Measuring the effects of Minimum Wage in Bolivia’s dual economy

RESEARCH PROPOSAL
Presented to
Partnership for Economic Policy (PEP)

By
Marcelo Claure
Alejandra Leyton
Vanessa Sánchez
Christian Valencia

BOLIVIA

April 15th, 2015
**Before you begin**

Please consult the following webpages/documents regarding PEP’s expectations in terms of:

- Specific policy issues to be addressed by projects supported under the PAGE programme
- Scientific content of eligible research project proposals
- Initiatives to be undertaken by PEP supported research teams in terms of policy outreach

Please note that:

- projects involving data collection will not be considered/selected under this final (3rd) PAGE round, with the exception of those selected under the “special call for field experiments”
- plagiarism is strictly forbidden – see note on "references and plagiarism" at the end of this document/template. PEP will be using a software program to detect cases of plagiarism.

PEP encourages applicant research teams to submit proposals in English, but content (in text boxes below) may also be written in French or Spanish (and will be accepted given proper justification of language barrier).

1. **Abstract (100 to 250 words)**

The abstract should state the main research question, the context and its relevance in terms of policy issues/needs in relation to PAGE thematic foci, complete with a brief description of the data that will be used.

| The minimum wage (MW) remains one of the most controversial issues in labour economics, economic policy, and politics. In Latin America labour markets are characterized by the presence of two sectors: a covered formal sector entitled to labour legislated benefits and a uncovered informal sector\(^1\) which is not[1].

The existing evidence on the effect of minimum wage on dual economies has been heterogeneous. In Bolivia the economic boom and the political context of the last years have been a justification for a steep raise of the national government-legislated minimum wage, even when 60% of the workforce is at the informal sector.

The goal of this proposal is to use data from the National Household Survey (2004-2012) which has information about individuals (e.g. employment, wages) and their household characteristics to analyze if minimum wage is binding in both sectors and to quantify the effect of minimum wage on employment, the probability of being employed in the formal sector and wages at individual and regional level with special interest on women and young people.

In order to achieve this, we propose the estimation of two different models: a fixed effects model, as is common in the literature; and a triple differences model comparing rural and urban women by intensity of their exposure to changes in MW in each autonomous department.

As far as we know, these results will constitute the first scientific evidence in Bolivia about the

\(^1\) As other papers, this analysis will use the “legalistic” or “social protection” definition of informality, which stresses the lack of labor protection and social security benefits[1] [7]
effects of minimum wage policies in labour markets and will become a crucial input for policy makers to design policies that could improve workers conditions and social protection in both sectors.

2. Main research questions and contributions

Explain the focus (or key questions) of your research and its policy relevance.

2.1. Explain why you think this is an interesting research question and what the potential value added of your work might be (knowledge gaps). You might want to explain whether or not this question has been addressed before in this context (including key references), and if so, what do you wish to achieve (in addition) by examining the question again?

Introduction

The minimum wage (MW) remains one of the most controversial issues in labour economics, economic policy, and politics. On the one hand, a minimum wage could be justified because it provides a basic guarantee for a sufficient income for full-time workers to acquire essential goods and services. Furthermore, it prevents employers with dominant market positions to take advantage of certain types of employees like women, low-qualified workers, the long-term unemployed and individuals with little or no working experience. On the other hand, the existence of a minimum wage could also have negative effects as it could discourage employers from hiring persons covered by the current legislation and, therefore, it would negatively affect the employment rate of certain collectives, possibly women and young people [2].

In Latin America labour markets are characterized by the presence of two sectors: a covered formal sector entitled to the MW and an uncovered informal sector which is not [1]. Informality in developing countries has been characterized as large, fragmented, with a vast array of people and economic activities, including home-based work, street vendors, entrepreneurs who employ other workers and self-employed persons [3]. Even though it has been characterized, the term ‘informal sector’ has not been uniquely defined and therefore every characterization of formality and informality needs to specify precisely the regulation concerned [4]. The idea in this paper is that informality should be defined in terms of legal status of employment, rather than enterprise or job characteristics. This means that informality could be defined by several measurement criteria, such as having a signed contract, being entitled to benefits (e.g. health insurance or pension), working at the public sector, or paying taxes [5]. This has been known as the legalistic, contract-based or social protection definition of informality and it is going to be used in the present proposal. It is worth to note that this definition has also been used in similar minimum wage analysis in Brazil [7] and Honduras [1].

The existing evidence on the effect of minimum wage on dual economies has been heterogeneous. Evidence in Indonesia showed a negative impact of MW on the number of workers employed in the formal sector. In Ecuador, Canelas (2014) found non-compliance of the MW in the informal sector. However, there is also evidence that average wages in the informal sector reacted positively to an increase in the minimum wage in the formal sector [6].
In Bolivia, minimum wage has been legislated by the central government and beginning in 2006 minimum wage started to increase every year at a different rate, following the premise of responding to an economic boom and an income redistribution policy. In this context, the goal of this proposal is to characterize the labour market in Bolivia, analyze if minimum wage is binding at the informal and formal sectors, and to measure the effect of the changes in minimum wage over the last 10 years on employment, the probability of being employed in the formal sector and wages at individual and regional level with special interest on women and young people.

**Background**

Over the last years, Bolivia has experienced an economic boom followed by a policy of yearly raises of the national minimum wage. Prior to 2006 minimum wage had remained fairly stable and since May first 2006 the government set an increase in the nominal minimum wage of 15%, this policy can be seen as an unexpected shock to labour market which was followed by constant yearly increases. By 2011 and 2012 the growth of minimum wage reached 20% and 22.6% respectively (Figure 1).

![Figure 1. Yearly percentage increase in minimum wage and prices](image)

Along with the redistributive income policy, an increase in prices over the last years has been a governmental justification for the magnitude of the changes in minimum wage; but as showed in Figure 1, during the last four years the percentage increase in minimum wage was way over the increase in prices, suggesting that minimum wage fixation was not related to the purchasing power or to an increase in productivity, but to other causes such as a favorable external environment and political reasons. Besides, even if changes on the national minimum wage responded to an overall economic growth in Bolivia, this growth was determined by favorable prices of minerals and hydrocarbons that specific autonomous departments in Bolivia produce, therefore this growth has not been equal for each department.

