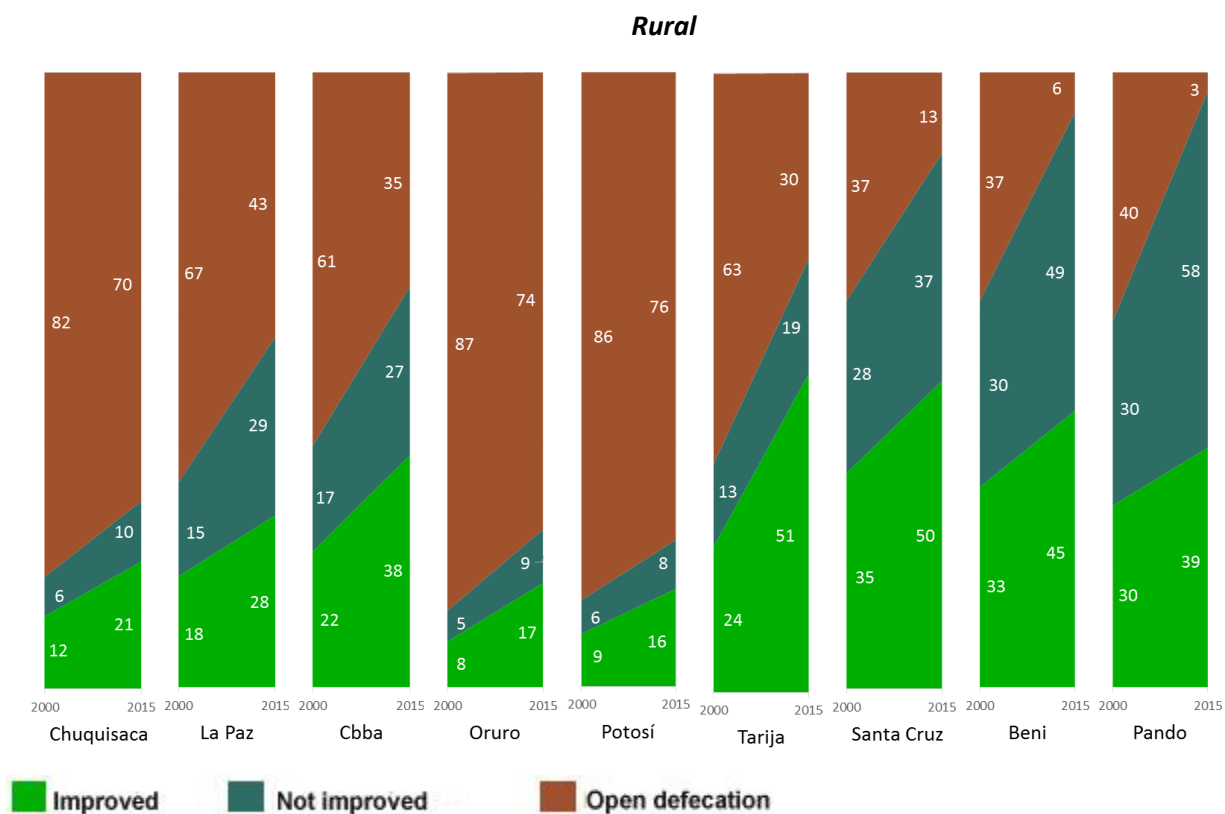
According to the latest Bolivian population census (2012), the coverage of sewerage systems is only 57.6 percent, which means that the members of about 1.5 million Bolivian households still

do not have a comfortable, hygienic, safe place to defecate. The lack of sanitation services is particularly uncomfortable for women (Shahriari, 2012), but it is also a main contributor to child mortality (Heaton & Forste, 20013). Even for the ones who do have comfortable sanitation services in their house, the sewage mostly goes untreated into the rivers thus potentially causing health problems downstream (INESAD, 2015).

Figure 19 shows the progress in sanitation coverage for rural and urban areas in each of the 9 departments of Bolivia. Perhaps the most striking aspect of these graphs is the big differences between departments. In the rural parts of Oruro, Potosi and Chuquisaca more than 70 percent of the population defecate in the open, while this is the case for less than 10 percent of the rural population in Beni and Pando. Even in urban areas of Chuquisaca, 11 percent of the population defecate in the open. Most departments, however, have made considerable progress over the last 15 years.

Figure 19: Progress in sanitation coverage, by department and area, 2000-2015



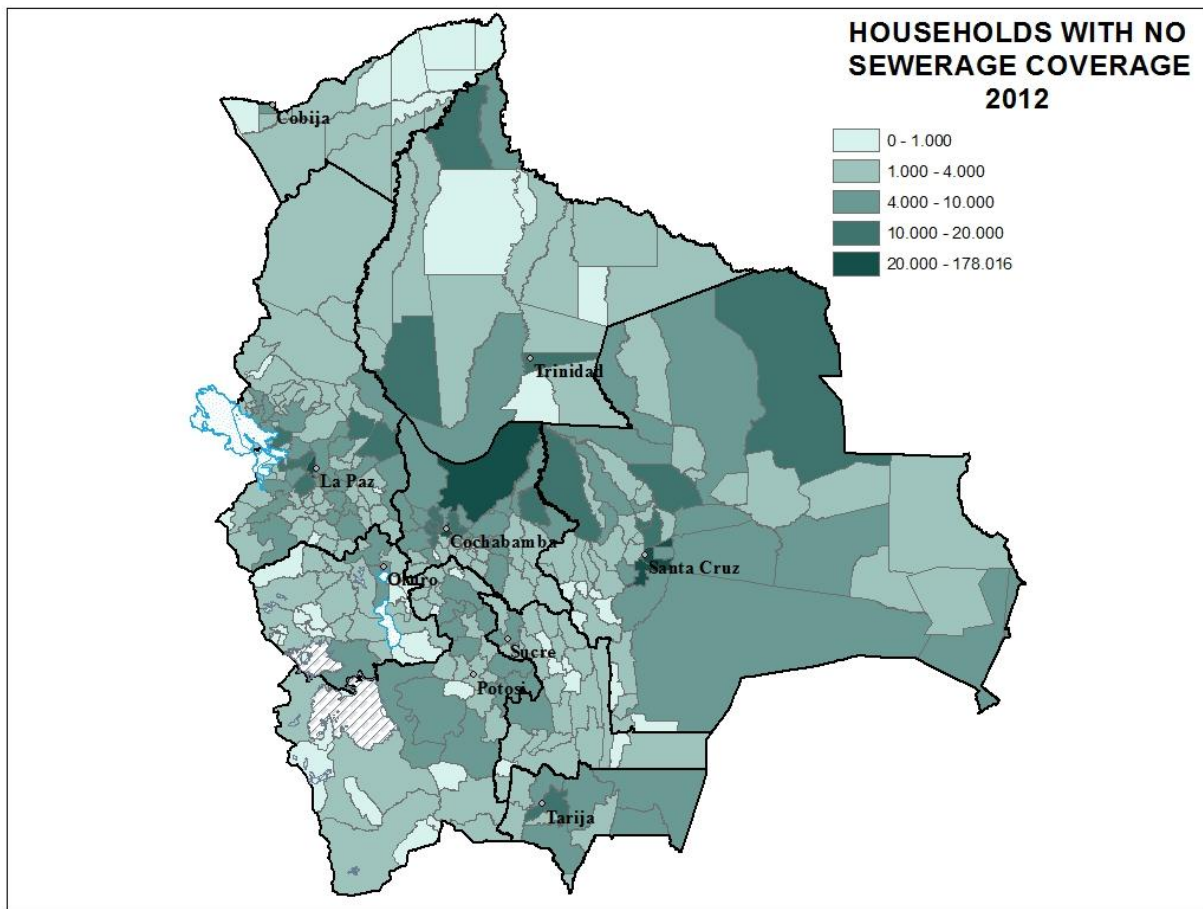


Source: UDAPE-UNICEF (2015).

In terms of absolute numbers of households without sewerage systems, the following 10 municipalities top the list: Santa Cruz de la Sierra (178,016), El Alto (53,433), Cochabamba (52,942), Villa Tunari (28,142), La Guardia (22,716), Warnes (19,063), Sacaba (18,708), Trinidad (17,929), Riberalta (16,759), and Viacha (16,393).

Water and sanitation investments should preferably go together, so that the used water is disposed off in a convenient, healthy and environmentally friendly way. Bolivia has big challenges in this area (INESAD, 2015).

Map 8: Number of households without sewerage access, by municipality, 2012



Source: Authors' elaboration based on official 2012 municipal indicators calculated by UDAPE.

4.4 Factors associated with progress in social indicators

In order to inform policy and public investments, it is of interest to understand which factors are associated with progress in the social indicators. For that purpose we run a simple cross-municipality regression with the change in the Unsatisfied Basic Needs index between 2001 and 2012 as the dependent variable.

We apply a general-to-specific principle and start out with all the potential explanatory variables we have in our data set for 2001 plus the change in total per capita transfers between 2001 and 2012. First we eliminate variables that are very highly correlated with other explanatory variables ($|\rho| > 0.8$) in order to avoid problems of multi-collinearity. Subsequently, we eliminate insignificant variables one by one (starting with the least significant), until all remaining variables are statistically significant at the 95 percent level. We then apply the Fields' decomposition to this final regression in order to judge which variables are best at explaining the variation in progress between municipalities (Fields et al., 1998). Annex C shows both the

initial and the final regressions. Table 12 below shows the Fields' decomposition based on the final regression.

Only six factors are significantly related to the change in Unsatisfied Basic Needs between 2001 and 2012. The estimated coefficient for these five factors are all negative, indicating that they are associated with bigger reductions in Unsatisfied Basic Needs, i.e. they are beneficial for subsequent poverty reduction. The most important variable (as judged by the Factor Inequality Weights derived from the Fields' decomposition) is piped water coverage in 2001. Variations in this variable explain about 11 percent of the variation in the dependent variable. The municipalities that had high water coverage in 2001 improved more than others, all other things equal. The second most important variable is initial UBN, indicating that municipalities with initially high UBN have experienced the biggest reductions in UBN, i.e. we have experienced a process of convergence between municipalities. The third most important variable is per capita transfers resulting from the Popular Participation Law. Municipalities which received higher per capita transfers in 2001 improved the most. Notice that per capita transfers from the HIPC Law did not turn out to be significant in the regression, and IDH transfers did not exist in 2001. The fourth most important variable is the change in total per capita transfers between 2001 and 2012. Thus, the municipalities that have experienced the biggest increases in transfers are the ones that have experienced the largest reductions in Unsatisfied Basic Needs. The fifth most important variable is the level of education of the adult population in 2001. Municipalities with better educated populations, all other things equal, tended to experience bigger improvements in the Unsatisfied Basic Needs index. Finally, the last significant variable is life expectancy in 2001. Municipalities with better health tended to improve more, all other things equal.

