

**Urban socioeconomic attribute differences in the border areas  
of Imperial County, California, USA, and Mexicali, Baja California, Mexico**

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A new application of spatial analysis is developed and applied to study urban socioeconomic attribute differences in the binational urban region of Mexicali, Baja California, and Imperial County, California. Information from the U.S. and Mexican censuses are merged into a common framework. The research goals are to describe the spatial patterns of socioeconomic characteristics, both individual and combined; to evaluate if these patterns conform to a hybrid spatial model; to test the usefulness of a commonality index that shows the extent of similarities or differences on both sides of the border; and to evaluate the implications of the findings for future urban development and regional planning. The methods include mapping and cluster analyses, which are applied to small area samples to determine urban zones with common sets of characteristics. The commonality index assesses the groups of clusters to determine how evenly they are distributed on both sides of the

border. The findings indicate that the binational urban area conforms to a hybrid spatial model, in particular Mexicali tends to support a Mexican border city model (Arreola and Curtis, 1993), while the urban areas of Imperial County conform to rings or sectors (Greene and Pick, 2005), as well as disorder for some attributes. The spatial patterns of socioeconomic attributes for the entire binational urban area are analyzed. The index of commonality (Viswanathan and Pick 2005) is generally small in value, but higher for certain attribute groups. Implications of the findings for binational planning and policy, and future urban development are discussed.

### **Background**

Imperial County, California is a rich primarily agricultural country that has become somewhat more urbanized in recent decades. Its population in 2000 was 142,361, seventy six percent of which was urban. Its population is predicted to more than double to 294,200 by 2020 (California State Department of Finance, 2001). Across the border in Mexico, the Mexicali Municipio's population of 779,154 in 2000 is projected to reach 1.21 million by 2020 (CONAPO, 2003). The municipio in 2000 consisted over 90 percent of the city of Mexicali. The cities are important since the United States-Mexican border is one of the longest borders in the world between an advanced and developing nation. Also, these border cities are where most of the maquiladora industry is located, which contributes significantly to Mexican exports. Understanding the urban structure of the border's sister cities can shed light on the broader economic and political system of the U.S.-Mexican border and how it is changing.

### **Detailed Research Questions**

1. What spatial patterns exist in the binational urban region, for each of 16 socioeconomic attributes? This question is based on Burgess's ring model, Hoyt's sector model, and the Mexican border city model of Arreola and Curtis (1993). We postulate a hybrid model, in particular that the U.S. side corresponds to rings and/or sectors, while the Mexican side corresponds to the Mexican border city model.
2. What is the level of commonality for Imperial County-Mexicali derived from cluster analysis of an overall variable set, the four *a priori* groups, and the five data-driven variable groups? This level is tested by a commonality index (see Viswanathan and Pick, 2005). Variable groups that referred to as *a priori* are determined by the investigators, while data-driven groups are determined through quantitative procedures.
3. What are the implications of the study for planning and policy in the region, and for its future urban development?

### **Summary of Results**

The first research question is supported for most attributes. For most of the individual attributes, the data support a hybrid model, that combines a Mexican border city model for Mexicali, urban sector theory for Brawley, traditional ring theory for El Centro, and alternating sectors and rings for Calexico. Several individual attributes are a-theoretical, in particular migration, secondary education and underemployment.

The second research question, referring to clusters, is likewise largely validated. Mexicali again conforms to Mexican border theory, while the Imperial County (IC) city of El Centro predominantly supports traditional ring structure and the IC city of Brawley supports the urban sector

model. The city of Calexico in IC is less clear in its urban structure, but conforms to urban sectors more than anything else.

The findings on index of commonality reveal high extent of differences, which may be due mostly to the huge housing differences and the large economic gap between the two sides. For the a priori groups, the index was highest for population and social groups and lowest for economic and housing. The greater congruence of population and social attributes makes sense. For one thing, Imperial County cities have received large migration inflows from Mexico over many generations, so similarities in some of these characteristics relate to historical resemblance in migration patterns. Education may be more congruent because Mexicali has high educational levels for Mexico, while Imperial County has low educational levels for the U.S., leading to convergence. At the same time, Imperial County has influenced Mexicali through economic exchanges, limited reverse migration, and other factors.

The findings on index of commonality for data driven variable groups reveal several groups with enhanced binationality. In particular, an "economic deprivation" group has one of the higher values for the binationality index. The highest index value is for the data driven Group 4, consisting of nativity, home ownership and population.

The results point to adherence to a several urban models in selected parts of cities, including Mexican border city theory for Mexicali, sector theory in Brawley, ring theory for El Centro, and alternating ring and sector models for Calexico, depending on the dimension. This binational urban area's complex urban structure supports a hybrid model. A more unified border city urban theory awaits more extensive comparative analysis of all the border sister cities.

The methods used in this study may be applied by government planners to better understand border cities from an overall urban planning standpoint. The problems of putting into use this new planning tool include the reduced set of commonly-defined variables by both nations' censuses, lack of access to the data-bases on the other side of the border, and lack of will to include joint data-sets in urban planning. A precursor to utilizing such data for integrated planning is governmental

cooperation and the sharing of data and boundary files between U.S. and Mexican urban planners.

We hope that the methods and planning steps can be adopted and applied to better understand and make decisions on the urgent problems confronting the U.S.-Mexico border cities.

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