A methodology to compute regional housing price index using matching estimator methods

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Abstract This paper proposes a methodology for a spatial cost index of housing that considers spatial heterogeneity in properties across regions. The index is built by combining three different techniques to reduce the spatial heterogeneity in housing: Quasi-experimental methods, hedonic prices and Fisher spatial price index. Using microdata from the Chilean survey CASEN 2006, it is shown that the quasi-experimental method called Mahalanobis metric within propensity score calipers (MMWPS) leads to a significant reduction in the potential bias. The technique matches dwellings of a particular region with other properties of similar characteristics in the benchmark region (Metropolitan region). Once the houses are matched, a hedonic price model is computed, and a regional housing price matrix is created using Fisher spatial price indices. The paper concludes the existence of price differentials for homogeneous houses across regions in Chile.

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1 Introduction

The cost of living is known to vary across regions in most countries; these variations have important implications for studies of regional income convergence, as well as for adjusting national wage bargaining agreements to take regional price differences into account. However, in many countries, regional cost of living indices are not estimated on a regular basis. In this paper, some initial explorations with the development of a
regional housing index will be explored. A price index would be helpful in the formulation and design of housing policies, social housing programs or any public policy focused on regional housing markets. Therefore, to design adequate regional housing policies and to understand the dynamics of the housing market, regional scientists must be able to precisely estimate the housing price index across different regions or spatial units.

The contribution of this paper is to take heterogeneity into account in the comparison of regional dwellings by using a quasi-experimental control group method (Rosenbaum and Rubin 1983). Using this method, we match dwellings between different regions with similar characteristics and quality. The output will be two samples (one for each region) of houses with homogeneous characteristics; which will allow comparing house prices through a regional housing price index. This information will be used to explore two issues: (1) whether housing prices are statistically different across the regions; and (2) the role of inherent heterogeneity in housing in computing these differences.

In this paper, we use three kinds of quasi-experimental control group methods: (1) nearest matching on the propensity score, (2) Mahalanobis matching including the propensity score and (3) Mahalanobis matching within score calipers. This paper evaluates the three methods in the context of the housing price index and chooses the best method based on the reduction of the average regional bias, measured through the standardized differences of house characteristics between spatial units (Tritchler 1995).

The matching method allows identifying one “control house” in the metropolitan region for each “treatment house” in any region, both having statistically similar characteristics. Therefore, one generates two samples with the same number of observations. Hedonic regressions are run on these samples, estimating the hedonic coefficients for the characteristics in each matched sample. Using the Spatial Fisher Housing Price Index and its superlative property, a regional housing price index in Chile is calculated for 2006.

The results show that Mahalanobis matching within score calipers was the best method to reduce geographic bias for each covariate among regions and the regional differential in the propensity score in the Chilean case. In addition, the Regional Fisher Price Index shows that the second Region (Antofagasta) is the most expensive in the country.

This paper contains six sections. Section 2 surveys the relevant regional housing price index literature. Section 3 discusses the quasi-experimental methods used and presents the hedonic functions. Section 4 describes the data used. Section 5 reports the estimation of quasi-experimental methods and parameters for hedonic regression. Section 6 considers the policy implications of the Regional Housing Price Index. Finally, Sect. 7 presents the conclusions.

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1 This distance measurement, unlike Euclidean distance, does not depend on the scale of variables and considers the correlations among variables.

2 There are 12 regions in Chile and one Metropolitan Region. Given that the Metropolitan region is the largest, each house in the regions was matched to a “control house” in the Metropolitan Region.