Table 12: Fields decomposition of regression explaining changes in poverty rates at the municipal level, 2001-2012

| Explanatory variable (X) | Estimated coefficient | Standard Deviation of X | Correlation between X and Y | Factor Inequality Weight (FIW) |
|---|------------------------------|--------------------------------|------------------------------------|---------------------------------------|
| Piped water coverage 2001 | -0.2092 | 23.7199 | -0.1893 | 0.1111 |
| UBN 2001 | -0.3446 | 17.7634 | -0.1058 | 0.0766 |
| Per capita transfers from the Popular Participation Law | -0.0369 | 47.6277 | -0.2227 | 0.0464 |
| Change in total transfers between 2001 and 2012 | -0.0018 | 1049.2001 | -0.1453 | 0.0322 |
| Years of education adult population 2001 | -1.4998 | 1.6715 | -0.0618 | 0.0183 |
| Life expectancy 2001 | -0.3422 | 4.9845 | -0.0363 | 0.0073 |

Source: Authors' estimation.

The regression results suggest that the large increase in transfers to municipalities has been important for the reduction in Unsatisfied Basic Needs in Bolivia. HIPC transfers seem to have been less effective than the other kinds of transfers, though.

The regression results also suggest that, all other things equal, it is easier to achieve progress when the population has piped water and are healthy and educated.

It is also interesting to reflect on the variables that are not significantly related to progress in the social indicators. Natural resources (oil, minerals and forests), for example, were among the first variables to be dropped due to their statistical insignificance in the regression. Likewise, none of the geographical variables, such as climate, topography or municipality size were significant, and the same holds for population variables such as urbanization rates, population density, and migration rates. Roads were not found to be significant either.

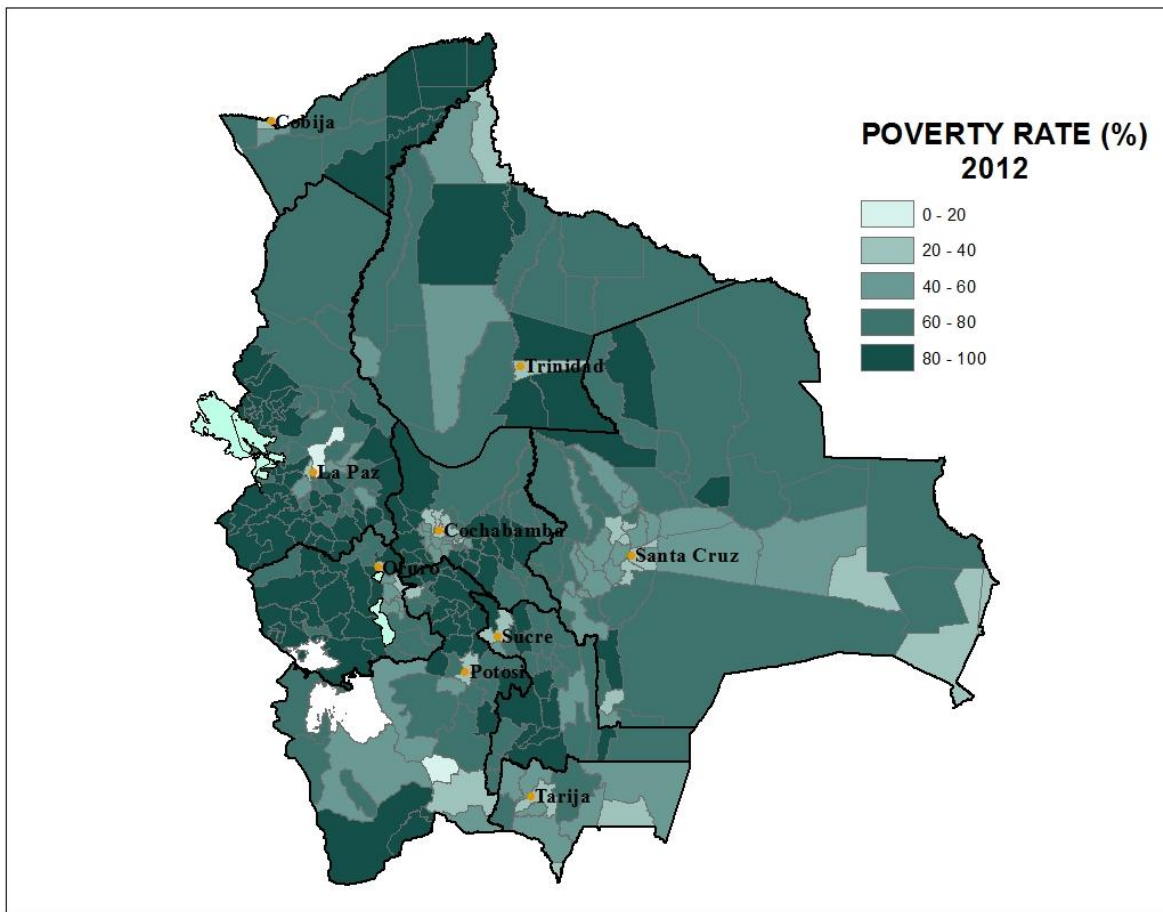
4.5 Factors associated with the level of Unsatisfied Basic Needs in 2012

While the financial transfers to municipalities have clearly helped improve social indicators all over Bolivia and have also contributed to some degree of convergence between municipalities, Bolivia remains extremely heterogeneous in terms of social indicators.

The Bolivian government has defined a poverty line based on the Unsatisfied Basic Needs Index (all households with a UBN index above 67 are considered poor), and by this measure, poverty rates vary from 14.3 percent in the municipality of La Paz to 97.9 percent in the municipality of El Choro (in the Department of Oruro) in the year 2012.

Map 9 gives an overview of the distribution of poverty as calculated by UDAPE using the Unsatisfied Basic Needs (UBN) methodology on the 2012 population census. The overall poverty rate for Bolivia in 2012 is calculated at 44.9 percent. The UBN methodology also defines an extreme poverty line, which results in an extreme poverty rate of 9.6 percent, which is similar to the World Bank's extreme poverty calculation using the \$1.25/day poverty line, which puts 8.0 percent of the population below the extreme poverty line.

Map 9: Poverty rates in 2012, by municipality



Source: Authors' elaboration based on official poverty rates calculated by UDAPE.

In order to understand which factors are related to the level of poverty in 2012, we run a simple regression with poverty rates at the municipal level in 2012 as the dependent variable. Again, we apply a general-to-specific principle and start out with all the potential explanatory variables we have in our data set for 2012 plus the time-invariant variables, but excluding variables that are part of the construction of the dependent variable (such as piped water coverage, sanitation coverage, electricity coverage, etc). First we eliminate variables that are very highly correlated with other explanatory variables ($|\rho| > 0.8$) in order to avoid problems of multi-collinearity. Subsequently, we eliminate insignificant variables one by one (starting with the least significant), until all remaining variables are statistically significant at the 95 percent level. We then apply the Fields' decomposition to this final regression in order to judge which variables are best at explaining the variation in poverty rates between municipalities. Annex C shows both the initial and the final regressions. Table 13 below shows the Fields' decomposition based on the final regression.

Table 13: Fields decomposition of regression explaining poverty rates at the municipal level, 2012

| Explanatory variable (X) | Estimated coefficient | Standard Deviation of X | Correlation between X and Y | Factor Inequality Weight (FIW) |
|---|------------------------------|--------------------------------|------------------------------------|---------------------------------------|
| Television 2012 | -0.3571 | 21.8807 | -0.8933 | 0.3684 |
| Computer 2012 | -0.6873 | 8.1474 | -0.8854 | 0.2617 |
| Share of people with salaries 2012 | -0.2356 | 14.9870 | -0.6958 | 0.1297 |
| Per capita transfers from the HIPC law 2012 | 0.1235 | 37.6568 | 0.4819 | 0.1183 |
| Share of women 15-20 who already have at least one child 2012 | 11.7767 | 0.1240 | 0.2147 | 0.0166 |
| Share of people of working age 2012 | -0.5561 | 3.5164 | -0.1072 | 0.0111 |
| Density of primary roads (km/km ²) | -0.0200 | 60.0391 | -0.1688 | 0.0107 |
| Per capita transfers from the Popular Participation Law 2012 | -0.0120 | 189.7981 | -0.0181 | 0.0022 |
| Per capita transfers from IDH revenues 2012 | -0.0045 | 1045.2064 | 0.0151 | -0.0037 |
| Share of municipality with a slope of >10 percent | -0.0520 | 32.5715 | 0.1214 | -0.0108 |

Source: Authors' estimation.

Ten variables turn out to be statistically significant in the final regression and together they explain more than 90 percent of the variation in poverty rates across municipalities. According to the Fields' decomposition, the coverage of TVs is the most important variable explaining 37 percent of the variation in poverty rates across municipalities. This variable clearly acts as a proxy for electricity coverage, which was excluded since it is a direct component of the UBN index. The next most important variable is computer coverage, which explains 26 percent of the variation in poverty rates between municipalities.

The third most important variable is the share of people with salaries (as opposed to being self-employed or not employed at all). The fourth most important variable is per capita HIPC transfers. Notice, though, that the estimated coefficient is positive implying that municipalities with higher HIPC transfers are poorer. This is of course because HIPC transfers were designed to be pro-poor, as previously explained. The fifth most important factor is the share of young women aged 15-20 who already have at least one child. Municipalities with more teenage mothers tend to have higher poverty rates, all other things equal. The sixth most important variable is the share of the population who is of working age, indicating that municipalities with lower dependency burdens are less poor. The seventh most important variable is the density of primary roads, indicating that municipalities with a better road network are less poor. The

eighths and ninths significant variables are per capita transfers from the popular participation law and per capita transfers from IDH revenues, respectively. The sizes of the estimated coefficients suggest that Popular Participation funds may be slightly more effective in reducing poverty than IDH funds, or it could simply be a reflection of the fact that IDH revenues are distributed in a slightly more pro-poor manner than Popular Participation funds, as we showed in section 4.4 above. From a simple cross-municipality regression, one simply cannot infer much about causality. The last significant variable is the fraction of the municipality with steep slopes, indicating that the highly undulated valley regions tend to be less poor than the flat regions of either the highlands or the lowlands, all other things equal. Again it is worth noting some of the variables that were dropped from the regression due to statistical insignificance, such as natural resources (hydrocarbons, minerals, and forests), climate, population density, urbanization rates, share of population working in the agricultural sector, and rate of budget execution.

