Geoforum, Vol. 22, No. 3, pp. 255–269, 1991
Printed in Great Britain

0016-7185/91 $3.00+0.00

The Transfrontier Organization of Space along the U.S.–Mexico Border

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Abstract: The transfrontier dimensions of urban space in the U.S.–Mexico international border have not been extensively researched. The growth of large cities along the boundary, and the emerging high-volume patterns of transborder social, economic, and functional interaction, call for a better understanding of the unique spatial formations that are evolving in this region. We might term these spatial configurations 'international border metropoli', a fusion of settlements from two cultures into a single spatial domain. Transfrontier urban phenomena tend to somewhat alter the significance of the international boundary line. Using the San Diego–Tijuana region as a case study, evidence of transboundary spatial integration is reviewed. Special attention is given to patterns of transborder travel. Data extracted from a survey of Mexican border crossers allow for an examination of both the volume and the form of transboundary, intraurban linkages that connect and unify border settlements like San Diego and Tijuana.

The effects of international boundaries on the human organization of space in the late twentieth century represent an important new area of inquiry for scholars. Prior to World War II, political geographers regarded the study of boundaries as central to understanding changing patterns of national power and territorial organization.[1] The stabilization of border zones since that time, and the subsequent pattern of urban growth along some international borders, particularly in Western Europe and the U.S.–Mexico border region, has left a vacuum of research addressing the resulting cultural, economic, and spatial organization of settlements along increasingly permeable boundaries. Only a few scholars, such as HOUSE (1982, p. 55), have recognized that borderlands represent ". . . a field of forces, changeable through time, within which there is economic, social, cultural and political interaction between contrasting States, and even differing civilizations". Clearly the development of world capitalism and changing forms of technology have decreased the need for external boundary maintenance (WALLERSTEIN, 1974), thus setting in motion a host of regional forces that have led to the growth of industries, transboundary trade, and urban settlements along international borders.

This paper seeks to understand the dimensions of urban spatial organization along the U.S.–Mexico border, an area in which large cities have exploded onto the regional landscape in the decades following World War II (HANSEN, 1983). The study of a metropolis stretched across an international boundary—a functional spatial arena that encloses two national cultures—opens up fertile ground for new research. Explanations of urban events must be tied to variables measured against two national cultures, while a unique spatial formation, a metropolitan region bisected by an international boundary, emerges.

An understanding of border settlement geography will become crucial in local and regional government decisions, and in U.S.–Mexican foreign policy matters. It is clear in the latter case that the border region has already become prominent on the agenda of bilateral negotiations (UNITED STATES HOUSE OF REPRESENTATIVES AND SENATE, 1984).

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It is hoped that future urban research will lay the groundwork for transnational public policy debates about this important international region.

This paper begins with an overview of the context within which metropolitan areas along international borders may be studied. Discussion then moves to the 'twin metropolis' of the U.S.–Mexico border region, focussing briefly on two elements of its bicultural character: landscape and morphology. Finally, this paper considers the spatial organization of the transborder metropolis, by utilizing transboundary travel data gathered in a field research project carried out in the San Diego–Tijuana region.

International Boundaries and Urban Space

As mentioned above, until recently research on the nature of settlements along international boundaries had been scarce. In traditional political geography, scholars tended to focus on the military and strategic significance of boundaries in national territorial disputes or in analyses of power relations between nation states (SPYKMAN, 1942; MINGHI, 1963; PRESCOTT, 1965). Early researchers emphasized the restrictive nature of borders, viewing them as an obstruction to 'normal' patterns of economic activity (BOGGS, 1940). Christaller's *Central Places in Southern Germany*, published in 1937, outlined elements of uncertainty associated with international boundaries, arguing that borders tended to upset the size and spacing of trade areas, creating locational problems for consumers (CHRISTALLER, 1966, p. 96). Losch wrote on international boundaries in his discussion of "Economic Regions under Difficult Conditions", and compared political boundaries to the edges of market areas, noting that "both break up the regular meshes, which are then replaced by relatively uneconomic areas" (LOSCH, 1954, p. 199).[2]

After World War II, boundary studies shifted their focus from a prior concern with the criteria for boundary delimitation to a consideration of the functions boundaries perform (MINGHI, 1963). This clearly reflected changing historical circumstances in the postwar era, in which European boundaries were stabilized, and questions surrounding their function became more important than those concerning their definition or defense. New strands of research began to examine what HOUSE (1968, p. 331) termed "normal boundary contact between states".

European scholars have thus been important contributors to the literature on boundaries. During the postwar era, these scholars were among the first to acknowledge the gradual shift away from absolute national sovereignty toward a more integrated world system. In Europe, changing technologies and economic processes caused researchers to envision a more integrated system of nation-states, in which the political borders would become more permeable, allowing for exchanges of workers, consumers, products, and capital (ANDERSON, 1982). A popular view among these writers is represented by the statement: "Territorial borders are quite meaningless for science, and economic interdependence crosses political borders not occasionally, but as a general rule" (LUHMAN, 1982, p. 241). Of course, it is also the compact political geography of Western Europe, and the historic juxtaposition of ethnic systems, culture, language, and religion that have contributed to the regional integration of societies across political borders (HOUSE, 1968, pp. 334–344; TAGIL, 1982).

An important dimension of postwar Western Europe and other boundary regions is the appearance of urban areas of significant size. To date, these border settlements have not been studied in great detail. Research has tended to focus on the regional impacts of European integration (JENSEN-BUTLER, 1987). But, a number of important urban districts, including Lille, Trieste, Basel, Geneva, and Liege–Maastricht–Aachen, have evolved along national borders in recent decades. These and other settlements have accelerated a growing pattern of cross-boundary economic and social exchanges linking settlements on either side of the political line. For example, it is estimated that in Western Europe approximately 250,000 workers travelled across international borders to work in 1975 (RICQ, 1982). These linkages have contributed to European scholars' view of border zones as functional planning regions, in which the significance of a political boundary as a strict dividing line between nations becomes modified (QUINTIN, 1973; STRASSOLDO, 1982).