At the same time, labour informality remained a pervasive characteristic of the country, according to CEDLA\(^2\) between 2008 and 2011 the proportion of employment in the informal economy raised from 60% in 2008 to 65% in 2011. Furthermore, Landa (2008) found that

---

\(^2\) Center for Labor and Agrarian Development
between 1995 and 2005 the percentage of people in Bolivia who changed from the formal to the informal sector doubled those who went in the other direction[7]. This same study also showed that female, indigenous and low educated people have higher probabilities of being in the Bolivian informal sector[7]. Finally data from CEDLA stated that only 7.3% of the informal workforce contributed to social security and less than 10% had a health insurance; the situation of the vulnerable workforce was also critical, in 2012 almost 50% of the young workers (17-24 year old) didn’t receive a payment for their services and only 17% of them contributed to social security, being this percentage even lower among young women (14.9%).

Previous minimum wage studies in dual economies
Beginning with Stigler in 1946, there has been extensive research on how labour markets react to changes in minimum wage. However, when analyzing minimum wage in Latin America, empirical evidence has been ambiguous, from positive, negative and even no effect of the MW on employment[8-10]. Maloney and Nunez (2003) found positive effects of minimum wage on informal sector wages, in particular, found that in Mexico, Argentina, Uruguay, Brazil, Chile, Honduras and Colombia the influence of the minimum wage is more significant in the informal sector than in the formal sector[6]; this phenomena could be explained by the known *lighthouse effect*. On the other hand, Bosch and Manacorda (2010) found no significant effect of the minimum wage on the earnings of informal workers in Mexico. [11]

While the substantial raise of the Brazilian statutory minimum wage in the early 2000’s “does not seem to have produced any negative effects on employment growth or the level of employment of formalization in the country” [12], recent data for Indonesia found no significant increases in total employment or unemployment from increases in the minimum wage. Instead, they found a negative impact on the number of workers employed in the formal sector with negative effects concentrated on women, having more women losing their job in the formal sector [12].

In Ecuador, Canelas (2014) using fraction affected as a measure of minimum wage found no effects of minimum wage on employment and salaries in the different states of the country. She attributes this lack of impact to the large none compliance of minimum wage. The problem with the paper is that the parameter could be attenuated because formal workers migrate to the informal sector in order to maintain their jobs[13].

Ham (2013) using a diff-in-diff methodology (where the control group are informal workers and the treatment group is composed of formal workers) found that in Honduras there is a positive effect on salaries. One issue with these results is that there is no evidence of parallel tendencies between the control and the treatment group[1]. If this assumption does not hold, all the results are biased.

Research questions
What are the effects of the minimum wage on wages, employment and the probability of being employed in the formal and the informal sector? How are vulnerable populations being affected

---

3 The minimum wage set in the formal sector could be sort of reference price, a signal for bargaining, throughout the economy at large.
by changes in minimum wage? What are the characteristics of minimum wage beneficiaries?

Even when all these questions have been addressed before in the literature for other countries there is an urgent need to develop scientific evidence to prove causal relationships that could enlighten the formulation of future policies to improve the conditions of Bolivia’s labour markets.

References
1. Ham, A., Revisiting the Effects of Minimum Wages in Developing Countries: Evidence from a Particular Policy Change in Honduras. Available at SSRN 2217835, 2013.

2.2. Describe the specific policy issues/needs that your research aims to address; how your potential outcomes/findings may be used in policy making?

- Justify timing of your research in terms of policy and socioeconomic needs/context – e.g. reference to existing/planned/potential policies at the national level.
- Evidence of previous consultation with potential users (e.g. policymakers and key stakeholders) to help define your research question is strongly encouraged. Include a list of names, institutions and email addresses when possible.

Since 2006 the labour market in Bolivia has been experiencing significant increases in the legislation of the national minimum wage, decisions that were made on a context of favorable external prices and income redistribution policies. Many academics, researchers, entrepreneurs
and investors have criticized these policies, arguing lack of evidence of their impact and lack of sustainability for the significant raise in wages. Considering that 60%-80% of the labour force is in the informal (uncovered) sector, one of the main concerns about these policy changes is that the effect they could have had in both sectors is uncertain. On the one hand these policies could incentivize workers to move to the formal, regulated economy that is in theory enforced to apply these increases; on the other hand, employers at the formal sector could be incentivized to reduce the number of employees, hours worked or social benefits, probably with worse effects for women, young and the less educated.

In this context, in 2012 a meeting on labour economics was held in La Paz to discuss the effect of the latest labour policies in Bolivia (e.g. increases in minimum wage). National experts from the academia and the public sector were gathered and they all arrived to the main conclusions that employment in Bolivia is still characterized by precarious conditions and since Bolivia is not facing a productive development but a conjectural economic growth, new policies need to be designed in order to take advantage of this period of wealth. Furthermore, Muriel (2012) conducted a workshop among the main employers in Bolivia and they concluded that there is not “sufficient empirical basis nor the technical inputs to determine the (positive and / or negative) effects of labour legislation on the labour market”[14].

A scientific analysis of the effects of the minimum wage over employment and income considering both sectors of the economy will constitute an important input for policy makers as well as for private investors on how to address these welfare policies in the most effective and efficient way. It is also important to notice that this would constitute the first research on minimum wage policies that considers the duality of Bolivia’s economy, which is critical to analyze not only the economic effects of these policy changes but also the effects on equality and social protection.

Finally, some of the stakeholders that will benefit from this study include Governmental Offices, Universities, and Governmental Research Institutions who presented their work during the labour economics conference and who we contacted again in 2014 to discuss our ideas about this project and receive important feedback.