While cross-section regressions by definition cannot say anything about causality, the regression results reported above hint at some vicious circles of poverty. The most important ones appear to be the lack of electricity and piped water, which keep the population and the municipal governments so poor that they cannot afford to invest in electricity and piped water. The lack of affordable electricity affects economic productivity, time budgets, opportunities for income generation, and more generally the ability to improve living conditions (GEA, 2012). Likewise, the lack of convenient access to safe water affects health, learning, time budgets and economic opportunities (FAO, 2007).

Another vicious circle is related to the lack of salaried jobs and economic opportunities which prevents people from getting out of poverty. The lack of economic opportunities in turn implies a lack of incentives to acquire education, so young people instead drop out of school and young women start having babies in their teens. This, in turn, increases dependency burdens and makes it difficult for these families to escape poverty.

Directing lots of funds at these poverty traps has indeed helped improve the situation in most places, but with the sharp reductions expected in transfers to municipalities starting this year, it may become difficult to secure continued progress or even maintenance of status quo.

4.6 Summary of current gaps in basic services

Bolivia has achieved important progress over the last decade in terms of reducing poverty and improving the living conditions of its population. The economic bonanza the country has enjoyed in the last decade, due to the commodity boom witnessed in the world markets, has significantly contributed to the positive results, by permitting a dramatic increase in funds available for investment in basic services in all municipalities.

Despite this impressive progress, Bolivia is still one of the poorest and least developed countries in Latin America, and large gaps in basic services exist even in the main cities, or actually especially in the main cities.

Table 14 summarizes in which municipalities the top ten largest gaps in basic services discussed in the previous sub-sections are found. The municipalities are ranked from the largest to the smallest number of times they appear on one of the top ten gaps lists.

El Alto and Cochabamba appear on the list of top ten gaps for all six gap indicators. Santa Cruz de la Sierra and Sacaba both appear on five out of the six top ten gap lists. La Paz, Viacha and Sucre appear four out of six times. Villa Tunari, Riberalta, Oruro and Potosi appear on half of the lists, and Trinidad, La Asunta and Tarija appear on two list. Seven other municipalities appear on one of the top ten gap lists, while the remaining 318 municipalities in the country never appear on any of the six top ten gap lists analyzed.

Table 14: List of municipalities with the top ten largest gaps in key social indicators, 2012

| Municipality | Number of households without electricity coverage | Number of households without piped water | Number of households without sewerage systems | Number of out-of-school youth (6-19 years) | Number of births taking place outside health centers | Number of young mothers aged 15-20 |
|--------------------------|--|---|--|---|---|---|
| El Alto | 23,158 | 32,537 | 53,433 | 22,441 | 6,812 | 5,995 |
| Cochabamba | 7,729 | 76,496 | 52,942 | 17,006 | 1,957 | 5,010 |
| Santa Cruz de la Sierra | - | 23,793 | 178,016 | 55,402 | 3,091 | 16,219 |
| Sacaba | - | 22,094 | 18,708 | 5,195 | 739 | 1,624 |
| La Paz | - | 20,743 | - | 14,740 | 2,034 | 3,616 |
| Viacha | 6,626 | 13,717 | 16,393 | - | 793 | - |
| Sucre | - | 13,105 | - | 7,089 | 928 | 2,132 |
| Villa Tunari | 17,838 | 26,060 | 28,142 | - | - | - |
| Riberalta | - | 17,983 | 16,759 | - | - | 1,734 |
| Oruro | - | - | - | 6,447 | 1,219 | 1,980 |
| Potosi | - | - | - | 4,845 | 973 | 1,762 |
| Trinidad | - | 11,849 | 17,929 | - | - | - |
| La Asunta | 9,051 | - | - | - | 677 | - |
| Tarija | - | - | - | 6,764 | - | 1,685 |
| La Guardia | - | - | 22,716 | - | - | - |
| Puerto Villarroel | 8,144 | - | - | - | - | - |
| San Pedro de Buena Vista | 7,280 | - | - | - | - | - |
| Caranavi | 7,054 | - | - | - | - | - |
| Entre Rios | 6,513 | - | - | - | - | - |
| Yapacaní | 6,469 | - | - | - | - | - |
| Montero | - | - | - | 4,611 | - | - |

Source: Authors' calculations based on indicators from UDAPE and data from the 2012 population survey.

This list provides a good overview of where to focus investments in order to help the largest numbers of people resolve some basic problems that tend to keep them in poverty.

This list does not at all coincide with the municipalities with the highest rates of Unsatisfied Basic Needs, though, because the latter tend to be rural municipalities with small and scattered populations.

Previously, a lot of resources have been targeted at the municipalities with the highest rates of UBN, because it looks much more impressive and pro-poor to increase coverage of a service from 5 percent to 95 percent than from 95 percent to 100 percent.

However, a simple calculation illustrates why it is important to focus on absolute numbers of households served instead of rates of coverage. For example, if we improve a social indicator from 5 percent coverage to 95 percent coverage in a small, poor, rural municipality with 1000 households, we will have helped 900 households with that service. But if we increase coverage from 95 percent to 100 percent in a big, relatively rich municipality with 300,000 households, we will have helped 15,000 households. That is, the latter intervention contributes 16 times more to the improvement in the national indicator than the former, although it at first glance looks like a marginal and anti-poor intervention.

Arguably, the poor in peri-urban areas may need some of these basic services even more than the poor in rural areas. Sewerage coverage, for example, is crucial in urban areas in order to avoid major public health problems, whereas people in sparsely populated areas can defecate behind a convenient bush without causing much danger to themselves or others. Secondary education or higher education is also much more important for urban youth than for young people who plan to stay in agriculture for the rest of their life.

Other services, such as electricity and communication, are crucial for everybody, and even the most remote person needs to be covered eventually. However, since it is much cheaper to provide these services in densely populated urban areas than to scattered households in rural areas, it is recommendable to start with the low-hanging fruits first. That is, for the same amount of financing, we can benefit many more people if we start building the cheapest connections first.

4.7 Summary of current challenges in the decentralization process

During the last decade, Bolivia has achieved significant results in terms of reducing poverty incidence and in improving the living standard of its population. While the present paper has only shown indicators based on Unsatisfied Basic Needs, as calculated from census data, other research shows that income poverty and income inequality has also improved dramatically. Eid et al. (2013) show that national income inequality fell 13 Gini points (.59 to .46) between 1999 and 2011, making Bolivia the best performing country in Latin America in terms of inequality reductions during this period. The reductions in inequality mainly took place after 2005 and occurred mainly because the labor incomes of the poorest deciles have been increasing much faster than the incomes of the richest percentiles (about a 10-15 percent difference in annual growth rates between the richest and poorest percentile in both rural and urban areas). Indeed,

the richest percentile of the urban population experienced a five percent per year real reduction in labor incomes during the 2005-2011 period, while the poorest percentile experienced real growth rates of about 10 percent per year during the 2005-2011 period. The rapid increase in labor incomes for the poorest percentiles is mainly due to a rapid increase in demand for unskilled labor, such as construction workers and domestic help, due to the generalized economic bonanza. In comparison, the different cash transfer programs have had virtually no effect on inequality, as they are not specifically targeted at the poor.

Thus, both the large increase in public funds, as well as the large increase in the incomes of the poorer segments of the population are very strongly linked to the economic boom caused by the high prices of Bolivia's export products in world markets. This means that as the economic boom ends, both the government and the poor who did well during the boom, will have a much tougher time ahead. In order to avoid outright reversals of the progress achieved, future public investments will have to become both more efficient and even more pro-poor. This sub-section highlights some key challenges for national and sub-national governments.

Reduce inequalities in the distribution of public resources

The economic bonanza experienced from 2005 to 2014 has produced large revenues to Bolivia's public sector, both from national taxes and from the hydrocarbon rent. This has increased the availability of resources for all government levels, in every region of the country. The discussion in this paper shows that the existing system of intergovernmental transfers has had a positive and statistically significant impact on reducing the levels of Unsatisfied Basic Needs.

However, the current system of distributing resources among government categories and regions embed significant vertical and horizontal inequalities, especially regarding the distribution of IDH and royalties (Revollo, 2013). Inequalities are evident when per capita revenues and per capita public investments are calculated for each region. Disparities are even larger when indicators are calculated in terms of the number of poor persons.

As discussed in Appendix B, the Law of Decentralization and Regional Autonomies (DRA - Law 031 of 2010), contemplates the need to carry out a process leading to a Fiscal Pact, which would correct inequalities among regions. The fiscal pact has become an important issue under discussion in Bolivia at present, but it has proved to be a very sensitive and difficult process. Better-off regions, in terms of the distributed resources, do not want significant changes to be introduced to the current distributional structure, while poorer regions are asking for an increased share of public resources.

Law 031 also recognizes the need to establish the linkage between incomes and spending responsibilities for decentralized units. Thus, the distribution of resources should also consider the responsibilities assigned to sub-national governments.

However sensitive the issue of redistributing resources could be, it should be addressed in the framework of a fiscal pact. It is important that public resources be allocated and spent more efficiently and equitably, favoring not only regions with high poverty incidence but also regions with rapid population growth.

Improve the efficiency of public investments

There is evidence that Bolivia's significant achievements in terms of poverty reduction and unmet basic needs were to a large extent the result of the improved economic conditions, owed to the export commodity boom, and to a lesser extent to public spending (Eid et al., 2013). Thus, when export prices drop, fiscal revenues will drop at least by the same proportion, which could partially revert the progress. To avoid this, Bolivia needs to improve the quality and efficiency of public spending.

This is a key factor that needs to be addressed at all government levels. Investment at the sub-national level has been constrained by various factors, e.g. short time to spend additional allocated budget, excessive bureaucracy to implement projects, strict legal frameworks to punish corrupt public servants, and lack of institutional capacities. All these problems should be addressed in order to improve the efficiency of public investment.

Bolivia does not have a system to measure the quality of public investment, as is the case in Chile and Peru. This type of systems permit evaluating how efficiently public investment is spent, in terms of its impact in achieving key development objectives, such as poverty reduction, employment creation, etc. This type of system is also the last link in the budget cycle, because the results of evaluating the quality of public investment are feedback into the preparation of the budget for next year. This type of system should be implemented in Bolivia, for all government levels and regions.