Border cities, in some cases 'twin cities' overlapping the boundary line, provide an ideal laboratory for studying transboundary social and economic interaction. One issue that has concerned the European writers, for example, has been the cross-border economic impacts of activities on each side of the national boundaries (SAYER, 1982; HOUSE, 1968). Others have been preoccupied with the legal and political aspects of European transfrontier cooperation (DUPUY, 1982; ANDERSON, 1982; STRASSOLDO, 1982; HANSEN, 1983).

While Western European boundaries have provided one framework for considering transborder linkages and the organization of urban space, the U.S.–Mexico border region offers an important comparative setting in which to examine similar processes, During the period 1950–1980, this region experienced one of the most dramatic regional growth patterns in the world.

In the 1970s, seven U.S. metropolitan areas along the border displayed growth rates between 3 and 5 times the national rate of 11%, while in Mexico, border city population grew at rates of between 67 and 96%, far exceeding the national average for Mexico of 37% (HANSEN, 1984, pp. 140–141). In the 1980s, growth has continued, *albeit* at slower rates than the previous decade. The implications of urbanization along the U.S.–Mexico boundary are as complex as they are in Western Europe. Substantial differences in levels of economic development and culture, as well as a history of borderlands conflict (FERNANDEZ, 1977), make negotiation of border area relationships more difficult. The philosophy of European integration that led to the formation of the European Economic Community does not presently have a counterpart in North America. While urbanization has occurred on either side of the international boundary, and interaction flourishes, there is no clear answer as to the future of border relationships. More critical to this paper, the organization of space within which those transboundary relationships will be housed remains to be understood.

HANSEN (1981, pp. 22–30), in reviewing location theory and growth pole literature, as they apply to border regions, has concluded that these fields of knowledge do not provide an adequate basis for analyzing the economy of border regions. Still less conceptual guidance exists for explaining the organization of urban space in border regions. Yet what is clearly needed is an understanding of the ways in which man imposes order upon the border environment, and molds a landscape appropriate to the special characteristics of this generic regional type. We must begin by studying the cultural elements of border living space, or, as PRESCOTT (1987) argues, more attention should be focussed on the study of the cultural landscapes around the international boundary. Furthermore, we need to understand better the transboundary spatial relationships embedded in urban space, and here we might heed the words of MINGHI (1963, p. 428) who noted that "For this, we must concern ourselves with the role of the boundary in determining spatial patterns of selected behavioral activity which is in itself an indicator of iconographic attitudes."

The Bicultural U.S.–Mexico Border Metropolis

Cross-border functional integration is mediated by the degree of boundary permeability that exists in a given border region. In the case of Western Europe, growing economic interdependence since World War II has led to the gradual evolution of more porous borders, and consequently, of border zones that are functionally and culturally assimilated. Along the U.S.–Mexico border, such matters have not been fully explored. We need to examine the effects of the boundary on contiguous urban settlements, while accounting for regional conditions that are rather distinct from the Western European case. A growing community of scholars from the U.S. (DILLMAN, 1970, 1983; PRICE, 1973; SLOAN and WEST, 1977; MARTINEZ, 1978; HANSEN, 1981, 1983, 1984; HOUSE, 1982; HERZOG, 1985, 1990), and Mexico (BUSTAMANTE and MALAGAMBA, 1980; GRAIZBORD, 1983; TAMAYO and FERNANDEZ, 1983), now recognizes the border zone and its twin city pairs as a region encapsulating common social, geographic, and economic phenomena.

Since World War II, in-migration to Northern Mexico and the southwestern U.S. has fueled the growth of a system of large and medium sized paired metropolitan centers along the border. The demographic transformation of the border zone has been heavily influenced by the large migration streams originating in the interior of Mexico, with the borderlands as an interim destination and, ultimately, the southwestern U.S. as the final destination. The migration process has been the driving force in the bicultural history of the border region, and has served as an important determinant of the cultural landscapes and spatial form of settlements juxtaposed around the boundary line. For nearly a century, a steady stream of transboundary movements unfolded, leaving a legacy of Mexican border cities on one side of the boundary, while an important ethnic group, Mexican-Americans, would become a dominant urban social group on the other side. Thus, the impact of these migration streams is expressed, not only by the numbers of Mexicans permanently residing in U.S. cities, but by the alchemy of cultural forces introduced into the region, and manifest by language, behavior, and landscape (MEINIG, 1971).

Most scholars recognize that Mexican migration to the borderlands has evolved in a cyclical manner

(BUSTAMANTE, 1978). These cycles, beginning around 1880, reflect the fluctuations of economic and political circumstances that caused Mexican migrant labor to be in demand at one time, yet rejected at another. Over time, from the late nineteenth century until the present, the fluctuating dependency, and extended experiences of Mexicans in the U.S. Southwest, helped to institutionalize the back-and-forth migration streams, and generate a dependency in both nations on these laborers. The existence of a regional need for Mexican labor in the U.S., and thus the promise of temporary employment north of the border has, in part, been responsible for the growth of large cities on the Mexican side of the international boundary. These settlements could house Mexican citizens who periodically migrated into the U.S. to engage in temporary work, thereby supplying a source of income vital to their well-being in their permanent residences in Mexican border cities.

One of the more intriguing characteristics of the bicultural metropolis on the U.S.–Mexico border is the gradual increase in the degree to which the lives of city residents on either side of the boundary are interconnected. Urbanization seems to have magnified the extent to which border residents in the U.S. and Mexico are symbiotically united (DILLMAN, 1983). This unity has been noted by researchers studying the elements of interdependence within twin metropolitan areas, including Brownsville–Matamoros (GILDERSLEEVE, 1978), Laredo–Nuevo Laredo (SLOAN and WEST, 1976, 1977), El Paso–Ciudad Juarez (D'ANTONIO and FORM, 1965; McCONVILLE, 1965), and San Diego–Tijuana (DUEMLING, 1981; HERZOG, 1985, 1990).