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Institution</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pablo García</td>
<td>Sub Director</td>
<td>Ministry of Autonomies Plurinational State of Bolivia</td>
<td><a href="mailto:dario.onim@gmail.com">dario.onim@gmail.com</a></td>
</tr>
<tr>
<td>Jose Luis Porcel</td>
<td>Director</td>
<td>Institute of Economic Research UAJMS</td>
<td><a href="mailto:jlporcel@hotmail.com">jlporcel@hotmail.com</a></td>
</tr>
<tr>
<td>Luis Soria Galvarro</td>
<td>Researcher</td>
<td>UDAPE</td>
<td><a href="mailto:lsoriagalvarro@udape.gob.bo">lsoriagalvarro@udape.gob.bo</a></td>
</tr>
</tbody>
</table>

3. Methodology

The conference was called “El empleo en debate” and it was organized by INESAD and UPB
Presentation of the specific techniques that will be used to answer the research questions and how exactly they will be used to do so. Explain whether you will use a particular technique normally used in other contexts or whether you intend to extend a particular method and how you will do so. Explain if these methods have already been used in the context you are interested in (including key references).

**Is minimum wage binding?**

As discussed in the background, Bolivia has a significant informal labour market, therefore the first step will be to identify if the minimum wage is binding for both labour markets using a non-parametric estimation of wage densities. Since we are using the legalistic definition of informality and based on the Bolivian context and the available indicators in the survey, we will define as formals those workers who have a signed contract and are entitled to benefits like retirement accounts. This indicator has been also preferred by previous papers, such as the OECD Employment Outlook (2010), since it gives an indication of the extent to which workers can access provisions when they confront adverse labour market outcomes.

Even when minimum wage wouldn’t be strictly binding (see Lemos (2004) for further references) minimum wage could still have effects in the entire labour market. As evidence from Maloney and Nuñez (2003) suggest, minimum wage could be important in the informal market as well (e.g. lighthouse effect). This result follows because a firm’s noncompliance with social benefits doesn’t prevent it to comply or use the minimum wage as an indicator for its workers compensations. The following images show that this holds true for Bolivia where wages are distributed across the minimum wage and the percentage of people who perceives a salary below the minimum wage has remained almost constant in every year although the significant yearly increases.
Figure 2 presents kernel densities for logarithm of wages for 2004 to 2012 for formal and informal workers. The vertical line is the logarithm of the minimum wage and as shown in the figure, an important amount of the informal workers distribution was below the minimum wage in 2007 with a lower proportion of them in 2012 (even when these distributions should be truncated at the mandatory minimum wage). These previous results could be associated to evidence of the lighthouse effect or to a greater proportion of people at the formal sector transferring to the informal one.

Characterizing the beneficiaries

A second step in the methodology will be to characterize the minimum wage beneficiaries. Some studies, Allegretto (2011) among others, identified women and young people as the beneficiaries of
setting a floor in wages. At the same time these studies specified that the beneficiaries’ households were not in a situation of poverty or vulnerability. On the other hand, Neri et al. (2000) in a study made for Brazil found that minimum wage policies have distributional impacts and effects in reducing poverty. These conclusions contradict the allegation made for developed countries so a review of what is happening in Bolivia is needed. Therefore a second step will be to provide descriptive statistics about individual and household characteristics (e.g. gender, socioeconomic status, educational attainment, marital status, etc.) of minimum wage recipients for each sector of the economy.

**Estimating the effect of minimum wage**

The standard literature in economics specifies that an increase in the minimum wage can reduce the demand for labour mainly for the most vulnerable people. At the same time, a greater minimum wage will have two contradictory effects on the supply side. A substitution effect will make leisure more expensive so there will be an increase in the supply of labour; and an income effect which will reduce the amount of employment offered, since with less work a person can attain the same level of income. Classic economic theory predicts that the substitution effect will predominate and we will observe an increase in the supply of labour. If this is true, an increase in minimum wage will come with greater unemployment due to a lesser demand and a greater supply.

A standard two sector labor market model will indicate that an increase in minimum wage will increase salaries in the formal sector and decrease employment in that sector. Some of the workers who lost their job will wait to find another job in the formal sector and others will go to work to the informal sector (where, according to the model, wages are supposed to be in a competitive equilibrium). This flow of workers across sectors will cause a decrease in salaries in the informal sector and an increase in employment in the informal sector. Evidence for Latin America (Maloney and Nuñez (2003), Lemos (2004) and Khamis (2008)) show that this is not the case and that minimum wage increases salaries in the informal sector as well.

The third step in this research will be to estimate the effects of minimum wage on the (i) individual level and the (ii) regional level. To identify the impact on the outcome variables we will take advantage of a natural experiment. As mentioned before, in Bolivia prior to 2006 nominal minimum wage has remained fairly stable until May first 2006 when the government set an increase in the nominal minimum wage of 15% with retroactive payments to January of the same year. The government also started to increase minimum wage every year using different increase rates ranging from 5% to more than 20% in a year. Since in Bolivia minimum wage is legislated at the national level this policy has different effects on each of the autonomous departments because the policy do not account for differences in the labour market conditions between autonomous departments, so an increase of 20% in the minimum wage is less severe in Beni than in Oruro. We see this policy as an unexpected shock\(^5\) to the labour market and can help us identify the impact.

We will use three different definitions for the variable of interest: 1 minimum wage will be the real minimum wage in every region. Since prices have variability across regions a flat national minimum wage will result in differences in real minimum wage in every region; 2 minimum wage will be defined

\(^5\) The policy was not discussed with stakeholder and came as a surprise.
as the proportion relative to the median income in every region; Following Card (1992) we will define minimum wage as “fraction affected”. This means that the variable of interest will be the fraction of workers between the old minimum wage and the new minimum wage in every region.

(i) The individual level
For the individual level we will analyze the effects of minimum wage on hours worked, the probability of being employed, sector of employment and wages, especially for vulnerable populations such as women and young people.

