Effects of Inflation on Poverty in Mexico

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*/ The opinions/points of view herein stated are the author’s responsibility and do not necessarily represent the institutional view of Banco de México or its Governing Board.
1 Introduction

2 Data and descriptive analysis

3 Econometric model

4 Conclusions
Introduction

- During periods of high inflation, wages may adjust slower than prices and this can reduce real wages.

- Evidence shows that balance of payments crisis from ‘80s and ’90s brought high inflation, and as consequence, reduction in real labor income (e.g. Cardoso, 1992).

- Taking into account that the main source of household income in developing countries is labor income (Fields, 1990), it has also shown that inflation has adverse effects on poverty (Ferreira et al., 2010; Easterly and Fischer, 2001; Martínez Trigueros, 1998; Ferreira and Ravallion, 2008; Perry et al., 2006).
Introduction

- I estimate a fixed effect model at city level.
- Poverty and poverty gap are the dependent variables.
- The main independent variable is regional inflation, regional GDP and city time trends are also included as additional controls.
- The presence of non-observed heterogeneity between cities correlated with the variables of interest could bias the results. The econometric model used in this study allows to control for this potential problem.
- The 1995 and 2009 Mexican economic crisis caused important variations on the variables used in this model, this allows to identify the effects of interest.
- Non-linear effects of inflation on poverty are also estimated.
Introduction

Main findings:

1. According to the linear model, a 1% annual increase in the Consumer Price Index generates a 1.3% growth in poverty.

   The same change in inflation increases the poverty gap by 1.8%.

2. The non-linear model suggests that in an economy when inflation reaches two digits, as inflation grows its effect on poverty increases more than proportionally.

It is important to communicate these results to the general public in order to reinforce the importance of the main mandate of Banco de México.
Effects of Inflation on Poverty in Mexico

Outline

1. Introduction
2. Data and descriptive analysis
3. Econometric model
4. Conclusions
Data

- GDP data comes from Mexico’s National Accounts System (INEGI, for its acronym in Spanish) and inflation data from INEGI and Banxico.
- A household is considered to be in poverty if the average of labor income of household’s members is lower to the threshold determined by the National Council for the Evaluation of Social Development Policy (CONEVAL, for its acronym in Spanish).
Data: poverty

- The idea of measuring poverty from labor income was proposed by CONEVAL as an alternative measure of poverty.
- This measure does not include government transfers, inheritance or rents.
- The poverty line is obtained from the alimentary basket proposed by CONEVAL at 2008 prices.
- I use two measurements of poverty:
  - **Percentage of poverty:** The percentage of people living in households in which the real labor income of the household per capita is less than the poverty line.
  - **Poverty gap:** The average labor income of people in poverty as a percentage of the poverty line.
Descriptive Analysis

CPI and percentage of poverty
(Annual change in percent)

Source: Banxico and INEGI.
Descriptive Analysis

Poverty, GDP and PI
Index start of the crisis = 100

Source: Banxico and INEGI.

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Econometric Model

- This identification strategy has been used in other studies that seek to analyze the effects of inflation on poverty, see e.g. Ferreira et al. (2011) and Ravallion and Datt (1996).

- The presence of observed and unobserved heterogeneity that does not change over time between cities and affects the variables of interest can bias the results. Consequently, a regression with fixed effect panel data is used to estimate the impact.

- During the study period, Mexico went through a first stage of macroeconomic instability with high price volatility and high levels of inflation (balance of payment crisis of 1995), followed by periods of low and stable inflation.

- This could suggest a non-linear relationship between the variables of interest, hence linear and non-linear specifications are estimated.
Econometric Model

\[ \Delta \ln P_{ob_{it}} = \gamma_1 \Delta \ln CPI_{it} + \gamma_2 \Delta \ln CPI^2_{it} + \gamma_3 \Delta \ln GDP_{it} + \gamma_4 trend_i + \pi_i + u_{it} \]

where:

- \( i t \) is city and time;
- \( P_{ob_{it}} \) is one of the two poverty measures;
- \( CPI_{it} \) is the consumer price index in the city \( i \);
- \( GDP_{it} \) is the state GDP corresponding to the city \( i \);
- \( trend_i \) is a time trend specific to each city; and
- \( \pi_i \) is the fixed effect by city.
### Results

#### Fixed-effects linear regressions determinants of poverty, 1993-2009

<table>
<thead>
<tr>
<th></th>
<th>Percentage of Poverty</th>
<th></th>
<th></th>
<th>Poverty Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Inflation</td>
<td>0.943***</td>
<td>1.700***</td>
<td>1.348***</td>
<td>1.358***</td>
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<tr>
<td></td>
<td>(0.0659)</td>
<td>(0.0964)</td>
<td>(0.103)</td>
<td>(0.105)</td>
</tr>
<tr>
<td>GDP</td>
<td></td>
<td>-1.628***</td>
<td>-1.625***</td>
<td>-1.992***</td>
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<tr>
<td></td>
<td></td>
<td>(0.150)</td>
<td>(0.148)</td>
<td>(0.171)</td>
</tr>
<tr>
<td>Trend by State</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General trend</td>
<td>0.0176***</td>
<td>0.00887***</td>
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<tr>
<td></td>
<td>(0.00136)</td>
<td>(0.00158)</td>
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<td></td>
</tr>
<tr>
<td>Constant</td>
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<td>-0.337***</td>
<td>-0.181***</td>
<td>-0.184***</td>
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<tr>
<td></td>
<td>(0.00651)</td>
<td>(0.0214)</td>
<td>(0.0244)</td>
<td>(0.0239)</td>
</tr>
<tr>
<td>Observations</td>
<td>476</td>
<td>476</td>
<td>448</td>
<td>448</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.226</td>
<td>0.362</td>
<td>0.515</td>
<td>0.535</td>
</tr>
<tr>
<td>Number of cities</td>
<td>28</td>
<td>28</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>