Yet the notion of interdependence is rather complex. GRAIZBORD (1983) reviews this concept for the U.S.–Mexico border region, and makes a distinction between border region economic space, which has become distinctly less responsive to the boundary line, and national political space, which clearly responds to the differences created by the international border limits. Those who regard 'interdependence' from a political perspective tend to reject the principles of 'integration' or 'symbiosis' in describing the border region and its 'twin cities'. RICO (1983), for example, is quite critical of the idea of interdependence, claiming it to be more rhetoric than reality, for, when one examines the relationship between the two countries along the border, the complete domination of the U.S. over Mexico is apparent. Studies of the Ciudad Juarez–El Paso region have illustrated this most clearly (MARTINEZ, 1978; CASTELLANOS, 1981). CASTELLANOS (1981, p. 46) has shown that when one focuses on the economic nature of cross-border relations between Ciudad Juarez and El Paso, 'interdependence' cannot possibly exist, because in the areas of tourism, twin plants, and commerce, there is no mutual benefit but, rather, the subordination of Mexicans to U.S. consumer values. FERNANDEZ (1977, p. 116) has argued that the large concentrations of population in Mexican border towns perform the function of a reserve army of workers at the disposal of U.S. industry and agriculture.

While the application of dependency theory to border city relations generates the critical perspective noted above, it is possible to view border city dynamics in less polemic manner, and thus open up what GRAIZBORD (1983, p. 6) has termed a more "positive analysis of U.S.–Mexico relations at the regional and urban scale". Price, for example, in studying Tijuana in the early 1970s, observed what he termed 'international symbiosis', or the interdependence of two or more cultural systems (PRICE, 1973). MEINIG (1971) noted a similar process operating in Ciudad Juarez–El Paso. In both cases, the growing juxtaposition of the lives of border residents has led to numerous forms of cooperation, both formal and informal, and this has led to HANSEN (1981, p. 156) to conclude that "Economic, social and cultural relations between the twin cities have been more marked by increasing symbiosis than by the confrontation of differing systems."

In recent studies of interdependence between U.S. and Mexican settlements along the border, some scholars recognize that this integration is growing stronger (HANSEN, 1981; HOUSE, 1982). Forces responsible for this integrated settlement geography are economic, environmental, and functional. Economic interdependence is a product of history and geography: border cities share a common region and its resources, and therefore have an increasingly mutual role in the growth and development potential of the region (RAMIREZ ACOSTA and CASTILLO RODRIGUEZ, 1985). Their economies have often developed in a complementary fashion, although the U.S. city typically enjoys far greater prosperity in the relationship. Tourism, trade, and industrial development are often cited as the principal economic activities that tie U.S. and Mexican border cities together (DILLMAN, 1983).

Environmental interdependence along the inter-

national frontier results when urban areas are juxtaposed over a physiogeographic surface whose logic has little connection to humanly constructed political boundaries. Air sheds, hydrological systems, and land formations spill across the international border between U.S. and Mexican cities. Both the transboundary flow of water and air, and the bilateral arrangement of land uses impose a unifying effect on these settlements. Consequently, issues such as air and water pollution or water supply affect both sides of the boundary, and need to be resolved mutually (BATH, 1982; BATH and APPLEGATE, 1982; MUMME, 1980). Pollution generated by the growing assembly plant (*maquiladora*) sector is increasingly a bilateral concern (SANCHEZ, 1989).

Functional linkages between U.S. and Mexican border cities emerge as an outgrowth of economic interdependence, and are strengthened through environmental, social, cultural, and historic ties. These linkages, simply put, involve an overlapping across the political boundary of the built environments of twin cities, and an evolving interconnection of infrastructure on either side of the border. As urbanization continues, there is a greater tendency for freeways, sewer systems, mass transit projects, industrial developments, and other man-made facilities to become integrated (HERZOG, 1985; GRAIZBORD, 1986).

San Diego–Tijuana: Morphology and Cultural Landscapes in a Transboundary Metropolis

One prototype of the U.S.–Mexico transfrontier metropolis is found in the San Diego–Tijuana region, the largest of the U.S.–Mexico border urbanized regions, with some $3\frac{1}{2}$ million inhabitants. Although San Diego is rapidly becoming a major U.S. sunbelt metropolis, a number of important Mexican influences in the landscape and morphology of the city still persist. The original town center, known as 'Old Town' today, is a reminder of the first settlement in this region, a mission built by Spanish priests in the middle of the eighteenth century. Such well-known landmarks as Presidio Park and the Santa Fe railroad station are monuments to the strong Spanish–Mexican architectural heritage of the pre-1850 era (FORD, 1984). Nearly half of the historic landmarks registered by the State of California for San Diego county are strongly linked to the Hispanic heritage of the city (MILLS, 1968). The abundance of Spanish colonial style churches, housing built in Northern Mexican ranch style, and other buildings with Mexican design influences add further to the vivid bicultural alchemy of this Southern Californian metropolis. Still more evidence emerges when one recognizes that San Diego county place names literally abound in the use of Spanish language.

Modifications imposed by American culture on the traditional morphology and cityscape of Tijuana have been recent, yet perhaps more dramatic. The international boundary line has long had a significant impact on Tijuana's physical structure. During the earliest period of settlement (1820–1880), the town's central business district was located only a few hundred yards from the border, allowing rapid circulation into the U.S., an intrinsic activity and principal reason for the city's existence, even in the nineteenth century (PINERA and ORTIZ, 1983). The most important residential neighborhood in the city's early years of growth (1880–1930) was Colonia Libertad, a community that literally abutted the international boundary, and was built with capital earned by Mexican workers in the U.S. who were subsequently deported (BUSTAMANTE, 1985).