A priori we expect that a greater minimum wage will generate movements between the formal and informal sector especially for people whose wage was between the former minimum wage and the new minimum wage. If this is what is happening minimum wage policy is not affecting employment but is endangering people as there are more people that won’t be covered by the protective benefits of the formal sector. One important note here is that we cannot affirm at this point that self-employed workers belong to the informal sector; even if they do not have a signed contract or protection from social security, they could be self-employed because of personal preferences instead of need or lack of empowerment. Therefore our proposal is to distinguish at this point the three categories separately, in order to develop a more detailed analysis.

Therefore the sector of employment variable will be defined as:

\[
y_i = \begin{cases} 
0 & \text{if person } i \text{ is employed in the formal sector} \\
1 & \text{if person } i \text{ is employed in the informal sector} \\
2 & \text{if person } i \text{ is self-employed} 
\end{cases}
\]

The equation for individuals that we intend to estimate is:

\[
y_{idt} = \beta_1 + \beta_2 mw_{dt} + \beta_3 X_{it} + \varphi_d + \rho_t + \epsilon_{idt}
\]

Where \( y \) are the outcomes of interest for individual \( i \), in region \( d \), in time \( t \), \( mw \) is the minimum wage defined above for region \( d \) in time \( t \), \( X \) is a vector of individual characteristics such as ethnicity, age, experience; and \( \varphi \) is a region fixed effect that will capture differences across regions and \( \rho \) is a vector of time dummies to capture common macroeconomic effects. When the outcome variable is categorical we will use a Probit model to estimate the equation.

An alternative model is to use a difference-in-difference-in-difference approach, where the treatment group is women who live in the urban area and the control group are women who live in the rural area. The idea behind the election of the control group is that minimum wage enforcement and other labour legislation enforcement is not likely to occur in the rural area, especially among women. If we only use a DD setting based on these two groups we could find the problem that different shocks -

---

6 Defined as those with no signed contract and retirement accounts.
7 These are not definitive since they can change as we made progress in the investigation.
that are not related with the minimum wage’s intensity change- could be affecting the outcomes of women in the urban area relative to women in the rural area. To address this possibility and following Clemens and Wither (2014)\(^8\) we divide states into two groups: states for which the intensity of change is high and states for which the intensity of change is low.

<table>
<thead>
<tr>
<th>Indicators for women</th>
<th>Chuquisaca</th>
<th>La Paz</th>
<th>Cochabamba</th>
<th>Oruro</th>
<th>Potosi</th>
<th>Tarija</th>
<th>Santa Cruz</th>
<th>Beni</th>
<th>Pando</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fraction Affected</td>
<td>0.04</td>
<td>0.08</td>
<td>0.10</td>
<td>0.13</td>
<td>0.06</td>
<td>0.09</td>
<td>0.05</td>
<td>0.03</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Table 1 shows the fraction of working women affected by the national minimum wage change for 2006 (the first year of minimum wage change in the sample) in every autonomous department. As we can see this fraction affected varies from zero percent in Pando to thirteen percent in Oruro. We use a five percent threshold to separate the high intensity autonomous department from low intensity autonomous department and we use the low intensity group as an additional control. Using this classification and the control groups mentioned in the paragraph above we plan to estimate the following model for years 2005-2006.

\[
y_{ist} = \beta_0 + \beta_1 \text{year} + \beta_2 S_t + \beta_3 D_t \times \text{year} + \beta_4 D_t \times S_t + \beta_5 S_t \times \text{year} + \beta_7 D_t \times S_t \times \text{year} + \delta X_{its} + \epsilon_{its}
\]

Where year takes 1 in 2006 and 0 otherwise, S takes 1 if the autonomous department is a high intensity department and 0 otherwise, D takes 1 if the person lives in the urban area and X is a set of additional controls at individual and state level specially to control for differences in macroeconomic situation. The parameter of interest is \(\beta_7\) which will give us the effect of minimum wage change for women in the urban area.

In this DDD model we will only use two years of the sample because after 2006 the intensity in every department in response to changes in the national minimum wage varies so composition of the groups could change.

(ii) The regional level

For the regional level\(^9\) we will estimate the effects of minimum wage in rate of employment and on average wages of women and young people. In the literature there are two big branches of research to identify the impacts of minimum wage. The first one is to use differences across regions as in Neumark and Wascher (2007) and the other is to use employment data of industries or restaurants as in Card and Kruger (1993). As mentioned before we will estimate outcomes at a regional level using differences across regions. The following equation will be used at regional level:

---
\(^8\) Clemens and Wither (2014) in a study of the effects of minimum wage during the Great Recession dive states into three groups, those who experienced a high binding minimum wage change, a medium and a low binding minimum wage change.

\(^9\) Bolivia is a unitary state consisting of nine departments. Departments are the primary subdivisions of Bolivia, and possess certain autonomy rights under the Constitution of Bolivia.
\[ y_{dt} = \beta_1 + \beta_2 mw_{dt} + \beta_3 X_{dt} + \gamma_d + \varphi_t + \varepsilon_{dt} \]

Where \( y \) are the outcomes of interest for region \( d \), in time \( t \). \( mw \) is the minimum wage defined above for region \( d \), in time \( t \). \( X \) is a vector of region characteristics in time \( t \) such as rate of literacy, size of the labour force; \( \gamma \) is region fixed effects to capture region effects, and \( \varphi \) is a vector of time dummies to capture common macroeconomic effects.

One of the strongest criticisms to the so called “canonical” model of the minimum wage\(^{10}\) is that the minimum wage can be endogenous because regions can set a minimum wage based on the conditions prevailing in the labour market. We won’t be affected by that problem between regions because nominal minimum wage is set arbitrary at the national level, is flat across them (note that the variance between regions comes from the definition of \( mw \) given above) and it does not appear to be linked to the labour market conditions in each autonomous department.

