

# The Geographic Spread of a Large Devaluation

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Large devaluations are associated with dramatic changes in relative prices. At the same time, high- and low-income households consume very different baskets of goods. By affecting the relative cost of these baskets, a large devaluation can have distributional consequences. In Cravino and Levchenko (2017) we show that the 1994 Mexican peso devaluation was strongly anti-poor: the cost of living for households in the bottom decile of the income distribution rose between 1.48 and 1.62 times more than the cost of living for households in the top decile. This difference in inflation arose both because poor households spend relatively more on tradeable product categories, and because they consume cheaper varieties within each category. Price increases were larger for tradeable categories and for the cheaper varieties, both contributing to the distributional effect of the devaluation in roughly equal proportions.

This paper expands our analysis by examining the regional variation in the cost of living changes following the devaluation. A recent literature documents regional differences in price levels within countries driven by both trade costs and markups (see e.g. Atkin and Donaldson 2015, Hottman 2017). Furthermore, regional prices respond differentially to exchange rate shocks (Friedman and Levinsohn 2002, Levinsohn et al. 2003, Auer et al. 2017). It follows that the distributional consequences of large devaluations

may also vary across regions. This paper asks the following two questions: i) Do the distributional effects in Cravino and Levchenko (2017) reflect changes in the relative prices of local consumption baskets across regions with different income levels, or were the anti-poor effects of the devaluation pervasive across all regions? and ii) To the extent there is regional variation in inflation following the devaluation, in which regions did the poor fare relatively worse off? To answer these questions, we compute changes in income-specific price indices across 6 broad Mexican geographical regions.

Our main finding is that the distributional consequences of the devaluation were pervasive across regions. There was however important regional variation in the changes in the cost of living, and these were very different for the high- and the low-income households. For the high-income households, it didn't matter much where they were located, in contrast, poor households fared very differently across regions. This regional dispersion was driven both by different price changes for the same items across regions and by differences in consumption baskets of households with the same income across regions.

## I. Computing income-specific price indices across regions

### A. Methodology

We start by describing our methodology for computing income- and region- specific price indices. Let there be  $G$  product categories indexed by  $g$ , and let each  $g$  contain varieties indexed by  $v_g$ . Households from different regions and income levels spend different shares of their income both across product categories  $g$ , and across varieties  $v_g$  within each category.

Let  $\hat{x}_t \equiv x_t/x_{t_0}$  denote the cumulative

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growth of  $x_t$  between a base period  $t_0$  and period  $t$ . The change in the consumption price index of household  $h$  living in region  $r$  is given by:

$$(1) \quad \hat{P}_{rt}^h \equiv \sum_{g \in G} \omega_{gr}^h \hat{P}_{gr,t}^h,$$

where  $\omega_{gr}^h$  is the share of expenditure on product category  $g$  of household  $h$  from region  $r$ .  $\hat{P}_{gr,t}^h$  is the cumulative change in the price of the basket of varieties from category  $g$  that are consumed by household  $h$  from region  $r$ . Note that it can vary across households because high- and low-income households consume different varieties within the each product category. For instance, higher-income households shop at higher-end stores and purchase higher-quality versions of each product.<sup>1</sup>

In what follows, due to space constraints we focus on the consumption price indices of a hypothetical high-income household and a hypothetical low-income household in each region. The hypothetical high-income household is a household that assigns expenditure shares  $\omega_{gr}^h$  across categories equal to the expenditure shares of the households in the top decile of the national income distribution living in region  $r$ . Within each product category  $g$ , this hypothetical household consumes those varieties  $v_g$  that are priced above the median variety in the region. Similarly, the hypothetical low-income household living in  $r$  has the expenditure shares  $\omega_{gr}^h$  of the households at bottom decile of the income distribution, and within each  $g$  consumes the varieties  $v_g$  that are priced below the median variety the region.

The price indices in (1) are what Cravino and Levchenko (2017) call the Combined price indices. That paper contains the complete statement of the assumptions behind the construction of the Combined price indices, and examines their sensitivity to alternative assumptions. The Combined price indices capture differences in

consumption baskets of the rich and the poor at all levels of product disaggregation: high-income households have different expenditure shares across goods  $\omega_{gr}^h$ , and within goods they consume higher-priced varieties. We show in Cravino and Levchenko (2017) that these two channels matter about equally for the anti-poor effect of the 1994 Mexican devaluation. In this paper, we compute the Combined price indices by region.<sup>2</sup>

### B. Data

The analysis is based on two data sources. The first is the micro data on consumer prices used for the construction of the Mexican CPI. The Bank of Mexico publishes every monthly price quote collected for the purposes constructing the CPI in the *Diario Oficial de la Federacion* (DOF), the official bulletin of the Mexican government. These data are publicly available starting in January 1994. Importantly for this paper, the data include information on the city in which each price quote is collected. During the period we analyze, these price data were collected in 35 cities.