Tijuana's morphology has traditionally been compact, with important uses densely clustered around the central business district. This conforms with an urban design pattern common to most Mexican cities, one inherited from Spanish colonial city engineers, in which important urban institutions surrounded the main plaza. In Tijuana, the central business district and tourist zone have been the dominant spatial nucleus since the settlement's inception. Yet recently this pattern has yielded to a changing morphology that features a more decentralized geometry, similar to the urban form in Southern California (HERZOG, 1985, 1990). Middle- and upper-income suburban housing developments, many built with public monies, are appearing on the urban periphery. City planners tend to encourage decentralization, reflecting the state and federal planning strategy for Tijuana. Two satellite growth centers on the outskirts of the city have been developed with public monies to achieve that objective (CABRERA FERNANDEZ, 1978). A freeway system is being designed to facilitate this centrifugal expansion, thus encouraging the privatization of intraurban travel (e.g. automobiles) at the expense of mass transit. The influence of Southern California is apparent. Additional examples of the 'NorthAmericanization' of the Tijuana landscape include the construction of a U.S.-style regional shopping mall (Plaza Rio Tijuana) in the city's redeveloped river zone area, the introduction of condominium-style housing, and the use of

American construction materials, such as glass and steel, in skyscrapers.

The spatial organization of the bicultural metropolis described above reveals a network of transboundary movements between settlements on each side of the border. These movements reflect the fact that the boundary has become highly permeable to increased interactions between residents, businesses, and institutions north and south of the border line. At the regional scale, this border metropolis displays sets of high-density flows of automobiles, trucks, pedestrians, and mass transit vehicles between important origin and destination points on either side of the international boundary.

Human interaction between border cities has become more consistent and predictable over time. Interaction is enhanced by the growing interdependent relationship mentioned above. Strong family and cultural networks create transfrontier social bonds. Extended family networks transcend the border. On one side, family members may have become U.S. citizens, while relatives reside on the Mexican side of the boundary. Visitations, cooperative investment, and transboundary family employment arrangements are common. A substantial number of Mexican children attend school in the U.S., although they reside in Mexico. An equally large number of Mexican citizens avail themselves of the U.S. postal system, by renting post office boxes north of the boundary. But the most significant bond that ties people and cities together is an economic one. Mexicans regularly cross the boundary to work in the U.S., both legally and illegally. Consumers on each side of the boundary seek to find comparative advantages on the opposing side of the line. Americans, for example, purchase tourist services (food, entertainment, artisan goods), and commodities or services rendered inexpensive by lower labor costs on the Mexican side of the border (automobile repair, for example). Mexicans purchase U.S. high-technology goods, clothing, specialized foods, and other commodities not available or more expensive on their side of the boundary.

Transboundary Travel Patterns in the San Diego–Tijuana Region: a Survey of Mexican Border Crossers

Until recently, little was known about travel between U.S. and Mexican border cities such as San Diego and Tijuana. Ironically, although San Diego–Tijuana represents the most heavily travelled boundary zone in the world, for many years the only regional data available on border crossings and international commuters were collected by the Immigration and Naturalization Service, and estimates of monthly flows were considered to be rather crude.[3]

Table 1. Trip purposes of Mexicans entering San Diego, 1983*

Trip purpose	%
Home	12.2
Work	40.2
School	1.7
Recreation	3.1
Shop	21.2
Social	8.4
Personal business	8.3
Other	4.6
$N = 1078$	100.0

*Source: 1983 survey of Mexican border crossers (directed by author), San Ysidro, CA.

It has remained for scholars to use primary data to improve understanding of cross-border travel patterns. On a typical weekday during the year, an estimated 50,000 Mexicans cross the border in a northerly direction. Between 40 and 50% of these travellers are daily commuters journeying to work, according to data collected by the author in 1983 (Table 1).[4] An additional 40% cross for the combined discretionary activities of shopping, social visiting, personal business, and recreation. Shopping is clearly the dominant transboundary activity of this second group. These regular crossing patterns verify the strong bicultural relationship that exists between the two cities. Tables 1 and 2 offer categorical breakdowns of the survey data by trip purpose (Table 1), and frequency of crossing/length of stay in the U.S. (Table 2).

When one places transboundary spatial flows into a temporal context, the logic of transborder movement patterns is clear. The most regular temporal pattern favors commuter workers. Four-fifths of this group crosses the border into San Diego county on a daily basis, while those crossing for other purposes (shopping, social, personal business etc.) venture across the boundary less frequently (Table 2). Crossing to attend school in San Diego also yields a regular pattern, but northbound school trips represent less than 2% of total trips (Table 1). In the case of Tijuana to San Diego trips made for recreation, social travel, and shopping, the preponderance occurs only once a

Table 2. Trip purposes across border, by frequency and length of stay*

	Border crossing frequency					Duration of stay in U.S.				
Trip purpose	Daily	Several times per week	Weekly	Every 2 weeks	Rarely	Less than a few hours	Few hours	Full day	Several days	Longer
Home	17.3	29.3	15.0	5.3	26.3	6.0	13.5	16.5	8.3	60.9
Work	80.9	8.5	5.1	2.1	2.3	1.2	12.4	81.3	1.6	4.6
School	84.2	15.8	0.0	0.0	0.0	0.0	5.2	73.7	15.8	5.3
Recreation	28.1	6.3	12.5	6.3	40.6	6.3	46.9	43.8	6.3	3.1
Shop	10.2	26.1	27.0	13.3	19.0	4.4	88.1	8.1	9.7	1.8
Social	6.5	28.3	22.8	8.7	28.3	5.4	60.9	19.6	6.5	13.0
Business	28.3	35.9	16.3	6.5	10.9	2.2	70.7	22.8	3.3	3.3
Other	29.8	34.0	17.0	4.3	12.8	2.1	80.9	10.6	0.0	8.5

*Source: 1983 survey of Mexican border crossers (directed by author) San Ysidro, CA.

week or less, while business trips are made either 'daily' or 'several times a week' (Table 2).

Table 2 also summarizes the length of time spent in the U.S. by various categories of border crossers. Three time patterns emerge. Border crossers going home stay the longest; those crossing for recreation, shopping, social, or personal business stay in the U.S. for a few hours on average; 80% of the commuter workers remain in San Diego for a full day. This temporal pattern serves to distinguish the transboundary commuter worker from all other border crossers.