**Econometric issues**

For the estimation at the regional level we acknowledge the presence of three possible problems: 1) demand elasticity could be different for the two sectors (informal and formal); 2) the sorting across sectors depends on individual heterogeneity (is not randomly assigned); 3) that the standard two sector labor market model\(^{11}\) is a good description of Bolivia’s labor market. If these conditions are true the parameter of interest will be biased toward zero giving us a lower bound\(^{12}\). If the parameter is significantly different from zero we can tell that minimum wage has greater impacts (in absolute value) on the variables of interest. The problem arises if the parameter is not statistically different from zero because we cannot distinguish between the bias and the impact effects. To confront this situation we propose: 1) to use different definitions of informality such as the contribution to social security, the contribution to a health insurance and type of contract, allowing us to see if the results are dependent on our definition; and 2) following Lemos (2004) and acknowledging that the sectors have important differences, we will estimate the models for the formal sector and informal sector by their own.

One issue of concern is that minimum wage could be set in response to changing labour market conditions such as increases in labour productivity. Even when data on labour productivity is unavailable, we think that it is unlikely to argue that labour productivity had increased in more than 100% since 2006. We also believe that the existence of a big informal and unregulated labour sector could undermine the implementation of policies that affect directly the labour market. We argue that the constant changes in minimum wage are arbitrary and are not negotiated among stakeholders, so the magnitude or intensity of the changes in minimum wage is not endogenous. Besides, the heterogeneity in productivity, prices and income among autonomous departments allow us to assume that the intensity of changes of national MW at the departmental level are exogenous.

---

\(^{10}\) The so called canonical model is the model estimated using differences in minimum wage across regions. See Allegretto et al. (2011).

\(^{11}\) A model where an increase in minimum wage reduces employment in the formal sector and at the same time increases employment in the informal sector.

\(^{12}\) Note that this has nothing to do with the fact that changes in minimum wage are a natural experiment.
It is possible that we cannot find effects of minimum wage on employment in the short run because contracts are set for more than one period or because the market has not yet internalized the change in the previous year. If this happens our estimates will be biased toward zero, which is why we will use the lagged minimum wage in both models as a robustness check. The equations will be:

**(i) The individual level**

\[ y_{idt} = \beta_1 + \beta_2 mw_{idt} + \beta_3 mw_{idt-1} + \beta_4 X_{idt} + \varphi_d + \rho_t + \varepsilon_{idt} \]

**(ii) The regional level**

\[ y_{dt} = \beta_1 + \beta_2 mw_{dt} + \beta_3 mw_{dt-1} + \beta_4 X_{dt} + \gamma_d + \varphi_t + \varepsilon_{dt} \]

**References**


**4. Data requirements and sources**

This is a critical part of the proposal. The key issue is to explain the reason for the use of the particular data. You must establish that they are ideal for the question you wish to address. Please consult the “Guide for designing a research project proposals” for more detail.
We will use the Bolivian Household Surveys as source of information. Since 1999 as part of the MECOVI program, supported by United Nations, Bolivian National Institute of Statistics (INE, for its acronym in Spanish) has been collecting information related to employment, education, health, household characteristics, etc. The MECOVI program collected information from 1999 to 2002, for the years 2003 and 2004 there is a continuous survey which emphasises in disaggregated income and expenditure information. Since 2005 there is a yearly survey for households (with the exception of 2010). These set of surveys have information on employment, occupation, wages, worked hours and household and individual characteristics among others, and are the most reliable micro data available in Bolivia.

We think it's appropriate to start with the 2003-2004 survey, since its sampling design is based in the "master frame" constructed with National Census of 2001. Therefore, we will use surveys from 2003 to 2012, the latest available survey by the time of this proposal.

The Bolivian Household Survey has a nationally representative sample, which can be separated into urban and rural samples, there is also a stratum of “Unsatisfied Need Index” (NBI) in the first years that was included to improve the accuracy of the household information. However since 2008 it was replaced by a different welfare indicator.

The sampling frame is based on the "Master Frame" constructed by National Institute of Statistics with information of the 2001 National Census. This frame contains 16,790 Primary Sampling Units (PSU), which are the association of census sectors, and since 2002, all household surveys are based on these PSU at the national level.

Stratification is developed to divide population in independent groups with notorious differences in answered variables to guarantee accuracy. The stratification is constructed based on two variables, the first one identifies if the household in the PSU's urban or rural and the second variable was constructed considering four categories based on Basic Need Satisfaction or the welfare indicator, since 2008.

Sample size was estimated using the Simple Random Sample Method with households attempting to accomplish a low sampling error; this sampling was adjusted by a Design Effect (DEFF).

The sampling design is a Multi-Stage Cluster Sampling. For probability sampling, they use the probability proportional to size sampling method in all stages but the last, where they use systematic random sampling. For first stages, size is based in the number of households inside the “master frame” of 2001 National Census. Beyond the first stage conditional probabilities to previous stages are used.

Weights are constructed as the inverse probability of selecting sampling units in their different stages, since the last sampling stage is the household, the weight will represent the amount of households represented by a chosen household at the national level. Some adjustments are performed to alleviate issues such as non-response, population projections (for latter surveys)
since they are temporally far from the “master frame”.