Standard errors in parenthesis

*** p<0.01, ** p<0.05, * p<0.1

Notes: Annual frequency data. Cities included in the regression: Acapulco, Aguascalientes, Campeche, Chihuahua, Colima, Cuernavaca, Culiacan, Durango, Guadalajara, Hermosillo, León, Merida, Mexico City (Distrito Federal), Monterrey, Morelia, Oaxaca, Puebla, Querétaro, Saltillo, San Luis Potosí, Tampico, Tepic, Tijuana, Toluca, Tuxtla Gutierrez, Veracruz, Villahermosa, and Zacatecas.
### Results

**Fixed-effects non linear regressions determinants of poverty, 1993-2009**

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<tr>
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<tbody>
<tr>
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<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
<td>(8)</td>
</tr>
<tr>
<td><strong>Inflation</strong></td>
<td>-2.962***</td>
<td>-1.739***</td>
<td>-1.516***</td>
<td>-1.627***</td>
<td>-3.871***</td>
<td>-2.300***</td>
<td>-1.986***</td>
<td>-2.141***</td>
</tr>
<tr>
<td></td>
<td>(0.343)</td>
<td>(0.379)</td>
<td>(0.373)</td>
<td>(0.385)</td>
<td>(0.423)</td>
<td>(0.488)</td>
<td>(0.504)</td>
<td>(0.511)</td>
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<td></td>
<td>(1.063)</td>
<td>(1.107)</td>
<td>(1.094)</td>
<td>(1.108)</td>
<td>(1.314)</td>
<td>(1.408)</td>
<td>(1.460)</td>
<td>(1.449)</td>
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<tr>
<td><strong>GDP</strong></td>
<td>-1.442***</td>
<td>-1.414***</td>
<td></td>
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<td>-1.749***</td>
<td>-1.699***</td>
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<tr>
<td></td>
<td>(0.154)</td>
<td>(0.155)</td>
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<td></td>
<td>(0.182)</td>
<td>(0.205)</td>
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<tr>
<td><strong>Trend by State</strong></td>
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<td></td>
<td></td>
<td><strong>Yes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General trend</strong></td>
<td>0.0100***</td>
<td>0.00305*</td>
<td></td>
<td></td>
<td>0.0129***</td>
<td>0.00549**</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>(0.00117)</td>
<td>(0.00166)</td>
<td></td>
<td></td>
<td>(0.00157)</td>
<td>(0.00218)</td>
<td></td>
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</tr>
<tr>
<td><strong>Constant</strong></td>
<td>0.0943***</td>
<td>-0.0850***</td>
<td>0.0174</td>
<td>0.0214</td>
<td>0.127***</td>
<td>-0.103**</td>
<td>0.00894</td>
<td>0.0138</td>
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<tr>
<td></td>
<td>(0.0174)</td>
<td>(0.0280)</td>
<td>(0.0326)</td>
<td>(0.0339)</td>
<td>(0.0215)</td>
<td>(0.0378)</td>
<td>(0.0440)</td>
<td>(0.0448)</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
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</tr>
<tr>
<td><strong>R-squared</strong></td>
<td>0.433</td>
<td>0.469</td>
<td>0.590</td>
<td>0.616</td>
<td>0.440</td>
<td>0.478</td>
<td>0.586</td>
<td>0.612</td>
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<td><strong>Number of cities</strong></td>
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Results

$$\Delta \ln Pob_{it} = 0.02 - 1.627 \Delta \ln CPI_{it} + 8.749 \Delta \ln CPI^2_{it}$$

Source: Author’s calculations
Counterfactual

a) Observed and fitted data from regression 4, Table2. % Poverty

b) Fitted data assuming low inflation since 1995 % Poverty
c) Fitted data assuming the 2009 crisis had the inflation observed in 1995 % Poverty

Source: Author’s calculations
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Central Bank communication implications

- Inflation causes poverty.

- Central Bank mandate of keeping low inflation in Mexico is established in the Constitution. In a democratic country like Mexico, the Constitution is determined by the society.

- The majority of the population in Mexico did not experience a balance of payment crisis with strong GDP contraction and three-digit inflation.

- However, macroeconomic stability cannot be taken for granted.

- The Central Bank must reinforce with the general public both, with formal research and intuitively the consequences of high levels of inflation.

- The diffusion of these results, both with formal research and understandable way to all public is a fundamental activity for Central Banks in developing countries.