The second data source is the household expenditure survey, the 1994 Encuesta Nacional de Ingresos y Gastos de los Hogares (ENIGH). It contains household-specific expenditures on nearly 600 distinct consumption items, along with household income and the municipality of the household residence. See Cravino and Levchenko (2017) for a detailed description of these two data sources and the steps for cleaning and harmonizing the data.

We match the municipalities in the ENIGH to the cities in the Mexican CPI data. The geographical catchment area of ENIGH is wider than of the DOF data. For this reason, we focus on a subsample of 7,460 households that live in the cities in which the Bank of Mexico collects price data. Our exercise requires information on region  $\times$  income decile-specific expenditure shares and price changes. Since we

<sup>1</sup>Cravino and Levchenko (2017) provide evidence that high-income households consume more expensive varieties, both in Mexico and in the US.

<sup>2</sup>Cravino and Levchenko (2017) define a “Liberal” and a “Conservative” version of the Combined price index. Here we restrict attention to the Liberal version.

only have a few thousand households in the ENIGH, we aggregate the cities and municipalities into 6 coarse regions: Mexico City, Northern Frontier/Northwest, Northeast, North Central, South Central, and South. These correspond to the official region definitions employed by the Mexican statistical authorities, after combining the Northern Frontier and Northwest regions due to low numbers of households available in ENIGH in those regions. This level of regional disaggregation ensures that there are data for at least 600 households per region.

Finally, we separate households into income deciles in each region. This can be done using either region-specific or national income decile cutoffs. In what follows we adopt national income cutoffs. Thus, our analysis answers the question, in which region was a household with a given nominal income worse off following this devaluation? However, the results are if anything more pronounced under region-specific income decile cutoffs. In this sample, the mean household income in the top decile, 38,118 pesos, is more than 20 times higher than the mean income in the bottom decile, 1,782 pesos.

## II. Results

Figure 1 reports the cumulative inflation across households and regions, measured by the  $\hat{P}_{rt}^h$ 's, in the two years following the devaluation, i.e. from October 1994 to October 1996. The dark bars show the change in the price indices for the hypothetical poor households in each region, while the white bars depict the price changes for the hypothetical high-income households. Two findings stand out from this picture.

First, the devaluation was anti-poor in every region. The difference in cumulative inflation experienced by the low-income vs. the high-income households ranges between 27 percentage points in Mexico City to 48 percentage points in the North Central region. We note, however, that this cross-regional variation is large relative to the overall inflation in Mexico over this period, which was about 85 percent.

Second, the variation in inflation across

regions is much larger for the low-income households compared to high-income ones. For the low-income households, the regional variation in the price indices is 20 percentage points, from about 1.95 to 2.15. In contrast, the regional variation for high-income households is only 5 percentage points, from 1.64 to 1.69. Interestingly, the regional variation in the outcomes for the high- and the low-income households seems to be negatively correlated: regions in which the poor tended to do relatively better compared to other regions are also the ones in which the high-income households tended to do relatively worse. For instance, Mexico City is the (relatively) best region to be a poor household, but it's the third-worst to be a high-income household following the devaluation.

What drives this regional dispersion of outcomes for the poor? There are two broad possibilities. First, it may be that the prices of goods consumed by the poor rose systematically more in some regions than in others. Second, it is possible that prices changed by a similar amount across regions, but that in some regions the consumption baskets of the poor were tilted towards categories experiencing the largest price increases.

To illustrate this, we write equation (1) as:

$$\begin{aligned}
 \hat{P}_{rt}^h &\equiv \underbrace{\sum_{g \in G} \omega_g^h \hat{P}_{gr,t}^h}_{\text{Local prices}} + \underbrace{\sum_{g \in G} \omega_g^h \hat{P}_{g,t}^h}_{\text{Local exp. shares}} \\
 (2) \quad &+ \underbrace{\sum_{g \in G} (\omega_{gr}^h - \omega_g^h) (\hat{P}_{gr,t}^h - \hat{P}_{g,t}^h)}_{\text{"Covariance"}} \\
 &- \underbrace{\sum_{g \in G} \omega_g^h \hat{P}_{g,t}^h}_{\text{National}}
 \end{aligned}$$

where in all cases the absence of an "r" subscript indicates a national (non-region-specific) value. The first term labeled "Local prices" is the price index that would obtain if the price changes were those observed in each region, but if households had the same expenditure shares  $\omega_g^h$  across re-