Table 2 presents some descriptive statistics of Bolivian Household Surveys. As mentioned above, one of the methodological steps is to define the group of MW beneficiaries and the characterization of informal and formal workers. There is a notorious difference among informal and formal mean monthly wages, in the first years formal wages are twice informal wages, an interesting fact is that this gap seem to have reduced through the years. However, the other measure of central tendency shows that there is a slightly reduction of this gap.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly wage (Mean) Informal</td>
<td>973.26</td>
<td>1,017.11</td>
<td>1,098.57</td>
<td>1,086.80</td>
<td>1,268.43</td>
<td>1,244.00</td>
<td>1,361.42</td>
<td></td>
</tr>
<tr>
<td>Formal</td>
<td>2,206.99</td>
<td>2,712.57</td>
<td>2,505.49</td>
<td>2,170.45</td>
<td>2,043.74</td>
<td>1,926.36</td>
<td>2,012.21</td>
<td>2,172.21</td>
</tr>
<tr>
<td>Monthly wage (Median) Informal</td>
<td>923.53</td>
<td>860.87</td>
<td>841.42</td>
<td>772.42</td>
<td>863.24</td>
<td>1,033.16</td>
<td>976.82</td>
<td>1,078.15</td>
</tr>
<tr>
<td>Formal</td>
<td>738.82</td>
<td>1,698.14</td>
<td>1,704.42</td>
<td>1,544.84</td>
<td>1,525.34</td>
<td>1,549.73</td>
<td>1,577.94</td>
<td>1,796.92</td>
</tr>
<tr>
<td>Monthly wage (Sd) Informal</td>
<td>1,705.44</td>
<td>765.27</td>
<td>1,615.92</td>
<td>1,257.62</td>
<td>1,506.75</td>
<td>1,060.06</td>
<td>921.45</td>
<td>1,109.37</td>
</tr>
<tr>
<td>Formal</td>
<td>1,152.21</td>
<td>3,034.42</td>
<td>3,252.88</td>
<td>1,907.29</td>
<td>1,846.31</td>
<td>1,566.56</td>
<td>1,447.25</td>
<td>1,591.88</td>
</tr>
<tr>
<td>Monthly wage (Iqr) Informal</td>
<td>849.64</td>
<td>1,537.8</td>
<td>993.34</td>
<td>1,050.81</td>
<td>906.40</td>
<td>1,034.88</td>
<td>1,116.58</td>
<td>1,293.78</td>
</tr>
<tr>
<td>Formal</td>
<td>622.43</td>
<td>728.78</td>
<td>701.19</td>
<td>772.42</td>
<td>714.33</td>
<td>878.18</td>
<td>923.60</td>
<td>1,030.23</td>
</tr>
<tr>
<td>Years of education (Mean) Informal</td>
<td>8.61</td>
<td>9.36</td>
<td>9.5</td>
<td>9.76</td>
<td>9.77</td>
<td>9.83</td>
<td>9.81</td>
<td>10.09</td>
</tr>
<tr>
<td>Age (Mean) Informal</td>
<td>30.77</td>
<td>32.01</td>
<td>31.1</td>
<td>31.67</td>
<td>31.5</td>
<td>31.94</td>
<td>31.34</td>
<td>32.5</td>
</tr>
<tr>
<td>Formal</td>
<td>37.51</td>
<td>38.24</td>
<td>38.76</td>
<td>39</td>
<td>39.05</td>
<td>38.56</td>
<td>38.89</td>
<td>38.66</td>
</tr>
<tr>
<td>Percentage of women Informal</td>
<td>32%</td>
<td>32%</td>
<td>39%</td>
<td>35%</td>
<td>37%</td>
<td>35%</td>
<td>35%</td>
<td>38%</td>
</tr>
<tr>
<td>Formal</td>
<td>38%</td>
<td>41%</td>
<td>36%</td>
<td>38%</td>
<td>40%</td>
<td>39%</td>
<td>39%</td>
<td>41%</td>
</tr>
<tr>
<td>Percentage of formal workers Informal</td>
<td>26%</td>
<td>28%</td>
<td>32%</td>
<td>33%</td>
<td>31%</td>
<td>33%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Occupation rate Informal</td>
<td>0.65</td>
<td>0.63</td>
<td>0.66</td>
<td>0.64</td>
<td>0.65</td>
<td>0.65</td>
<td>0.67</td>
<td>0.62</td>
</tr>
<tr>
<td>Formal</td>
<td>0.94</td>
<td>0.93</td>
<td>0.95</td>
<td>0.94</td>
<td>0.96</td>
<td>0.96</td>
<td>0.96</td>
<td>0.96</td>
</tr>
<tr>
<td>Employment rate Informal</td>
<td>0.77</td>
<td>0.74</td>
<td>0.76</td>
<td>0.74</td>
<td>0.75</td>
<td>0.76</td>
<td>0.76</td>
<td>0.73</td>
</tr>
<tr>
<td>Participation rate Informal</td>
<td>0.77</td>
<td>0.74</td>
<td>0.76</td>
<td>0.74</td>
<td>0.75</td>
<td>0.76</td>
<td>0.76</td>
<td>0.73</td>
</tr>
</tbody>
</table>

Formal workers have around 4 and 5 more years of education on average, with older population employed in this sector. Female participation has significantly increased in the informal economy, with a growth of almost 19%. An interesting fact is that the percentage of formal workers increased along the years as well as employment rates, even though informal labour participation is still the largest part of labour market. However, this growth of employment and formalization could related to the economic boom that Bolivia experienced in these last years and the growing participation of the state in the labour market.
Table 3 introduces the fraction affected indicator by autonomous department. It is the proportion of all salaried workers who were above the minimum wage in the previous year, but were below the new minimum wage. Additionally some relevant statistics as average years of education and average real wage for salaried workers are presented by each Bolivian department. This information is presented for three years in order to give a rough idea of differences among departments since we have different minimum wage implementations. This table shows that the definition of fraction affected varies across autonomous departments and the affected worker in every department is different from one year to another.

Table 2. Indicators across Autonomous Departments

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Chuquisaca</th>
<th>La Paz</th>
<th>Cochabamba</th>
<th>Oruro</th>
<th>Potosi</th>
<th>Tarija</th>
<th>Santa Cruz</th>
<th>Beni</th>
<th>Pando</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frac affected</td>
<td>0.05</td>
<td>0.04</td>
<td>0.08</td>
<td>0.09</td>
<td>0.04</td>
<td>0.08</td>
<td>0.04</td>
<td>0.05</td>
<td>0.01</td>
</tr>
<tr>
<td>Av. Education</td>
<td>10.26</td>
<td>11.19</td>
<td>10.33</td>
<td>12.06</td>
<td>10.19</td>
<td>10.20</td>
<td>10.35</td>
<td>9.58</td>
<td>11.08</td>
</tr>
<tr>
<td>Av. Wage</td>
<td>1,313.69</td>
<td>1,634.64</td>
<td>1,284.91</td>
<td>1,524.78</td>
<td>1,286.23</td>
<td>1,519.72</td>
<td>1,760.46</td>
<td>1,350.58</td>
<td>2,124.77</td>
</tr>
</tbody>
</table>