Improving the quality of public investment is also central to maximize its impact in terms of reducing poverty and improving the wellbeing of the population. The quality of public investment projects should be evaluated in terms of its contribution to the attainment of key objectives, e.g. reducing poverty, employment creation, increase access of the population to basic services, etc. A complete system to evaluate the quality of public investment should be set up, covering all levels of government.

Sustainability as oil prices drop

Bolivia's public budget has become very dependent on hydrocarbons revenues, which, because of the world oil price boom, increased significantly until 2014. The bonanza has permitted the government to increase its pro-poor expenditures and contribute to poverty reduction and to improve the wellbeing of the population. However, progresses made in the last decade could be stopped and even reversed. Reduced oil prices could leave public governments without the resources necessary to continue implementing and expanding their pro-poor policies.

Although general national tax revenues have increased substantially over the last decade, thus reducing the dependence on hydrocarbon revenues for some government entities, it is likely that a reversal of the favorable external conditions would result in reduced economic activity, and thus in lower national tax revenues in general. Thus, it is crucial to consolidate the increase in national tax collection, by reducing tax evasion and informality.

Sub-national governments, which still rely excessively on hydrocarbon revenues, need to diversify their revenue sources. Law 154 of July 2011, determine the classification and definition of taxes, and regulate the creation and/or modification of taxes controlled by sub-national governments. According to Law 154, taxes classified as being under the control of subnational governments are: taxes on the free transfer of goods, real estate taxes, vehicle property taxes, and transactions of these goods. Most of the municipal governments however, do not have capacity to collect taxes. Only a few large municipalities received the bulk of municipal taxes. Besides, few municipalities have property registers. This is particularly important for the collection of property taxes, especially in municipalities where population growth has been very rapid. Thus, the percentage of new properties and developments is very high. Property registries in rural areas are non-existent, and thus self-assessment and declaration is the only tool to determine the value of rural property.

In the case of taxes on vehicles, the existence of a large percentage of very old vehicles in most of the cities contribute to reduce the tax base considerably. Exemptions granted to public transportations and cargo fleet of vehicles further reduces the tax base. Additionally, smuggled vehicles enjoy periodic tax amnesties, which generate incentives to remain illegal and evade tax payments (IMF, 2004).

4.8 Opportunities for high-impact investments in Bolivia

Based on the analysis presented in this paper, we have identified some potential areas of opportunity for investments which appears to have very favorable social returns.

We have divided these into two parts: investment for development and technical assistance for development.

Investment for development

Investments to provide electricity and piped water to the people who still lack this are of utmost importance as energy and water is so basic that almost nothing else can be achieved without these. About one out of 3.2 million households in Bolivia do not have piped water in their house or on their property, and almost 600 thousand households still do not have electricity.

A large share of the population without access to electricity and piped water are concentrated in the peri-urban areas surrounding the three main metropolitan areas of Bolivia. The high population density in these areas and the closeness to the national interconnected electricity grid makes connecting these households relatively cheap, so providing these households with these very basic services is probably one of the most efficient ways to reduce poverty.

However, as more households get connected to the grid, and others get richer, expansions in electricity generation will clearly be needed. Bolivia is blessed with many relatively environmentally friendly energy options (hydro, natural gas, solar, wind and biomass) and is also considering nuclear power generation. Assigning funds for any of these options, should only be done after a careful evaluation of the costs and benefits of each option. This evaluation should

obviously be regionally disaggregated as some areas are much more suitable for certain kinds of energy than others (see below).

While sanitation systems did not show up as one of the most fundamental factors related to progress, it makes sense to install water and sewerage systems together, in order to make sure that the newly installed water is disposed of in a convenient and responsible manner. So far, the sewerage systems in Bolivia seem to be more convenient than responsible, as most of them lead the sewage directly into rivers without any treatment. While this may work for small amounts of sewage in large rivers, it cannot be considered responsible for large amounts of sewage in small rivers, and especially not for rivers with a dead-end like the one that leads sewage from El Alto to Lake Titicaca (INESAD, 2015). Thus, apart from investing in connecting households to the sewerage systems in large metropolitan areas, we also recommend investing in sewerage treatment plants at least for La Paz and El Alto. Although La Paz has gained recognition as one of the New 7 Wonder Cities (<https://www.new7wonders.com/en/cities>), that was despite the embarrassing open sewerage system running through the city.

Technical assistance for development

Some important areas will require a process of research, design and consensus building first. This could usefully be done using the modality of technical assistance. Some potential areas that have arisen in the present analysis are the following:

- **A regionally disaggregated cost-benefit analysis of different energy-generation and distribution options for Bolivia.** Here it is important to notice that the outcomes of the analysis will depend crucially on the social discount rate chosen. Bolivia currently operates with a social discount rate of 12.67% per year, which is extremely high and will always favor short-sighted solutions (low initial investments and quick installation, even if it has high operational and environmental costs for many decades in the future). So it may be worthwhile to also argue for a lower social discount rate which does not completely discount all future generations.
- **A system for monitoring the efficiency of public investments at national and local levels.** Public investment in Bolivia has increased substantially in the last decade and has become the main component of the country's total investment. However, Bolivia does not have a system for monitoring the efficiency of public investment, as is the case in other countries in Latin America. Thus, its efficiency cannot be assessed in terms of its contribution to key development objectives. Systems to assess the quality of public investment in other countries comprise two set of indicators: i) macro indicators, aimed at assessing the overall contribution of public investment to economic performance at the macro level; and ii) micro indicators, aimed at assessing the quality and impact of individual projects. Based on this assessment, the continuity of each project is determined. It is necessary to develop this type of system in Bolivia, in order to monitor the quality of public investment at the central and sub-national levels.
- **Support for making secondary education better and more relevant for students.** The present paper suggests that returns to secondary education currently is

virtually zero for most people in Bolivia. Making secondary education more relevant and useful is an incredibly complex challenge which requires country-specific, and even sub-nationally disaggregated, multi-disciplinary research, which at the same time should be informed by what is working well in other countries.

- **Campaign to get women to give birth in health clinics.** More than 68 thousand births take place outside health establishments every year, with much increased risk of child and maternal mortality. Fourteen thousand of these take place in just four municipalities (El Alto, Santa Cruz de la Sierra, La Paz, and Cochabamba) where there is no lack of supply of health facilities. This means that some relatively cheap interventions to increase women's interest in giving birth in a clinic in just these four municipalities could drastically increase the main national health indicator. This could be an attention grabbing addition to the Bono Juana Azurduy program, such as a diaper game, or some other option to win a lot of diapers if you give birth in a clinic.
- **Study on the Economics of Adolescent Pregnancy.** This paper has shown that municipalities with high adolescent pregnancy rates are much more likely to be poor, all other things equal, so it is worrying that adolescent pregnancy rates have been increasing over the last decade or more. Using a general equilibrium methodology, it would be possible to evaluate the long run effects of high adolescent pregnancy rates on the Bolivian economy in general and on poverty and inequality in particular.

5. Summary and conclusions

This paper has presented an analysis of the decentralization process that has been taking place in Bolivia over the last couple of decades. It starts with a review of the legal framework that determines the distribution of responsibilities and financial resources to the sub-national governments (9 departments and 339 municipalities), and continues with an analysis of the evolution and distribution of financing to these entities between 2001 and 2013. While all municipalities have experienced substantial increases in financing during the period analyzed, large horizontal and vertical imbalances exist, and with the recent drop in oil prices, the sustainability of these transfers is in doubt.

The paper then proceeds to describe the resulting progress in social indicators between 2001 and 2012 at the municipal level, and identifies the main remaining gaps in basic services by 2012. Specifically, we list the 10 municipalities with the highest number of people/families lacking access to basic services such as electricity, water, sanitation, education, and health.

The paper also offers an analysis of the factors that are most closely associated with progress in the main social indicator used by the Bolivian government – the Unsatisfied Basic Needs index, as well as the factors that are associated with the level of Unsatisfied Basic Needs by the end of the analysis (2012). While the data and methodology applied do not allow inferences about causality, the regression analysis does suggest some potential vicious circles of poverty. The most important one appear to be the lack of electricity and piped water, which keep the

population and the municipal governments so poor that they cannot afford to invest in electricity and piped water in order to escape poverty.

Another vicious circle is related to the lack of salaried jobs and economic opportunities which prevents people from getting out of poverty. The lack of economic opportunities in turn implies a lack of incentives to acquire education, so young people instead drop out of school and women start having babies already in their teens. This, in turn, increases dependency burdens and makes it difficult for these families to escape poverty.

Directing lots of funds at these poverty traps has indeed helped improve the situation almost everywhere. However, with the sharp reductions expected in transfers to municipalities starting this year, it may become difficult to secure continued progress or even maintenance of status quo. It is therefore crucial to improve the efficiency of public investments.

The paper provides a short-list of the 21 municipalities that concentrate the largest number of persons/families lacking electricity, lacking piped water, lacking sewerage connections, having the largest number of births taking place outside health establishments, having the largest numbers of out-of-school youth, and having the largest numbers of adolescent mothers.

El Alto and Cochabamba appear on the list of top ten municipalities for all six gap indicators. Santa Cruz de la Sierra and Sacaba both appear on five out of the six top ten gap lists. La Paz, Viacha and Sucre appear four out of six times. Villa Tunari, Riberalta, Oruro and Potosi appear on half of the lists, and Tríninad, La Asunta and Tarija appear on two list. Seven other municipalities appear on one of the top ten gap lists, while the remaining 318 municipalities in the country never appear on any of the six top ten gap lists analyzed.

The paper recommends that this list is used to prioritize investments geographically, as it identifies areas where large numbers of people can be served and pulled out of poverty at relatively low cost.

Investments to provide electricity and piped water to the people who still lack this are of utmost importance as energy and water is so basic that almost nothing else can be achieved without these. About one out of 3.2 million households in Bolivia do not have piped water in their house or on their property, and almost 600 thousand households still do not have electricity.

Sewerage systems are also important, especially in urban areas, in order to reduce child mortality caused by unhygienic conditions. By 2012, 1.5 million households still do not have a sewerage connection. And most of the sewerage systems that do exist simply lead the dirty water into a nearby river without any kind of treatment, thus causing pollution and public health problems downstream.

Every year, 68 thousand births take place outside health establishments with increased risk of child and maternal mortality. Fourteen thousand of these take place in just four municipalities (El Alto, Santa Cruz de la Sierra, La Paz, and Cochabamba) where there is no lack of supply of health facilities. This means that some relatively cheap interventions to increase women's interest in giving birth in a clinic in just these four municipalities could drastically increase the main national health indicator.