While the destinations of Mexican border crossers appear to be somewhat specialized (discussed below), the spatial pattern of origin locations within Tijuana (Figure 1) reveals a relatively dispersed set of origin points. When the location of border crossers is analyzed geographically, no single neighborhood or zone within Tijuana dominates as a source area for cross-boundary travel, although a moderate distance bias with respect to the international boundary does emerge. As one moves away from the point of entry, the number of crossings declines both in the case of commuter workers and social trips. Shoppers, however, may diverge from this pattern somewhat, as their perception of distance is less influenced by proximity to the boundary than it is by the type of product they wish to purchase. In general, however, the spatial arrangement of border crosser origins in Tijuana demonstrates that interaction with San Diego is not limited to one neighborhood or social group, but affects the entire urban area, cutting across socioeconomic and physical space, and reaffirming the strong degree of inter-city, cross-border integration of lifestyles.

Transboundary commuter workers

By far the most significant category of border crossers from the survey was Mexicans who commute to jobs in San Diego county on a daily basis. The Mexican commuter worker is an important phenomenon along the entire 2000-mile boundary. More than 1 million Mexican border residents possess border crossing cards which allow them to enter and stay for up to 72 hr in a zone of not more than 25 miles from the border. The border crossing card does not permit the user to work in the U.S. Yet, since there is no control on the use of these cards, it is probable that a large number of these border crossers work in the U.S. Data substantiating the actual number of illegal commuter workers are nearly impossible to obtain, however (HANSEN, 1981, pp. 90–92).

In this survey, commuter workers represented slightly more than 40% of the total number of cross-border trips surveyed. Of this group, 94% travel across the boundary on either a daily basis or several times a week. Most commuter workers tend to remain in San Diego all day, and return each evening to their residences in Tijuana. However, some commuters stay in San Diego for less than a full 8-hr day because they are doing part-time 'piecework'.

Legal transportation connections between Tijuana and San Diego are highly accessible and extensively used by Mexicans. Workers either drive across the boundary on one of the 24 lanes, or they walk across. Those who walk can continue their work trip by connecting into the local public bus system, using the Greyhound bus, or by riding the multimillion dollar San Diego light rail trolley system, all of which give adequate service from the border at San Ysidro to the city of San Diego, 20 miles north.

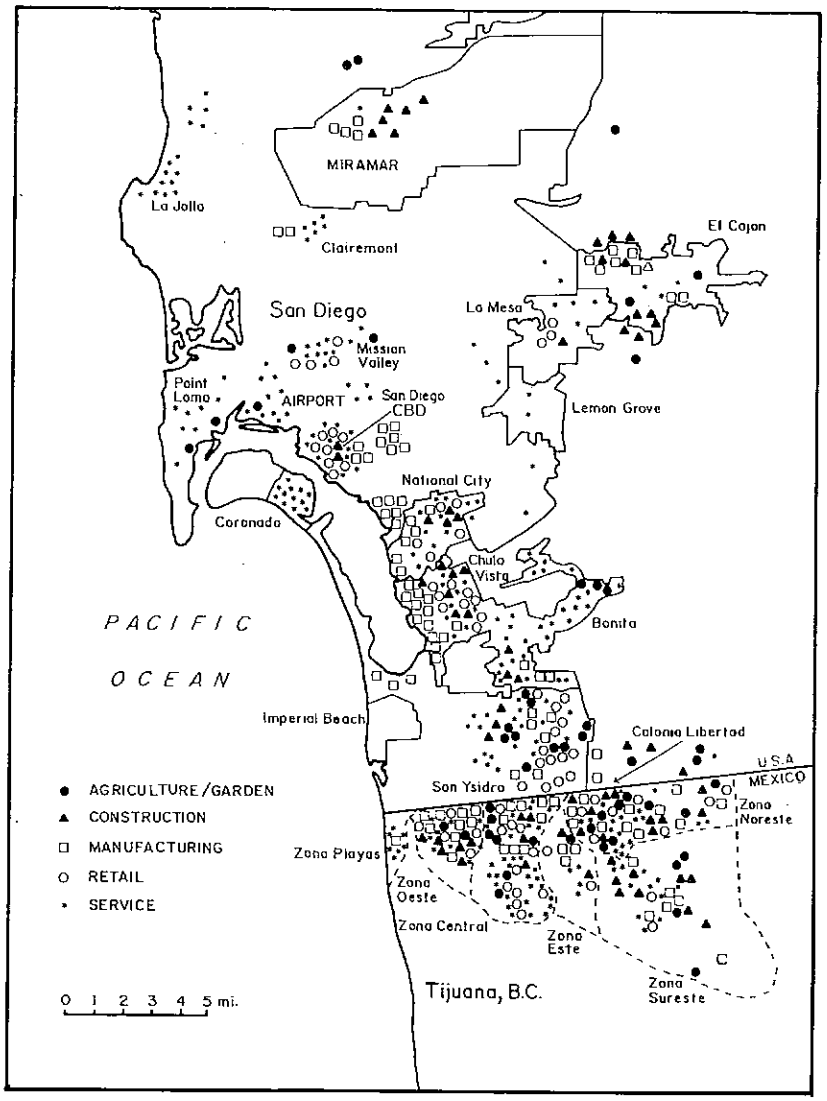

Figure 1. Mexican commuter workers in the Tijuana–San Diego metropolis: origin–destination patterns by employment category. Source: 1983 survey of Mexican border crossers (directed by author), San Ysidro, CA.

Workers who walk across the border, according to informal interviews carried out in the field, tend to utilize private automobiles available to take workers to specific job sites. Commercial parking lots near the border provide waiting areas for pedestrian crossers, ready to commute to their jobs. Separate rider systems exist for sweatshop manufacturing, restaurant and hotel locations, household service workers, and agricultural and landscaping workers. A substantial number of commuters are legal U.S. citizens, and thus can cross the border to work without difficulty. Many others, however, as mentioned above, do not possess 'green cards' and may be crossing illegally to work.[5] The daily movement of Mexican workers across the international boundary into San Diego represents an important dimension of the new spatial formations that are rapidly evolving along the U.S.–Mexico border. We might term this type of travel the 'international journey to work'. By examining these movements, some lessons about the spatial organization of the 'international border metropolis' can be gleaned.