| Frac affected| 0.01       | 0.01   | 0.02       | 0.01  | 0.01   | 0.02   | 0.01       | 0.02 | 0.00  |
| Av. Wage     | 1,541.43   | 1,607.90| 1,486.40   | 1,640.46| 2,038.86| 1,635.74| 2,153.95   | 1,278.96| 2,249.70|

| Frac affected| 0.03       | 0.02   | 0.02       | 0.01  | 0.04   | 0.01   | 0.02       | 0.02 | 0.01  |
| Av. Education| 9.42       | 12.34  | 11.96      | 12.10 | 10.02  | 11.06  | 9.99       | 10.12| 10.90 |
| Av. Wage     | 1,270.16   | 1,889.64| 1,685.91   | 1,634.27| 1,790.62| 1,560.71| 1,688.62   | 1,391.62| 2,204.84|

We used official information of household surveys, minimum wages available at the National Institute of Statistics (INE) and prices information of the Unit of Analysis of Social and Economic policies (UDAPE) website.

5. Policy influence plan (or research communication strategy)

- Referring to the policy context described in section 2.1., identify potential users of your research findings, including policymakers and other key stakeholders. Provide a list of institutions and, whenever possible, specific individuals to be targeted for effective policy influence. Please also indicate whether you have already made contacts within the institutions.
How, in the elaboration and execution of your project (from design to dissemination), will you consult/communicate with these users to both gather their inputs and keep them informed of your project (expected contributions and uses), in order to increase chances of your findings to be taken-up into policymaking?

You can refer to PEP’s research communications strategy and guidance to have a better idea of what is expected in terms of activities for policy outreach and dissemination.

<table>
<thead>
<tr>
<th>Institution</th>
<th>Contact</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institute for Advanced Development Studies (Inesad)</td>
<td>Beatriz Muriel</td>
<td>1. To inform the question of the research, our hypothesis and our expectancies</td>
</tr>
<tr>
<td>Fundación ARU</td>
<td>Werner Hernani</td>
<td></td>
</tr>
<tr>
<td>Socioeconomic Research Institute (IISEC)</td>
<td>Horacio Villegas</td>
<td></td>
</tr>
<tr>
<td><strong>International Organizations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IADB</td>
<td>Oscar Lora</td>
<td>2. Dissemination of our first draft in order to collect comments and suggestions</td>
</tr>
<tr>
<td>World Bank Bolivia</td>
<td>Patricia Alvarez</td>
<td></td>
</tr>
<tr>
<td>ILO</td>
<td>Rodrigo Mogrovejo</td>
<td></td>
</tr>
<tr>
<td><strong>Public institutions (Policy makers and Governmental research institutions)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of Autonomies, Plurinational State of Bolivia</td>
<td>Pablo García</td>
<td>3. Presentation of final results and dissemination of the published working paper and policy briefing.</td>
</tr>
<tr>
<td>UDAPE</td>
<td>Luis Soria Galvarro / Erick Meave</td>
<td></td>
</tr>
<tr>
<td>Ministry of Labor, employment and welfare, Plurinational State of Bolivia</td>
<td>Rocio Araoz / Hector Hinojosa</td>
<td>4. Delivery of do files to Public institutions to strengthen capacity building.</td>
</tr>
</tbody>
</table>

Our policy influence plan is based on two strategies: (i) the dissemination of our research throughout direct contact with stakeholders at key institutions, and (ii) the publication and presentation of our results on national coverage journals and conferences.

Throughout direct contact, we plan to reach three groups of institutions. First, we are convinced that applied research should be the foundation for policy decisions and that the quality and accuracy of this research is essential in the policy plan implementation. Therefore, our proposal and research will be shared to Bolivian academic institutions in order to improve the accuracy of our estimations and the perspective of our conclusions. Furthermore, an indirect benefit of sharing our research with academia is that they have a relationship with policy makers and can facilitate the acceptance of our work in the Governmental level.

The second group of institutions will be International Organizations. Since they analyze these
policies over a variety group of countries and contexts, their opinion will be an important input to strengthen our work. Important international organizations that work in the labour economics area are the WB, IADB and ILO, which operate in our country and are interested in promoting social security and inclusion in labour markets.

Finally and most important, our third pathway is get directly to the policy maker institutions, this is the government. We plan to reach four main institutions:

- Ministry of Economy and Public Finance
- Ministry of Autonomy
- Ministry of Labour, Employment and Social Security
- Analysis Unit of Social and Economic Policy (UDAPE)

Our strategy is to make contact with these key stakeholders at least in three occasions during the research elaboration process. First communication will inform the question of the research, our hypothesis and our expectancies to be included in the agenda of all every institution. The second contact will be to inform the preliminary results of our research and some implications of these findings, this second contact should generate some discussion on the results and suggestions and comments from the key institutions. The third contact will be to share a final version of a working paper and policy briefing; it should let us talk about some boundaries and potential corollaries for minimum wage policy. An optional fourth contact will be considered for those who could be interested in continuing similar research, in this contact we will provide our do files and data bases so we can facilitate and motivate the development of further research.

Finally, throughout the publication and presentation of our results we plan to present (i) a short article at the Economics weekly magazine “Nueva Economía”; (ii) an academic paper at the monthly report of the IISEC; and (iii) a policy briefing that will be delivered to all the institutions involved in the process. Also, presentations at national and international conferences will be included. Currently we have two main conferences identified: the Bolivian Economist Meeting, and the Bolivian Conference on Development Economics.

6. List of team members

Indicating their age sex, as well as relevant/prior training and experience in the issues and research techniques involved (start with team/project leader).