Education is a problem area with 380 thousand out-of-school children between 6 and 19. This is due mainly to a lack of demand rather than a lack of supply of education facilities. The lack of demand is due to a combination of the need to work in order to generate income for the household, and the perception that further education is of little use. Returns to both primary and secondary education are demonstrated to be very low in Bolivia, so the decision to drop-out is rational for many young people, especially during years where the economy is booming and providing ample job opportunities even for unskilled workers. Only people who finish a university level education start to reap the benefits of many years of schooling.

To solve the problem of high-school drop-out, simply providing more of the same is not going to work. Currently, secondary education is only of use for the ones who continue to study at university level, so alternative and more practical secondary education systems need to be developed, to be useful for those who do not plan on university level education.

The low quality and relevance of secondary education may also be a cause of teenage pregnancy, as young women use pregnancy as an excuse to drop out of school (Näslund-Hadley & Binstock, 2010). Teenage pregnancy is the only social indicator in Bolivia that has systematically deteriorated over the last decade, while all other indicators have shown substantial improvements. This is a cause for concern, and the government has recently created a national program to try to reduce the problem, but the underlying causes of the increase and the implications in terms of future poverty and economic growth has not yet been investigated.

Another major concern is how government entities at all levels will be able to adjust to the sharp decreases in resource availability which inevitably will follow if the drop in oil prices is sustained. The departmental governments of Tarija and Pando are particularly vulnerable as the vast majority of their resources come from the IDH tax and hydrocarbon royalties. Most municipal governments never fully spent their budgets lately, so they have built up savings in the Central Bank and should be able to withstand at least moderate reductions in transfers for a few years. However, during that time, they should work to improve efficiency in public investments so that they can keep improving social indicators even if the budgets become tighter. This is somewhat complicated by the fact that Bolivia does not have a system designed to monitor the efficiency of public investment in achieving key social targets, neither at the national level, and much less at the local level. Thus, there is little information available to guide municipal governments on how to improve efficiency.

The paper concludes with some specific recommendations on potential areas of opportunity for contributing to further improvement of the social indicators in Bolivia.

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Appendix A: Summary statistics for the variables in the municipal level data base

| Variable description | Variable name | Source | Minimum Value | Maximum Value | Population Weighted Average |
|---|-----------------|---|---------------|---------------|-----------------------------|
| Municipality area (for the 339 municipalities in existence in 2012) | area | Calculated from shape files provided by UDAPE | 12.24 | 70962.87 | 2843.19 |
| Average annual temperature (C) | temp | Andersen and Nina (2007) | 3.83 | 26.47 | 16.16 |
| Average annual rainfall (cm/year) | rain | Andersen and Nina (2007) | 5.76 | 337.74 | 87.91 |
| Altitude of municipal government (m.a.s.l.) | altitude | Andersen and Nina (2007) | 142.72 | 4589.80 | 2276.93 |
| Share of municipality with a slope of more than 10 percent | slope | Andersen and Nina (2007) | 0.00 | 96.44 | 33.78 |
| Dummy for the presence of oil concessions | oil | Andersen and Nina (2007) | 0.00 | 1.00 | 0.27 |
| Dummy for the presence of mining concessions | mining | Andersen and Nina (2007) | 0.00 | 1.00 | 0.97 |
| Dummy for the presence of forestry concessions | forest | Andersen and Nina (2007) | 0.00 | 1.00 | 0.10 |
| Density of primary roads 2001 (km/km ²) | primary_roads | Andersen and Nina (2007) | 0.00 | 368.46 | 44.50 |
| Density of secondary roads 2001 (km/km ²) | secondary_roads | Andersen and Nina (2007) | 0.00 | 35979.00 | 54.58 |
| Unsatisfied Basic Needs Index 2001 | UBN 2001 | PNUD | 19.08 | 100.00 | 57.88 |
| Population 2001 | pob2001 | PNUD | 221 | 1135526 | 346341 |
| Net migration rate during 1996-2001 (persons per thousands inhabitants) | migreciente2001 | PNUD | -39.45 | 198.44 | 1.92 |
| Unsatisfied Basic Needs Index 2001 | nbi2001 | PNUD | 19.08 | 100.00 | 57.88 |
| Share of population living in urban areas 2001 | urban2001 | PNUD | 0.00 | 1.00 | 0.63 |
| Share of population living in rural areas 2001 | rural2001 | PNUD | 0.00 | 1.00 | 0.37 |
| Life expectancy at birth 2001 | espvida2001 | PNUD | 40.35 | 70.24 | 63.58 |
| Literacy rate 2001 | alfa2001 | PNUD | 40.62 | 96.82 | 86.82 |
| Average years of schooling for adult population 2001 | anosesc2001 | PNUD | 1.52 | 10.61 | 7.33 |
| School enrolment rate 2001 | matricula2001 | PNUD | 10.16 | 98.79 | 76.88 |
| Per capita consumption (PPP adjusted \$/year) | consumo2001 | PNUD | 245.32 | 2565.29 | 1428.38 |

| | | | | | |
|--|------------------------------------|---|--------|---------|--------|
| 2001 | | | | | |
| HDI Index 2001 | idh2001 | PNUD | 0.31 | 0.74 | 0.63 |
| Electricity coverage 2001 | EnergiaElectrica2001 | INE | 0.00 | 95.32 | 64.17 |
| Piped water coverage 2001 | AguaPotable2001 | INE | 0.00 | 96.12 | 69.38 |
| Sewerage coverage 2001 | Alcantarillado2001 | INE | 0.00 | 79.24 | 28.83 |
| Popular participation transfers (in millions of Bs.) 2001 | RecursosParticipacionPopular2001 | Ministry of Economy and Public Finance | 0.00 | 123.26 | 42.10 |
| HIPC transfers (millones de Bs.) | RecursosHIPC2001 | Ministry of Economy and Public Finance | 0.00 | 12.17 | 4.53 |
| HIPC transfers for health spending (in millions of Bs.) 2001 | HIPCSalud2001 | Ministry of Economy and Public Finance | 0.00 | 2.44 | 0.83 |
| HIPC transfers for education spending (in millions of Bs.) 2001 | HIPCEducacion2001 | Ministry of Economy and Public Finance | 0.00 | 5.34 | 1.69 |
| HIPC transfers for infrastructure spending (in millions of Bs.) 2001 | HIPCInfraestructura2001 | Ministry of Economy and Public Finance | 0.00 | 7.18 | 2.00 |
| Popular participation transfers per capita (Bs. Per person) 2001 | RecursosParticipacionPopularPC2001 | Ministry of Economy and Public Finance | 0.00 | 366.44 | 0.00 |
| <u>HIPC transfers per capita (Bs. Per person)</u> | RecursosHIPC2001PC | Ministry of Economy and Public Finance | 0.00 | 347.15 | 0.00 |
| Unsatisfied Basic Needs Index 2012 | UBN 2012 | INE | 14.32 | 97.93 | 44.93 |
| Change in Unsatisfied Basic Needs Index 2001-2012 | ΔUBN 2001-2012 | Own calculation based on 2012 and 2001 census | -63.70 | 26.82 | -12.95 |
| Population 2012 | pob2012 | INE | 509 | 1454539 | 423421 |
| Population density 2012 | Population Density 2012 | Own calculation based on 2012 census | 0.04 | 2582.88 | 392.54 |
| Annual population growth rate 2001 - 2012 | CrecimientoPob2001-2012 | INE | -4.44 | 14.16 | 1.90 |
| Masculinity index 2012 | IndiceMasculinidad2012 | INE | 86.40 | 190.72 | 99.93 |
| Percentage of population living in urban areas 2012 | PorcentajeUrbana2012 | INE | 0.00 | 100.00 | 67.49 |
| Percentage of population living in rural areas 2012 | PorcentajeRural2012 | INE | 0.00 | 100.00 | 32.51 |
| Percentage of the population enrolled in the Civil Registry 2012 | RegistroCivil2012 | INE | 88.86 | 99.80 | 98.20 |

| | | | | | |
|--|----------------------------------|-------|-------|--------|-------|
| Percentage of population with identity card 2012 | CarnetIdentidad2012 | INE | 58.19 | 93.62 | 79.60 |
| Total literacy rate of the population aged 15 years or more | TasaAlfabetismoTotal2012 | INE | 68.15 | 100.00 | 94.80 |
| Literacy rate of men aged 15 years or more | TasaAlfabetismoHombres2012 | INE | 78.94 | 100.00 | 97.52 |
| Literacy rate of women aged 15 years or more | TasaAlfabetismoMujeres2012 | INE | 55.11 | 100.00 | 92.10 |
| Total school attendance rate for children aged 6 - 19 Years | TasaAsistenciaEscolarTotal2012 | INE | 46.02 | 94.11 | 87.44 |
| Male school attendance rate for children aged 6 - 19 years | TasaAsistenciaEscolarHombres2012 | INE | 33.82 | 95.21 | 87.35 |
| Female school attendance rate for children aged 6 - 19 years | TasaAsistenciaEscolarMujeres2012 | INE | 70.45 | 94.66 | 87.56 |
| Total average years of study of population aged 19 years or more | AnosEduTotal2012 | INE | 3.21 | 12.05 | 8.91 |
| Average years of study of population aged 19 years or more (Men) | AnosEduHombres2012 | INE | 4.03 | 12.72 | 9.55 |
| Average years of study of population aged 19 years or more (Women) | AnosEduMujeres2012 | INE | 2.44 | 11.46 | 8.30 |
| Percentage of female population aged 15 or more whose last childbirth was in a health care establishment | PartoClinica2012 | INE | 8.85 | 89.99 | 68.85 |
| Piped water coverage 2012 | AguaPotable2012 | INE | 0.00 | 93.98 | 69.17 |
| Electricity coverage 2012 | EnergiaElectrica2012 | INE | 13.46 | 99.35 | 83.20 |
| Sewerage coverage 2012 | Alcantarillado2012 | INE | 0.00 | 100.00 | 52.07 |
| Gas coverage 2012 | Gas2012 | INE | 4.72 | 97.39 | 72.83 |
| Television access 2012 | Televisor2012 | INE | 2.62 | 92.99 | 67.71 |
| Telephone coverage 2012 | Telefono2012 | INE | 2.75 | 89.36 | 65.94 |
| Computer access 2012 | Computadora 2012 | INE | 0.35 | 52.15 | 24.16 |
| Internet coverage 2012 | Internet2012 | INE | 0.00 | 23.39 | 9.98 |
| Percentage of population poor by UBN 2012 | TasaPobreza2012 | UDAPE | 14.32 | 97.93 | 44.93 |
| Percentage of population not poor by UBN 2012 | NoPobre2012 | UDAPE | 0.07 | 55.90 | 25.20 |
| Percentage of population almost poor by UBN 2012 | UmbralPobreza2012 | UDAPE | 1.70 | 45.72 | 29.87 |