Although no single zone of Tijuana provides a majority of commuters coming to San Diego, one neighborhood displaying the highest levels of daily commuter migration to San Diego deserves attention. This area, Colonia Libertad, offers an important case

study of Mexican commuters. Several explanations for its importance as a source area of commuters can be offered. First, Colonia Libertad is the oldest neighborhood in Tijuana, having first been subdivided in the early twentieth century when Mexicans in California were being deported south of the border (HERNANDEZ, 1983; BUSTAMANTE, 1985). Residents of Colonia Libertad have lived near the border since the 1920s, and, in some ways, are more 'Americanized' than other Mexicans in Tijuana. They demonstrate a long history of transboundary travel, and have developed a bicultural heritage of language and work skills. Over time, many have obtained legal residence in the U.S., and the skills and knowledge to find employment north of the border.

A second reason for Colonia Libertad's large contribution to the commuter labor force is that it lies strategically adjacent to the international boundary, and therefore allows rapid access into San Diego (Figure 1). Residents are able to walk across the border and find passage directly to their work locations, speeding up their overall journey-to-work trip. This strengthens the already strong 'pull' force of the U.S. minimum wage on Tijuana's civilian labor force. Equally, although Colonia Libertad is an old, established neighborhood, there is still considerable poverty among long-established residents. Thus, economic need imposes a 'push' force upon residents of this area, which, over time, has translated into the emergence of a commuter work force within the neighborhood.

Communication between Tijuana residents and temporary employers in San Diego is good. Over time, information systems, like the one associated with clandestine private automobiles ('*raiteros*') that link Mexican workers with places of employment, have been developed to facilitate the journey to work. Personal friendships are also helpful in this process. Within Tijuana, there appears to be extensive shared knowledge among neighborhood residents about who works in the U.S., and their degree of success there.

Locational patterns of employment for Mexican commuters

Most of the jobs filled by commuter workers fall into the categories of manufacturing laborers, service workers, construction, agriculture, and outdoor maintenance workers (Table 3). The most compelling logic one can attach to the employment patterns of

Table 3. Occupations reported by Mexican commuter workers, Tijuana, 1983*

Occupation category	Number of jobs reported	%
Agriculture	30	6.8
Construction	58	13.3
Manufacturing	107	24.5
Retail/trade	35	8.0
Services	196	45.1
Hotel/motel	43	
Personal	14	
Auto repair	47	
Private household	25	
Gardener	50	
Other	17	
Other	10	2.3
Total	436	100.0

*Source: 1983 survey of Mexican border crossers (directed by author), San Ysidro, CA.

Mexican commuters is that they are location-specific, and, therefore, verify the transboundary nature of spatial organization in the San Diego–Tijuana metropolis. Origin–destination flows of Mexican commuter workers are neither casual nor random in form. Work trip destination can be disaggregated by type of employment. The result is that specialized clusters of work trips are identified, showing knowledge by Mexican workers of labor submarkets in San Diego (Figure 1). Specialized labor markets that are filled by Mexican commuter workers can be identified from the survey data in sectors such as automobile repair, entertainment, hotel and other services, agricultural and landscaping, construction, and manufacturing.

Automobile repair worker jobs, which included mechanical and upholstery repair, as well as painting, tended to cluster in Chula Vista, National City, and south San Diego. This labor market spills across the border from Tijuana, where automobile repair and recycling began as a necessity for residents driving used cars purchased in Southern California, and evolved into an important cross-border service industry. While Tijuana provides automobile repair services at low rates to Americans, San Diego's South Bay area—Chula Vista, National City, and San Ysidro—provide a similar set of inexpensive services to the San Diego metropolitan area.

A large share of international commuters work in the entertainment and hotel service sector. The hotel industry reaps a considerable proportion of the total profits derived from this and other tourist activities, and Mexican commuter workers (typically female)

play an important role in the work force that provides maid service to approximately 30,000 hotel rooms. Two zones for this work group were identified in the data collected for this study. First, a cluster along San Diego Bay was noted, and second, many work destinations for this category were located in Mission Valley. Both areas are prime locations for the region's hotel business. Another important service category is that of private household domestics, scattered throughout the region.

Agriculture and landscaping represented another category of workers displaying a distinct spatial pattern. San Diego county, with its 4000 square miles of terrain, usually ranks among the nation's 10 most productive counties in terms of the aggregate economic value of agricultural products. Workers mainly cluster in south San Diego county (San Ysidro and Bonita), an area in which truck farming of commercial crops (mainly vegetables) remains vital, although these activities are gradually giving way to urban development. The main crops are winter tomatoes, celery, snap beans, and lettuce. Interestingly, a much smaller proportion of commuter workers in the data set ventured into northern San Diego county, a larger agricultural production area than south San Diego. One might attribute this pattern to the distance–decay effect, yet a better explanation is tied to the recognition that this area employs a substantial number of undocumented Mexican workers in the production of avocados, flowers, and citrus fruits (NALVEN and FREDERICKSON, 1982). Aside from farming cash crops, Mexican commuters also work as landscapers, principally in the north county area, the zone in which the largest number of new housing tracts are located. Because of San Diego's subtropical climate, both the agricultural and landscaping forms of employment are in high demand throughout the year.

Mexican commuters also worked in the construction and manufacturing sectors. Construction jobs tend to be scattered throughout the urban area, but were especially noticeable on the urban fringe, the area where the largest proportion of new urban growth is taking place. In this sector, Mexicans tend to perform the most menial and low paid tasks, such as building foundations and laying concrete. Mexican commuters often work for a minimum wage, and are not union members. The more sophisticated construction jobs, such as heavy grading, electrical finishing, plumbing, and framing, are typically filled by unionized Anglos.