Note that PEP favors gender-balanced teams, composed of one senior (or experienced) researcher supervising a group of junior researchers, including at least 50% female researchers, all contributing substantively to the research project. PEP also seeks gender balance in team leaders and thus positively encourages female-led research teams. (Each listed member must post an up-to-date CV in their profile on the PEP website – refer to “How to submit a proposal”)

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Sex (M,F)</th>
<th>Training and experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marcelo Claure</td>
<td>29</td>
<td>M</td>
<td>Msc. in Economics (Universidad de Los Andes,</td>
</tr>
</tbody>
</table>
Bogotá – Colombia), B.A Economics, B.A Systems Engineer (Universidad Católica Boliviana). Experience as a consultant in impact evaluation and as a consultant to the Government of Bolivia in the impact of autonomies. Computer Programming Lecturer at Universidad Católica Boliviana

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Gender</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alejandra Leyton</td>
<td>27</td>
<td>F</td>
<td>Master in Public Health /Health Economics (Tulane University) B.A Economics (Universidad Católica Boliviana “San Pablo”) 5 years of experience conducting research and impact evaluation at Tulane University, the IADB, PAHO, The World Bank Institute, The World Bank, UNDP and Universidad Católica Boliviana “San Pablo”.</td>
</tr>
<tr>
<td>Vanessa Sanchez</td>
<td>23</td>
<td>F</td>
<td>Msc in Economics at Universidad de Los Andes, Bogotá, Colombia. Industrial engineer. Graduated Finance Assistant.</td>
</tr>
<tr>
<td>Christian Valencia</td>
<td>26</td>
<td>M</td>
<td>B.A Economics at Universidad Católica Boliviana “San Pablo” at La Paz, Bolivia. Working experience as research assistant and junior researcher at the two Think Tank Initiative International Development Research Centers in Bolivia. Co-author of working papers related to literacy program evaluation in Bolivia, gender inequalities in the labour market of Bolivia, Peru and Ecuador and culture as a excluding factor of maternal health care in Bolivia.</td>
</tr>
</tbody>
</table>

7. **Expected capacity building**

Description of the research capacities that team members (and potentially their affiliated institutions) are expected to build through their participation in this project.

This is an important aspect in the evaluation of proposals and should be presented in some detail. What techniques, literature, theories, tools, etc. will the team and their institutions learn (acquire in practice) or deepen their knowledge of? How will these skills help team members in their career development? Also indicate which specific tasks each team member would carry out in executing the project.

The main capacity we expect to build with the affiliated institutions is the capacity to analyze the complexity of the Bolivian labour market with a scientific approach. The Bolivian economy present a very unique scenario for any economic analysis since 60% of their population is indigenous with 36 different nations inside the country.

Therefore, many of the economic research that has been applied in the country have been based
on models from developed countries (that do not account for the particular characteristics of the country); or it has been based on qualitative data that lacked of consistency in their methodology.

Another obstacle that we want to overcome is the lack of communication and cooperation between private and public research institutions and stakeholders. Our team is composed by professionals with working experienced both in the private and public sector, which will assist the fluent coordination and communication between those.

Team members will improve team work abilities and capacity to explain the results and their implication to a wide range of professionals, union leaders, academics, students and mainly policy makers. It is intended to receive constant feedback and to develop relationships with government official, unions, aid institutions and academics. To this end team members are expected to improve their ability to make connections and to deal with people of different backgrounds in order to understand the perception of phenomena at different points of view.

One of the long term expected capacity building is the demand of evidence, data and research work by government and aid institutions. It is more likely to have better policies and to have a better impact of them if they are supported by good research. In the long term policy makers might take suboptimal choices if there is not enough quality evidence to evaluate policies that are being taken now, mainly because these policies have no clear effects in the short term, or at least these effects could be blurred by the background mentioned above.

Team members will improve their problem solving capacity, will deepen their knowledge of complex dual labour markets, will gain significant experience working with a national representative data set as it is the Bolivian National Household Survey, will deal with methodological shortcomings and will improve their capacity to perform at academic workshops and conferences. All these skills would be useful for the development of a working methodology that could be relevant for addressing and working with different research questions.

<table>
<thead>
<tr>
<th>Name</th>
<th>Task/contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marcelo Claure</td>
<td>Data management and analysis, model design, Literature review, coordinate the contributions</td>
</tr>
<tr>
<td>Alejandra Leyton</td>
<td>Literature review, interpretation of the results, design the communication strategy</td>
</tr>
<tr>
<td>Vanessa Sanchez</td>
<td>Data analysis, model design, briefs</td>
</tr>
<tr>
<td>Christian Valencia</td>
<td>Data management and analysis, interpretation of the results</td>
</tr>
</tbody>
</table>

8. **List of past, current or pending projects in related areas involving team members**
Name of funding institution, title of project, list of team members involved

<table>
<thead>
<tr>
<th>Name of funding institution</th>
<th>Title of project</th>
<th>Team members involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundación ARU (Analysis prepared for ILO Bolivia).</td>
<td>Producción y reproducción de desigualdades de género en el mercado de trabajo: Un análisis comparativo de Bolivia, Ecuador y Perú</td>
<td>Christian Valencia</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>------------------</td>
</tr>
</tbody>
</table>

9. Describe any ethical, social, gender or environmental issues or risks that should be noted in relation to your proposed research project.

None

References and plagiarism:
Applicants should also be very careful to avoid any appearance of plagiarism. Any text that is borrowed from another source should be carefully contained between quotation marks with a reference to the source (including page number) immediately following the quotation. It is essential that we be able to distinguish what you have written yourself from what you have borrowed from elsewhere.

Note also that copying large extracts (such as several paragraphs) from other texts is not a good practice, and is usually unacceptable. For a fuller description of plagiarism, please refer, for example, to the following website:

- [http://writing.yalecollege.yale.edu/advice-students/using-sources/understanding-and-avoiding-plagiarism](http://writing.yalecollege.yale.edu/advice-students/using-sources/understanding-and-avoiding-plagiarism)

PEP will be using a software program to detect cases of plagiarism.