| | | | | | |
|--|----------------------------------|--|--------|---------|---------|
| Percentage of population moderately poor by UBN 2012 | PobrezaModerada2012 | UDAPE | 13.08 | 82.41 | 35.32 |
| Percentage of population extremely poor by UBN 2012 | PobrezaIndigente2012 | UDAPE | 0.47 | 58.95 | 9.19 |
| Percentage of population marginalized by UBN 2012 | PobrezaMarginal2012 | UDAPE | 0.00 | 5.63 | 0.42 |
| Potential labor supply rate 2012 | TasaOfPot2012 | INE | 70.30 | 87.57 | 79.28 |
| Dependency rate 2012 | IndDependencia2012 | INE | 0.54 | 2.11 | 1.17 |
| Share salaried workers 2012 | Asalariados2012 | INE | 5.97 | 70.17 | 41.65 |
| Share self-employed workers 2012 | CuentaPropia2012 | INE | 24.23 | 91.54 | 50.36 |
| Share of workers in primary sector 2012 | SectorPrimario2012 | INE | 2.39 | 91.91 | 29.46 |
| Share of workers in secondary sector 2012 | SectorSecundario2012 | INE | 0.00 | 25.84 | 9.99 |
| Share of workers in tertiary sector 2012 | SectorTerciario2012 | INE | 7.53 | 87.68 | 60.55 |
| Popular participation transfers (in millions of Bs.) 2012 | RecursosParticipacionPopular2012 | Ministry of Economy and Public Finance | 0.16 | 807.38 | 245.92 |
| HIPC transfers (in millions of Bs.) 2012 | RecursosHIPC2012 | Ministry of Economy and Public Finance | 0.02 | 29.16 | 7.47 |
| HIPC health transfers (in millions of Bs.) 2012 | HIPCSalud2012 | Ministry of Economy and Public Finance | 0.00 | 5.49 | 1.67 |
| HIPC education transfers (in millions of Bs.) 2012 | HIPCEducacion2012 | Ministry of Economy and Public Finance | 0.00 | 9.78 | 3.09 |
| HIPC infrastructure - transfers (in millions of Bs.) 2012 | HIPCInfraestructura2012 | Ministry of Economy and Public Finance | 0.00 | 19.40 | 2.71 |
| IDH transfers (in millions of Bs.) 2012 | TransferenciasIDH2012 | Ministry of Economy and Public Finance | 0.11 | 467.70 | 160.42 |
| Total municipal transfers per capita 2012 (Bs. Per person) | TotalTransfPC2012 | Own calculation based on 2012 census | 392.85 | 9364.69 | 1188.81 |
| Popular participation transfers per capita 2012 (Bs. Per person) | PopularTransfPC2012 | Own calculation based on 2012 census | 125.79 | 1671.67 | 586.96 |
| HIPC transfers per capita 2012 (Bs. Per person) | HIPCtransfPC2012 | Own calculation based on 2012 census | 9.33 | 287.33 | 40.05 |
| IDH transfers per capita 2012 (Bs. per person) | IDHtransfPC2012 | Own calculation based on 2012 | 129.53 | 8452.74 | 561.80 |

| | | | | | |
|---|------------------|--|-------|---------|--------|
| | | census | | | |
| Share of women aged 15-20 who has one or more children 2012 | TeenMomShare2012 | Own calculation based on 2012 census | 0.08 | 0.88 | 0.29 |
| Current budget 2012 (in millions of Bs.) | Vigente2012 | Ministry of Economy and Public Finance | 0.82 | 2890.00 | 899.00 |
| Executed budget 2012 (in millions of Bs.) | Devengado2012 | Ministry of Economy and Public Finance | 0.45 | 2000.00 | 574.00 |
| Share of budget executed 2012 | Ejecutado2012 | Ministry of Economy and Public Finance | 10.00 | 98.00 | 61.63 |

Appendix B: Review of the legal framework

A series of successive laws (and regulations) have changed the intergovernmental transfer system in Bolivia since 1994. The relevant ones are the following:

- Popular Participation Law 1551 of 1994 (PPL);
- Administrative Decentralization Law 1654 of 1995 (ADL);
- National Dialogue Law of 2001 (NDL);
- The Hydrocarbon Law 3058 of 2005;
- Decentralization and Regional Autonomies Law 031 of 2010 (DRA);
- Law No. 154 of 2011, for the Classification and Definition of Taxes, and for the Regulation of the Creation and/or Modification of Taxes.

This section summarizes the main features of each of these laws and explains the changes introduced by them to the intergovernmental transfer system.

B.1. Popular Participation Law (Law No. 1551 of 1994)

The administrative decentralization process in Bolivia started in 1994 when Congress passed the Popular Participation Law (Law 1551), which established the transfer of responsibilities related to the administration of physical infrastructure, education, health, sports, tourism, local roads and micro-irrigation sectors to municipal governments (Antelo, 2001).

Law 1551 established municipalities covering the whole territory of Bolivia and extended municipal jurisdiction to the rural areas that had previously been excluded. 311 autonomous municipalities were established, extending the activities of the state throughout Bolivia.

In order for municipalities to be able to comply with their new responsibilities, Law 1551 modified the percentage of national government revenues to be transferred to municipalities as well as the criteria for regional distribution.

Prior to 1994, transfers represented only 10 percent of central government revenues and were distributed to few municipalities. The criterion for distribution was fiscal effort by departments, which benefited La Paz, where most of the taxpayers were located, even though most other municipalities were poorer and more in need of funding (IMF, 2004).

The PPL established that 20 percent of revenues coming from general national taxes (effectively collected from domestic taxes and import tariffs), would be transferred to the 311 municipal governments existing at that moment, proportionally to population size. The latest National Census on Population and Housing would provide the population numbers to be used for this distribution. Law 1551 also established that 75 percent of the general national tax revenues accrue to the central government in the National Treasury (TGN) and 5 percent to regional public universities.

These general national taxes transferred to municipalities are sometimes called Popular Participation Revenues, because they come from the Popular Participation Law. They are also sometimes referred to as co-participated revenues, since municipalities are able to co-participate when they are distributed. At the time the PPL reform was implemented, transfers to

municipalities due to the co-participation transfers amounted to between 2 and 2.5 percent of GDP. In 2013, due to the increased national tax collection, co-participation resources transferred to municipalities amounted to 3.6 percent of GDP.

Thus, Law 1551 introduced an objective and transparent criterion to distribute resources among municipalities, reducing the risk of regional and political pressures, which had been pervasive in the past. PPL initially required that 90 percent of co-participation transfers should be allocated for investments. Law 1702 of 1996 reduced this to 85 percent. However, over time, additional specific earmarking was established for co-participation, mostly in favor of education and health sectors (IMF, 2004).

Furthermore, Law 1551 transferred to municipal governments the control over taxes on rural property, urban real estate, vehicles, and transactions of these goods, as well as incomes from patents approved within the framework of the Political Constitution of the State and the Organic Law of Municipalities. In 1996 these represented 2 percent of GDP, but their share of GDP has dropped steadily over time. In 2013 they amounted to only 0.9 percent of GDP.

B.2. The Administrative Decentralization Law (Law 1654 of 1995)

The Administrative Decentralization (AD) reform was the follow-up to the Popular Participation reform. The PPL had granted greater autonomy, responsibilities and resources to the municipalities, but the regions also demanded greater autonomy at the departmental level (Galindo, 1998).

The Administrative Decentralization Law (ADL), passed by Congress in July 1995, established the organizational structure of the Executive Branch at the departmental level, including a new distributional regime of economic and financial resources among regions. The aim of the new structure was to improve and strengthen the efficiency of the public administration in providing public services to the Bolivian population.

ADL also establishes the mechanisms for citizen participation through Departmental Councils (DC), their appointment procedures and their responsibilities. The law created Departmental Councils as a way for provinces and municipalities to participate in the decisions taken at the departmental level. Representatives appointed by municipal councils constituted the Departmental Councils.

The Administrative Decentralization Law transferred to departmental governments, at that time called prefectures, the following competences:

- Construction and maintenance of national roads⁶, secondary roads, rural energy, irrigation infrastructure, and support to entrepreneurial activities
- Development planning at the departmental level

⁶ The decentralization of the National Road Service (nowadays the Bolivian Road Administration, ABC), was reversed in 1998, due to the reduced efforts made by departmental prefectures to construct and maintain roads considered as part of the Fundamental National Road Network.

- Preservation and conservation of the environment
- Tourism promotion
- Implementation of social assistance programs
- Implementation of municipal strengthening programs
- Managerial, supervisory and control activities, on behalf of the Central Government, of human resources and of those budget items allocated to regions for the functioning of education, health and social assistance services.

The ADL aimed at strengthening the organizational structure of Departmental Governments in accordance with the responsibilities assigned to them. Law 1654 established the administrative structure of departmental governments, comprising:

- General Secretary
- Departmental Secretary of Sustainable Development and the Environment
- Departmental Secretary of Economic Development
- Departmental Secretary of Popular Participation
- Departmental Secretary of Human Development
- Departmental Treasury.

In order for departmental governments to be able to comply with their new responsibilities, public resources available to departmental governments, starting from 1996, included:

- Departmental royalties: hydrocarbons royalties transferred to departments correspond to 11 percent of the production value at the wellhead. Additionally, there is a 1 percent compensatory transfer, of which one-third accrues to the Department of Pando and two-thirds to the Department of Beni.
- Royalties from mining and other natural resources (shared equally among producing and non-producing departments).
- Resources from the Compensatory Departmental Fund (FCD): in favor of departments whose resources were below the national per capita average. The TGN was responsible for transferring these resources. The resources assigned to finance by the FCD cannot exceed a maximum of 10 percent of the IEHD revenues.
- Twenty five percent of effective revenues from the Special Tax on Hydrocarbons and its Derivatives (IEHD), created at the end of 1994 by Law 1606, which introduced modification to the Tax Reform. Half of the IEHD resources transferred to the departments are distributed to each of the departments in equal shares, and the other half according to the number of inhabitants.
- Annually allocated resources, foreseen in the General National Budget (GNB), for the payment of education, health and social assistance services to persons.
- Extraordinary transfers from the TGN, external and domestic credit, and those resources generated from the provision of services.

Resources received from royalties, from the FCD, and the 25 percent of the IEHD, had to be allocated as follows: 85 percent for investment and the remainder for current expenditures.