Similar to the plight of construction employees, Mexican commuter workers in the manufacturing sector find themselves at the bottom end of the worker hierarchy. Work environments where the Mexican commuters dominate tend to be the least desirable of the manufacturing sector, and involve exposure to noise, dirt, danger, and other unhealthy conditions. Work locations for San Diego were concentrated in the South Bay region (Chula Vista, National City) and the adjacent CBD, two of the principal industrial zones in the metropolitan area. Typical jobs filled by Mexican commuters included clothes manufacturing, manual assembly, cannery work, and laundry work. The area houses such industries as food and fish processing, shipbuilding, kelp processing, and chemical production.

Patterns of transborder shopping (northbound)

The transboundary flow of Mexican shoppers into San Diego county amounted to the second most important form of intraurban travel within the international boundary metropolitan region. In the data set utilized in this study, shopping trips consumed 21% of the total number of northbound trips measured. Only the journey to work surpassed this category of border crossings in terms of total volumes of movement (Table 1). Through informal interviews, it was learned that the Mexican perception of U.S. products strongly influenced the decision to cross the border in search of specific consumer items. This pattern is consistent across the border. Scholars have shown, for example, that Mexicans in border cities tend to view American products as superior in quality, while others prefer the environment of U.S. shopping centers, and the favorable availability of credit (URQUIDI and MENDEZ VILLAREAL, 1978).

Table 4 offers a breakdown of journey-to-shop distances for different kinds of products purchased, The principle good purchased in San Diego was food, followed by business purchases (other), clothing, products for the home, and, finally, electrical appliances. Considering the inconvenience of travelling across the international border into San Diego, it is surprising that almost half the Mexican shoppers named food, a lower-order good, as their primary purchase. This appears to illustrate the strong behavioral bonds that are emerging between Tijuana and San Diego: even the purchase of low-order goods is enough to generate a significant flow of consumers across the international boundary.

Table 4. Tijuana consumers: average shopping distances to and from border by product, and mode of travel*

Shopping purpose	Number of cases	%	Distance travelled (border to destination) (km)	Mode of transport (%)	
				Auto	Walk
Food	87	39.7	2.6	28.1	71.9
Clothing	42	19.2	7.4	42.9	57.1
Articles for home	16	7.3	8.2	50.0	50.0
Major electrical appliances	14	6.4	9.8	76.9	23.1
Other purchases (business)	60	27.4	9.9	88.6	11.4
Total	219	100			

*Source: 1983 survey of Mexican border crossers (directed by author), San Ysidro, CA.

If food, clothing, household articles, major electrical appliances, and business purchases represent a crude progression from low- to high-order goods, then the increasing distance travelled by Mexican shoppers from the border at Tijuana to San Diego (Table 4) conforms with standard consumer behavior patterns and central-place theory. The proportion of shoppers crossing by automobile rather than on foot increases from low- to high-order goods as well (Table 4), While almost 72% of food buyers cross the border on foot, only 57% of the clothing shoppers cross on foot, and even smaller proportions travel by foot to purchase articles for the home, major electrical appliances, or business purchases.

Conclusions and Policy Considerations

In the last three decades, international boundary regions in some areas of the world, particularly Western Europe and the U.S.–Mexico border region, have become increasingly urbanized. The growth of cities along these political borders presents a new agenda to geographers and other scholars, especially when strong evidence of transboundary interaction exists. At some point the transborder relationship blurs the significance of the international boundary, and a unique spatial formation begins to emerge—the 'international border metropolis'. The international metropolis is characterized by a fusion of settlements from two different cultures, integrated by social, economic, cultural, and spatial ties that transcend the political boundary. One must reevaluate the role of the boundary in defining border urban spatial organization.

This paper has focused on the urban spatial formations along the U.S.–Mexican border as a case in point. Both the literature and empirical evidence point to a trend in which twin settlements along the boundary are becoming spatially and functionally more interdependent. This integration of settlement geography has come about through cross-border relations that, over time, connect the lives of citizens, economic institutions, and governments on either side of the boundary.

Survey data allow one to describe the spatial organization of new transboundary formations. What becomes very clear is that the political boundary is regularly transcended by high-density flows of intraurban activities that cross the border. Thousands of functional intraurban trips are made daily between San Diego and Tijuana. More importantly, connections between origin and destination reveal that San Diego's South Bay area (Chula Vista, National City, San Ysidro, Imperial Beach) is becoming strongly integrated with Tijuana, linked by shopping trips, work trips, and social interaction. Over time, the influence of Tijuana, measured in terms of labor markets, consumer activities, family and social ties, or exchange of money, has gradually begun to seep north of the border. The survey of Mexican commuters to San Diego county offers an interesting dimension of the overall spatial formation described in this study. One can speak of what might be termed the 'international journey to work', on the surface a simple case of intraurban movement across an international border, yet in essence a more complex phenomenon revealing how labor is exchanged when a city from a world industrial power shares a border area with a city from a Third World developing nation.

The existence of a large daily work force in Mexico flowing regularly across the border into the San Diego metropolis is further evidence of a gradual blending of San Diego and Tijuana into a single

functional region. International commuter work trips in San Diego–Tijuana have become well entrenched in the region, and operate within a logic that demonstrates considerable knowledge by Mexicans of the spatial organization of labor markets on the U.S. side of the boundary. On the origin side, at least one neighborhood (Colonia Libertad) owes much of its formation to daily commuters. In some ways, we might label this neighborhood a Mexican 'bedroom community' for jobs in the U.S., since so many commuters reside here.

The international journey to work reveals linkages embedded in the landscape of border city regions like San Diego–Tijuana. Field surveys disclosed a transport infrastructure integrated into the transborder movement needs of international commuters. In some cases, clandestine private automobile systems have been set up to help commuters reach specialized work destinations, and even to recruit temporary labor. Information is exchanged through these networks, allowing regular employment for those with commuting experience. Over time, linkages between origin zones and specialized job site destinations have evolved.