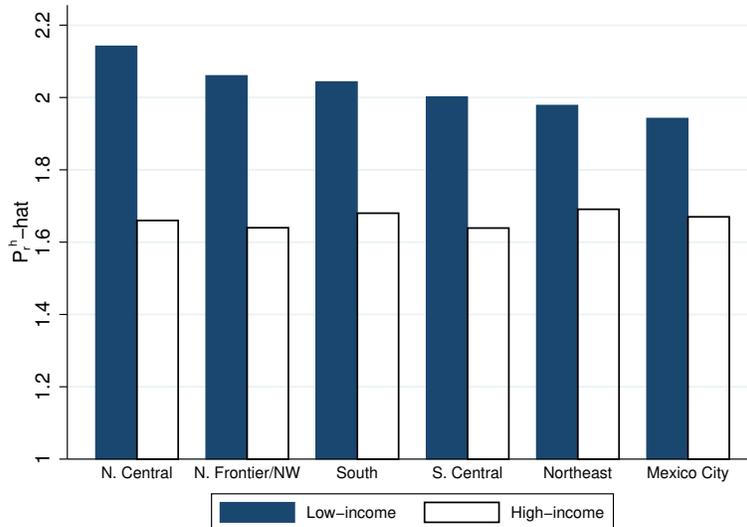


FIGURE 1. PRICE INDICES BY REGION AND INCOME LEVEL

*Note:* This figure reports the price index changes defined in (1) by region and income level, for the period October 1994 to October 1996.

gions. By contrast, the term labeled “Local expenditure shares” is the price index that would obtain if price changes in each region were equal to the national average, but expenditure shares were those observed in each region. The “Covariance” term captures the covariance between the regional variation in shares and the regional variation in prices. The last term does not vary across regions and thus by construction cannot account for regional variation.

Figure 2 reports the price indices labeled “Local prices” (left panel) and “Local expenditure shares” (right panel) in equation (2). It is notable that the variation of the price indices for the poor across regions arises about equally from variation in local prices and the variation in local expenditure shares. Both of these price indices deliver regional variation in the price index of the low-income households from 1.95 to 2.09, very close to the variation obtained for the full price index.

### III. Conclusion

Cravino and Levchenko (2017) show that the 1994 Mexican peso devaluation was strongly anti-poor. This paper builds on

that finding by exploring the regional variation in the distributional consequences of that devaluation. We show that the devaluation was anti-poor in all of Mexico’s broad regions. However, the size of disparities between high- and low-income households differed substantially across regions. These differences are driven largely by the variation in the price indices of the poor households, as the high-income households fared quite similarly across regions. This variation in turn is driven about equally by the differences in price changes and differences in consumption baskets across regions.

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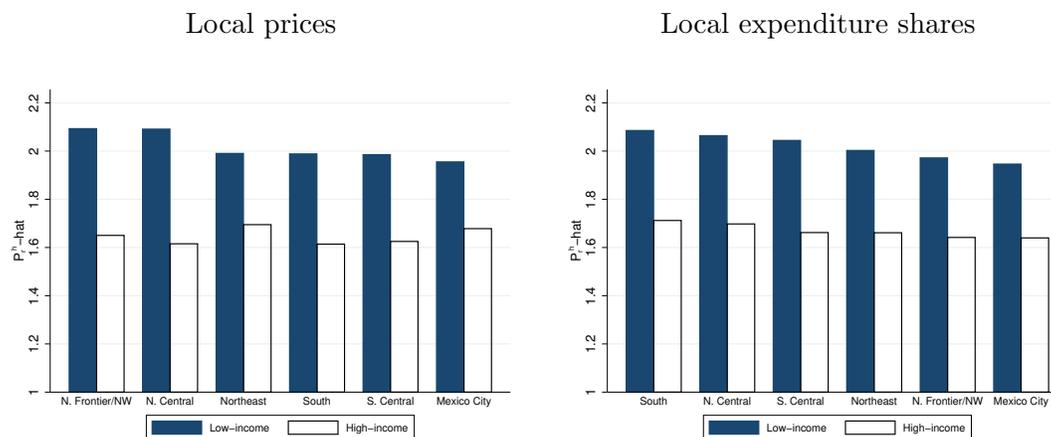


FIGURE 2. PRICE INDICES BY REGION AND INCOME LEVEL, HOLDING SHARES AND PRICE CHANGES FIXED

*Note:* This figure reports the price indices changes defined in (2) by region and income level, for the period October 1994 to October 1996.

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