B.3. The 2000 National Dialogue Law or HIPC II (Law 2235 of 2001)

Law 2235, of July 2001, established the basic guidelines for the implementation of the Poverty Reduction Strategy (PRS) prepared in the participative process known as “Diálogo 2000.” The Law also introduced modifications to the institutional structures and competences of public units responsible for implementing the programs aimed at reducing poverty incidence in the country. Besides, Law 2235 defines the criteria for the distribution of resources from the HIPC Debt Relief program, directed to finance poverty reduction programs. These resources were distributed among municipalities based on poverty incidence criteria. Thus, municipalities with the largest poverty incidence, measured in terms of Unsatisfied Basic Needs (UBN) received more HIPC resources. The department of Pando for instance, one of the poorest regions, received 33.8 percent of HIPC resources, while Santa Cruz, one of the richest departments, received only 15.1 percent of resources (UDAPE, 2002).

Municipalities started receiving HIPC resources from 2001. These resources were thought to be temporary, and they were expected to be exhausted by 2007. However, municipalities are still receiving HIPC resources by 2014, as the program is still producing debt relief resources for the Bolivian state.

Law 2235 also established that HIPC resources should be allocated to alleviate poverty according to the priorities established by the “Diálogo 2000.” After transfers to the Solidarity Fund for Primary Education and Public Health and the National Solidarity Fund of the Universal Maternal and Infant Health Fund (SUMI), the remaining resources are distributed as follows: 20 percent for investment in education; 10 percent for investment in public health services; and the remaining 70 percent for investment in social productive infrastructure. Since there is no functional classification or ability to track municipal expenditures, the funds are transferred directly to three distinct commercial bank accounts for each municipality, for each of the intended purposes (IMF, 2004).

B.4. The Hydrocarbon Law (Law 3058 of 2005), regulatory decrees and modifications

Law 3058, passed by Congress in 2005, created the Direct Tax on Hydrocarbons (IDH). The IDH was conceived as a tax on the production of hydrocarbons, measured at the wellhead, amounting to 32 percent of the gross value of hydrocarbon production, including oil, natural gas and Liquefied Petroleum Gas (GLP), whether exported or sold in domestic markets. Law 3058 and its regulatory decree (DS 28421) established the distribution of IDH revenues, according to the following criteria:

- Producer departments (Tarija, Chuquisaca, Santa Cruz and Cochabamba) receive 4 percent of the gross value of hydrocarbon production of their departments, totaling 12.5 percent of total IDH revenues.
- Non-producer departments (La Paz, Oruro, Potosí, Beni and Pando) receive each 2 percent of the total gross value of national hydrocarbon production, totaling 31.25 percent of total IDH revenues.
- The two above rules from Law 3058 implied that it was much more favorable to be a non-producer department than a department with relatively limited hydrocarbon production (Cochabamba, Chuquisaca and Santa Cruz). Thus, through DS 28421, a

National Compensatory Fund was set up to remedy this imbalance. This fund receives 4.5 percent of the gross value of total national hydrocarbon production, and distributes these funds so as to equalize IDH transfers between departments (except Tarija, which as the main producer department still received more than the remaining 8 departments.

- Since population is unequally distributed between departments, the above rule created large inequalities in per capita transfers, so a second Compensation Fund was set up to remedy this problem. This fund received 7 percent of total IDH revenues (which was taken from TGNs share of IDH revenues), which was distributed to the three most populous departments (La Paz, Cochabamba and Santa Cruz), with 80 percent going to municipalities and 20 percent to departmental governments, based on the population size criterion.
- Five percent of total IDH resources received by the TGN were transferred to the Indigenous Fund (Fondo Indígena), in order to finance social and productive development projects. The remaining 30.2 percent went to the TGN, in order to finance the National Police, the Army, and other centralized institutions.

Based on the regulatory framework outlined above, 32.8 percent of IDH revenues would be received by departmental governments, 25.6 percent by municipalities, 6.4 percent by universities and 35.2 percent by the TGN. In October 2007, SD 29322 increased the shares received by municipalities to 43.4 percent of total IDH revenues, reduced the share of regional governments to 15.8 percent and kept constant the share of universities in 5 percent. In November 2007, Law 3791 took 30 percent of total IDH revenues away from municipalities, departmental governments and the TGN in order to finance the payment of the universal non-contributory pension (Renta Dignidad), leaving municipalities with 30.4 percent of total IDH revenues, departmental governments with 11.1 percent, universities with 6.4 percent, the TGN with 17.1 percent and the Indigenous Fund with 5 percent. This resulting formula to distribute IDH resources is currently used.

Table 1 summarizes the changes introduced to the IDH distribution structure by the different laws and decrees approved over time.

Table 15: Changes introduced to IDH distribution structure among institutions (percent)

| Institutions | Law 3058 & SD 28421 (2005) | SD 29322 (October 2007) | Law 3791 (November 2007) |
|--------------------------|---|--|---|
| Departmental Governments | 32.8 | 15.8 | 11.1 |
| Municipalities | 25.6 | 43.4 | 30.4 |
| Universities | 6.4 | 6.4 | 6.4 |
| TGN | 30.2 | 29.4 | 17.1 |
| Fondo Indígena | 5 | 5 | 5 |
| Renta Dignidad | | | 30 |

| | | | |
|--------------|------------|------------|------------|
| Total | 100 | 100 | 100 |
|--------------|------------|------------|------------|

Source: Authors' elaboration based on the respective laws and decrees.

B.5. Law of Decentralization and Regional Autonomies (DRA - Law 031 of 2010)

Law 031, passed by the National Assembly in July 2010, was aimed at deepening the decentralization process started in Bolivia in the 1990s, within the framework of the new Political Constitution of the State approved in 2010. Law 031 did not modify the distribution of resources in force at the time, because it was considered too sensitive a matter. However, it recognizes the need to clearly identify the linkage between incomes and spending responsibilities for each decentralized unit. Law 031, contemplates the need for implementing a Fiscal Pact in order to correct existing asymmetries in the distribution of resources among regions (horizontal asymmetries) and government categories (vertical asymmetries), i.e. central government, departmental governments and municipalities.

Law 031 has been criticized from the local level because it is perceived to centralize instead of decentralize competences (Schlink, 2014). For instance, according to the DRA Law, the Central Government determines the policies for the budgeting process of sub-national governments, including the distribution of resources, ceilings for current expenditures, investment and indebtedness. Besides, the DRA Law grants the Central Government the faculty to freeze sub-national governments' accounts, carry out automatic debits from their accounts, and make modifications, either institutional or inter-institutional, to their budgets.

In relation to the allocation of responsibilities to sub-national governments, Law 031 establishes the possibility that the central government could transfer responsibilities to sub-national governments, without assigning corresponding additional resources to fund them. Article 77 of the DRA Law establishes that: "All transfers or delegation of responsibilities between the central level and autonomous territorial entities or among the latter, should be communicated to the State Autonomies Service, and indicate the definition of economic resources necessities for its implementation, which could come from previously assigned sources." According to Schlink (2014), this deepens the financial disequilibrium of autonomous territorial entities, because most responsibilities of the central government could be potentially transferred.

The DRA Law ratifies the clause introduced by Law No. 843 of 1986 (Tax Reform Law), that transfers to sub-national governments are determined based on effective—paid in cash—tax revenues. Thus, taxes paid by means of fiscal notes are not included in the distribution to sub-national governments but are entirely retained by the TGN. The central government has used this mechanism as a means to increase incomes for the central government in detriment of regional government incomes. The issuing of fiscal notes had decreased from 12.4 percent of total tax collection in 2005 to 7.1 percent in 2007. This percentage has increased since, and in 2013 it reached again the level of 12.4 percent of total tax collection. In 2009, the issuing of fiscal notes was equal to 18.6 percent of total tax collection.

Appendix C: Regression results

Table 16: Regressions explaining changes in poverty rates at the municipal level, 2001-2012

| | | | | | | |
|--|------------|-----------|------------|------------------------|-----------------------------|-----------|
| a) Initial regression with all potential explanatory variables included | | | | | | |
| Source | SS | df | MS | Number of obs = 335 | | |
| Model | 9879.69332 | 24 | 411.653888 | F(24, 310) = 9.12 | | |
| Residual | 13988.8565 | 310 | 45.1253435 | Prob > F = 0.0000 | | |
| Total | 23868.5498 | 334 | 71.462724 | R-squared = 0.4139 | | |
| | | | | Adj R-squared = 0.3685 | | |
| | | | | Root MSE = 6.7175 | | |
| cambio_nbi | Coef. | Std. Err. | t | P> t | [95 percent Conf. Interval] | |
| nbi2001 | -.4678327 | .0615452 | -7.60 | 0.000 | -.5889319 | -.3467336 |
| migreciente2001 | .0169158 | .0268178 | 0.63 | 0.529 | -.0358521 | .0696837 |
| rural2001 | .4384952 | 2.690488 | 0.16 | 0.871 | -4.855432 | 5.732423 |
| popden2001 | -.004985 | .0025909 | -1.92 | 0.055 | -.0100829 | .0001129 |
| espvida2001 | -.2868424 | .1091679 | -2.63 | 0.009 | -.5016462 | -.0720387 |
| alfa2001 | -.0658282 | .0931438 | -0.71 | 0.480 | -.2491022 | .1174459 |
| anosesc2001 | -.743104 | .7579366 | -0.98 | 0.328 | -2.234455 | .748247 |
| matricula2001 | -.0521367 | .0292893 | -1.78 | 0.076 | -.1097676 | .0054943 |
| consumo2001 | .0037089 | .002994 | 1.24 | 0.216 | -.0021822 | .0096 |
| energiaelectrica2001 | -.1873095 | .0298352 | -6.28 | 0.000 | -.2460147 | -.1286043 |
| aguapotable2001 | -.1391728 | .0252419 | -5.51 | 0.000 | -.1888399 | -.0895056 |
| temp | .8361252 | .5004811 | 1.67 | 0.096 | -.1486444 | 1.820895 |
| rain | .0246782 | .012941 | 1.91 | 0.057 | -.0007851 | .0501415 |
| altitude | .0045496 | .0025211 | 1.80 | 0.072 | -.0004112 | .0095103 |
| slope | -.042077 | .0179629 | -2.34 | 0.020 | -.0774216 | -.0067325 |
| oil | -1.065307 | 1.323987 | -0.80 | 0.422 | -3.670445 | 1.539831 |
| mining | -.772167 | 1.335929 | -0.58 | 0.564 | -3.400802 | 1.856468 |
| forest | -2.330627 | 1.460498 | -1.60 | 0.112 | -5.20437 | .5431152 |
| primary_roads | -.0064144 | .0077891 | -0.82 | 0.411 | -.0217406 | .0089118 |
| secondary_roads | -.0003131 | .0001958 | -1.60 | 0.111 | -.0006984 | .0000722 |
| recursospartpc2001 | -.0421319 | .01025 | -4.11 | 0.000 | -.0623003 | -.0219634 |
| recursoshpcpc2001 | .0389798 | .0200067 | 1.95 | 0.052 | -.0003862 | .0783458 |
| estimatedarea | .0000241 | .0000707 | 0.34 | 0.733 | -.000115 | .0001632 |
| deltatransferspc2001_2012 | -.0033085 | .0005919 | -5.59 | 0.000 | -.0044732 | -.0021439 |
| _cons | 50.80784 | 18.35716 | 2.77 | 0.006 | 14.68746 | 86.92822 |
| b) Final regression | | | | | | |
| Source | SS | df | MS | Number of obs = 335 | | |
| Model | 6967.11194 | 6 | 1161.18532 | F(6, 328) = 22.53 | | |
| Residual | 16901.4379 | 328 | 51.528774 | Prob > F = 0.0000 | | |
| Total | 23868.5498 | 334 | 71.462724 | R-squared = 0.2919 | | |
| | | | | Adj R-squared = 0.2789 | | |
| | | | | Root MSE = 7.1784 | | |
| cambio_nbi | Coef. | Std. Err. | t | P> t | [95 percent Conf. Interval] | |
| nbi2001 | -.3446383 | .038558 | -8.94 | 0.000 | -.4204904 | -.2687861 |
| espvida2001 | -.342243 | .1011108 | -3.38 | 0.001 | -.5411504 | -.1433356 |
| anosesc2001 | -1.499782 | .3233525 | -4.64 | 0.000 | -2.135888 | -.8636754 |
| aguapotable2001 | -.2091514 | .0229336 | -9.12 | 0.000 | -.254267 | -.1640358 |
| recursospartpc2001 | -.0369482 | .0085032 | -4.35 | 0.000 | -.0536758 | -.0202205 |
| deltatransferspc2001_2012 | -.0017843 | .0004014 | -4.44 | 0.000 | -.002574 | -.0009946 |
| _cons | 61.08229 | 8.809132 | 6.93 | 0.000 | 43.75276 | 78.41181 |