The global implications of the international journey to work deserve attention as well. Mexican poverty and high unemployment rates in the border cities will continue to make cross-border commuting attractive. Even while the Mexican government has sought to restimulate a struggling economy, it is likely that inter-border city migration will continue, just as movement further into the U.S. interior by undocumented Mexican laborers is likely to go on. Daily commuting along the border is now well entrenched, not only in San Diego–Tijuana, but also in Calexico–Mexicali, El Paso–Ciudad Juarez, Brownsville–Matamoros, and other paired urban areas (HANSEN, 1981).

For border metropolitan areas like San Diego–Tijuana, daily commuting may generate difficult policy questions for the future. The impacts on local labor markets and transport facilities are not extensively known. Arguments in favor and against Mexican commuters have been made. U.S. labor unions might argue that these workers take jobs away from permanent residents, yet this reasoning is weakened by the fact that many commuters are legal citizens of the U.S., on the one hand, and that Mexican workers are filling labor needs that would go otherwise unmet, on the other. Also, some local observers argue that commuter workers, like undocumented Mexican laborers, provide cheap labor sources within the U.S., and thus keep prices on certain goods and services low. Along the Mexican border the commuter worker flows allow some potentially unemployed Mexicans to earn money on the U.S. side of the border, money that is injected into the Mexican border region economy. One might also speculate that this allows for a natural transfer of technology between the two nations. Mexicans who work in the construction trade or in factories in the U.S. may return to Mexico at some point with new job skills.

Some scholars feel that in order to maintain its present economic growth level, the U.S. may have to import unskilled labor in large quantities (REYNOLDS, 1984). This occurs with great regularity in Western Europe, where workers from southern European nations like Greece, Yugoslavia, and Italy regularly migrate to jobs in the wealthier nations of the region, especially Germany and Switzerland. Without these large labor infusions, inflation and the cost of living might increase substantially in the U.S. Thus, it appears likely that U.S. and Mexican labor markets will continue to grow interdependently.

The emergence of transboundary urban spatial formations has other policy implications as well. Given increasing volumes of travel across the border, cooperation between the U.S. and Mexico on matters of traffic management and transport planning will become necessary. Problems of traffic congestion at the border, and connections between freeway and mass transit infrastructure must be jointly managed by planners from both sides of the boundary. Increasing population densities and the demand for services near the boundary line require some coordination between the two nations in the planning of such infrastructure as sewer systems, energy plants, and health facilities. Environmental problems that spill across the border in either direction must be jointly managed. The transboundary impacts of land uses need to be better understood. In the long term, a planning process that allows both San Diego and Tijuana to identify and plan for projected cross-border trends would be the appropriate institutional response to the emerging spatial organization I have documented in this paper. Whether such a planning process is politically feasible may be one of the great challenges facing the border region by the end of this century.

Acknowledgement—The author acknowledges the collaboration of Frederick Stutz, Department of Geography, San Diego State University, in earlier tabulations of Mexican

border crossing data, and in analysis of commuter worker and shopper flows.

Notes

1. These studies are reviewed in MINGHI (1963) and PRESCOTT (1965, 1987).
2. HANSEN (1981) reviews location theory in the border context and notes that, although most scholars have found border regions to cause locational disadvantages, a few have recognized the attractions of a border zone. These include: strategic trade relations, transfrontier investments, and specialized export industries. More recently, BECKMANN (1984) has reviewed the locational dynamics of boundary areas under different conditions: open border, closed border, mobile and immobile labor, mobile and immobile goods.
3. Monthly estimates of commuter workers are collected and tabulated by the U.S. Immigration and Naturalization Service. Interviews with officials from this agency revealed that these estimates significantly undercount the number of Mexican commuters due to seasonal variations, inadequate sampling techniques, and substantial cases of nonreporting of commuter status. Attempts to measure the flow of border crossings in the San Diego–Tijuana region more accurately have been made by the COMPREHENSIVE PLANNING ORGANISATION (1978).
4. This proportion may not reflect the true ratio of commuter workers to total border crossers in Tijuana–San Diego for several reasons: first, the survey concentrated on peak periods for border crossings, rather than uniformly interrupting the flow of travellers throughout a 24-hr day; second, some respondents refused to be surveyed, and others gave erroneous information to protect their border crossing privileges.
5. The question of the legal status of Mexican border crossers in the survey proved to be complex, and therefore deserves discussion. A distinction is normally made by immigration authorities between: (a) commuter aliens, or Mexicans possessing legal proof of lawful permanent residence in the U.S. (referred to as 'green cards'), but who choose to live in Mexico; (b) border residents, or Mexican citizens who permanently reside in a border city, and possess a nonresident border crossing identification card (a 'white card'); and (c) Mexican citizens with a nonimmigrant visa for temporary entry into the U.S. Mexicans in either the first category ('green card' holders), or those with temporary work visas who are legally permitted to cross the international boundary to work in San Diego, or other areas of California. However, it is known that a substantial number of Mexican border residents (the second category above) cross the boundary to work in San Diego, in violation of the nonresident border crossing permit. In the survey administered by the author, data on 'immigration status' of crossers could not be considered reliable, since, as mentioned above, some Mexicans who told the surveyors they were crossing to work, and possessed 'green cards', may have been giving false information. Discussions with local immigration officials corroborated this pattern more generally. Immigration and Naturalization Service officials pointed out that it is virtually impossible to enforce the nonwork status of the border resident crossing permit, since no mechanism exists to monitor border crosser activities once they are allowed entry beyond the international check point. It should be added that, since a significant sector of the Hispanic work force in San Diego and other California urban areas is drawn from the undocumented Mexican labor pool, this group should be considered part of the larger sociogeographical context within which legal crossings occur. One study in the San Diego region (COMMUNITY RESEARCH ASSOCIATES, 1980) estimated that between 25,000 and 45,000 undocumented Mexican workers are employed in San Diego county.

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