c) Fields' decomposition

Fields decomposition

| X | Coeff. | Sd(X) | Corr (X,Y) | F.I.W. |
|---------------------------|---------|-----------|------------|--------|
| nbi2001 | -0.3446 | 17.7634 | -0.1058 | 0.0766 |
| espvida2001 | -0.3422 | 4.9845 | -0.0363 | 0.0073 |
| anosesc2001 | -1.4998 | 1.6715 | -0.0618 | 0.0183 |
| aguapotable2001 | -0.2092 | 23.7199 | -0.1893 | 0.1111 |
| recursospartpc2001 | -0.0369 | 47.6277 | -0.2227 | 0.0464 |
| deltatransferspc2001_2012 | -0.0018 | 1049.2001 | -0.1453 | 0.0322 |

Sum of Factor Inequality Weights = 0.2919

Source: Authors' elaboration.

Table 17: Regressions explaining poverty rates at the municipal level, 2012

a) Initial regression with all potential explanatory variables included

| Source | SS | df | MS | Number of obs = 335 | | |
|---------------------------|------------|-----------|------------|------------------------|----------------------|-----------|
| Model | 108559.514 | 27 | 4020.72274 | F(27, 307) = 122.48 | | |
| Residual | 10078.454 | 307 | 32.8288404 | Prob > F = 0.0000 | | |
| | | | | R-squared = 0.9150 | | |
| | | | | Adj R-squared = 0.9076 | | |
| | | | | Root MSE = 5.7296 | | |
| tasapobreza2012 | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] | |
| crecimientopob20012012 | .5162862 | .2891112 | 1.79 | 0.075 | -.052604 | 1.085176 |
| indicemasculinidad2012 | -.0196864 | .0408145 | -0.48 | 0.630 | -.099998 | .0606253 |
| porcentajeurbana2012 | .0112207 | .0238064 | 0.47 | 0.638 | -.0356237 | .0580652 |
| registrocivil2012 | -.5581489 | .318272 | -1.75 | 0.080 | -1.184419 | .0681216 |
| carnetidentidad2012 | .0370384 | .0778721 | 0.48 | 0.635 | -.1161922 | .190269 |
| televisor2012 | -.3519305 | .0341084 | -10.32 | 0.000 | -.4190463 | -.2848147 |
| computadora2012 | -.6831611 | .1074596 | -6.36 | 0.000 | -.8946116 | -.4717106 |
| tasaofpot2012 | -.4262102 | .1773396 | -2.40 | 0.017 | -.775165 | -.0772553 |
| inddependencia2012 | -1.514222 | 1.834603 | -0.83 | 0.410 | -5.124209 | 2.095765 |
| asalariados2012 | -.1640756 | .0569109 | -2.88 | 0.004 | -.2760604 | -.0520908 |
| ocupaagro2012 | -.0192401 | .0582299 | -0.33 | 0.741 | -.1338203 | .09534 |
| sectorterciario2012 | -.0592712 | .062574 | -0.95 | 0.344 | -.1823994 | .063857 |
| temp | -.0324664 | .1166983 | -0.28 | 0.781 | -.2620961 | .1971633 |
| rain | .0203631 | .0114574 | 1.78 | 0.077 | -.0021819 | .0429081 |
| slope | -.0492639 | .0138525 | -3.56 | 0.000 | -.0765217 | -.0220061 |
| oil | -2.102182 | 1.097865 | -1.91 | 0.056 | -4.262475 | .0581111 |
| mining | -.3623488 | 1.123071 | -0.32 | 0.747 | -2.572239 | 1.847542 |
| forest | -2.110068 | 1.220485 | -1.73 | 0.085 | -4.511643 | .2915076 |
| primary_roads | -.0097311 | .0064989 | -1.50 | 0.135 | -.0225191 | .003057 |
| secondary_roads | -.0001558 | .0001689 | -0.92 | 0.357 | -.0004882 | .0001766 |
| teenmomshare2012 | 8.190175 | 4.707505 | 1.74 | 0.083 | -1.072884 | 17.45323 |
| popden2012 | .0014587 | .0017002 | 0.86 | 0.392 | -.0018869 | .0048043 |
| recursospartpc2012 | -.0130291 | .0067789 | -1.92 | 0.056 | -.026368 | .0003099 |
| recursoshpcpc2012 | .1489674 | .0261884 | 5.69 | 0.000 | .0974359 | .2004989 |
| recursosidhpc2012 | -.0120025 | .0056898 | -2.11 | 0.036 | -.0231985 | -.0008065 |
| deltatransferspc2001_2012 | .0070405 | .0057304 | 1.23 | 0.220 | -.0042353 | .0183164 |

| | | | | | | | |
|---------------|--|----------|----------|------|-------|-----------|----------|
| ejecutado2012 | | 1.183076 | 2.392553 | 0.49 | 0.621 | -3.524803 | 5.890954 |
| _cons | | 182.0045 | 32.03495 | 5.68 | 0.000 | 118.9686 | 245.0403 |

b) Final regression

| | | | | | | |
|----------|--|------------|-----|------------|-----------------|--------|
| Source | | SS | df | MS | Number of obs = | 339 |
| Model | | 109678.804 | 10 | 10967.8804 | F(10, 328) = | 308.87 |
| Residual | | 11647.1982 | 328 | 35.5097505 | Prob > F = | 0.0000 |
| Total | | 121326.002 | 338 | 358.952668 | R-squared = | 0.9040 |
| | | | | | Adj R-squared = | 0.9011 |
| | | | | | Root MSE = | 5.959 |

| | | | | | | | |
|---------------------|--|-----------|-----------|--------|-------|-----------------------------|-----------|
| tasapobreza2012 | | Coef. | Std. Err. | t | P> t | [95 percent Conf. Interval] | |
| televisor2012 | | -.3571177 | .0309639 | -11.53 | 0.000 | -.4180306 | -.2962048 |
| computadora2012 | | -.6872784 | .0861949 | -7.97 | 0.000 | -.856843 | -.5177138 |
| tasaofpot2012 | | -.5560547 | .1257564 | -4.42 | 0.000 | -.8034457 | -.3086638 |
| asalariados2012 | | -.2356335 | .0429937 | -5.48 | 0.000 | -.3202117 | -.1510553 |
| slope | | -.0519657 | .0126209 | -4.12 | 0.000 | -.0767937 | -.0271377 |
| primary_roads | | -.0200236 | .0056789 | -3.53 | 0.000 | -.0311952 | -.008852 |
| teenmomshare2012 | | 11.77667 | 4.116714 | 2.86 | 0.004 | 3.678173 | 19.87516 |
| recursospartpc2012 | | -.0120341 | .0024691 | -4.87 | 0.000 | -.0168913 | -.0071769 |
| recursosshipcpc2012 | | .1234819 | .0232237 | 5.32 | 0.000 | .0777956 | .1691681 |
| recursosidhpc2012 | | -.0044605 | .0006844 | -6.52 | 0.000 | -.0058069 | -.0031142 |
| _cons | | 141.8207 | 11.02757 | 12.86 | 0.000 | 120.127 | 163.5144 |

c) Fields' decomposition

Fields decomposition

| | | | | |
|---------------------|---------|-----------|-----------|---------|
| X | Coeff. | Sd(X) | Corr(X,Y) | F.I.W. |
| televisor2012 | -0.3571 | 21.8807 | -0.8933 | 0.3684 |
| computadora2012 | -0.6873 | 8.1474 | -0.8854 | 0.2617 |
| tasaofpot2012 | -0.5561 | 3.5164 | -0.1072 | 0.0111 |
| asalariados2012 | -0.2356 | 14.9870 | -0.6958 | 0.1297 |
| slope | -0.0520 | 32.5715 | 0.1214 | -0.0108 |
| primary_roads | -0.0200 | 60.0391 | -0.1688 | 0.0107 |
| teenmomshare2012 | 11.7767 | 0.1240 | 0.2147 | 0.0166 |
| recursospartpc2012 | -0.0120 | 189.7981 | -0.0181 | 0.0022 |
| recursosshipcpc2012 | 0.1235 | 37.6568 | 0.4819 | 0.1183 |
| recursosidhpc2012 | -0.0045 | 1045.2064 | 0.0151 | -0.0037 |

Sum of Factor Inequality Weights = 0.9040

Source: Authors' elaboration.