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DEVELOPING THE U.S.-MEXICO BORDER REGION
FOR A PROSPEROUS AND SECURE RELATIONSHIP:
HUMAN AND PHYSICAL INFRASTRUCTURE ALONG
THE U.S. BORDER WITH MEXICO

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Human and Physical Infrastructure Along the U.S. Border with Mexico

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Human and Physical Infrastructure Along the U.S. Border with Mexico

Abstract

The population of the U.S. border with Mexico has several characteristics that differentiate it from the rest of the nation, and that help to explain its lower than average personal incomes per capita. Growth of the population has been far above the national average and has led to a series of challenges for policymakers. Meeting the challenges will help determine whether or not the U.S. border region will continue to be one of the poorer areas of the country. The population along the U.S. border with Mexico is heavily concentrated in a few metropolitan areas, and with socio-demographic characteristics that cause incomes to be 87 percent of the national average, or 65 percent if the county of San Diego is excluded. Border residents have higher youth dependency ratios and lower labor force participation rates, both of which reduce the share of the population that contributes to income. In addition, they have lower levels of schooling, and a larger share of the population that has not mastered English. In theory, the ability of border communities to serve as gateways for U.S. trade with Mexico increases incomes and opportunities, and while there is some evidence to support this, the lack of physical infrastructure for a smoother, more rapid flow of commercial trade and personal border crossings, constrains the benefits from increased trade flows. Unmet needs for additional infrastructure are likely to grow as Mexico is currently investing heavily in its seaports and railroad networks in order to increase the flow trade originating in Mexico and the Pacific, and as environmental infrastructure investment has lagged far behind the needs projected during the pre-NAFTA debates.

Introduction

No characteristic is more central to the Mexico-U.S. border's unique opportunities and challenges than its sustained high rate of population growth over several decades. The border is a destination for internal migrants in both Mexico and the United States, for retirees, for seasonal residents looking for warmer winters, for job seekers, and for students. It is also a destination for international migrants, although primarily on the U.S. side where wages are higher and jobs have been relatively plentiful. Indeed, it is argued here that the border's relative economic success is reflected in the high rate of population growth, which, in turn, is the source of many of the problems and challenges confronting the region. Put another way, the border's environmental,

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human, and social challenges stem largely from its rapid rate of population growth and the correlated expansion of jobs and incomes.

To be sure, the long-run expansion of jobs has not produced a plentiful supply of high wage positions, particularly on the U.S. side, where wages and incomes lag behind the national average, often by a large margin. Nevertheless, wages and incomes are consistent with the human capital characteristics of U.S. border residents, while the economic dynamism of the region is reflected in the relatively high rate of growth of the labor force over the long run. One of the primary challenges for residents of the U.S. border with Mexico is to close the income (and poverty) gap with the U.S. average. This is a task that will require more investment in people and education, and will be extremely difficult as long as the U.S. resident population is constantly replenished by Mexican immigrants who bring a much lower level of average educational attainment.

Rapid population growth has put pressure on physical infrastructure as well as the region's natural systems. Roads, housing, energy, water, and air quality have all been stretched to provide necessary services. In many instances, state and local government revenues are inadequate to the task of providing public goods such as schools, water, and waste treatment, and federal resources have not kept pace with the growth in trade and the need for border crossing infrastructure for trade facilitation and community development. Other needs, such as the need for private investment in energy supplies, are shaped by conditions along the border, but are part of a much larger set of issues that are important to the Southwest and the entire nation.

In what follows, the U.S.-Mexico border is defined as the counties and municipios that touch the international boundary.¹ This is somewhat arbitrary, as is any definition, but is not too different from the implicit concept most people seem to use when they discuss "the border." In addition, given that counties and municipios cover the entire land mass of all U.S. and Mexican states and are primary administrative units for collecting and reporting census and other data, this definition has the significant virtue of being operational and allowing for the measurement of most socioeconomic and demographic variables. In total, there are 39 municipios and 25 counties on the international border.²

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The characteristics of the border population will be examined in the next section. Particular attention is given to those elements such as age structure, education, labor force participation, and language, which highlight the differences between the border and the U.S. average. The characteristics of the U.S.-side border population are used to shed light on the regional income levels. This is followed by an examination of border infrastructure, particularly infrastructure that facilitates the movement of goods and people. Finally, a few words are addressed on the topic of border environmental infrastructure.

Population and Population Characteristics

Table 1 shows total populations and border populations for Mexico and the United States. Historically, the U.S. border region has been more populated than the Mexican. For example, in 1950, the U.S. side had over 1.5 million residents, compared to less than 850,000 on the Mexican side. As can be seen in Table 1, by 2005, the two countries' border populations were nearly equal, having increased by a factor of 4.5 times in the United States, and almost 8 times in Mexico.

Table 2 shows the average annual rate of population growth on both sides of the border over two periods, 1950 to 1980 and 1980 to 2005. Perhaps the most important characteristic of the border population is that it grew faster over both periods than in either nation as a whole. In the U.S. case, population in the border region increased more than twice as fast as the United States in the first period and nearly twice as fast in the second period. In addition, the U.S. border population increased more rapidly than Mexico as a whole, although not faster than the Mexican border. Average annual population growth rates in the Mexican border region are significantly higher than in Mexico overall but the relative difference between Mexico and its border is not as great as the difference between the United States and its border. Between the two periods, growth slowed in every border state and both countries, but not in every border region of every state. In Coahuila, New Mexico, and Texas, border population growth picked up in the later period.³

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Table 1: Border Population, 2005

<i>Region</i>	<i>Population</i>	<i>Region</i>	<i>Population</i>
Mexico	103,263,388	United States	295,895,897
Mexico border	6,320,306	United States border	6,796,129
Border region of:			
Baja California	2,430,988	California	3,095,515
Sonora	586,680	Arizona	1,274,329
Chihuahua	1,384,360	New Mexico	250,124
Coahuila	319,353	Texas	2,176,161
Nuevo Leon	17,983		
Tamaulipas	1,580,942		

Source: U.S. Census Bureau (2007); INEGI (2005).

Table 2: Average Annual Population Growth, 1950-2005

	<i>Country or state</i>		<i>Border counties/municipios</i>	
	1950-1980	1980-2005	1950-1980	1980-2005
Mexico	3.23	1.75	4.27	3.07
Baja California	5.64	3.59	5.59	3.61
Sonora	3.69	1.85	4.30	2.56
Chihuahua	2.92	1.94	4.38	3.16
Coahuila	2.60	1.90	2.72	3.02
Nuevo León	4.16	2.07	-0.71	0.35
Tamaulipas	3.34	1.82	3.54	2.52
United States	1.37	1.07	3.29	2.13
California	2.72	1.69	3.90	1.86
Arizona	4.39	3.18	4.16	2.35
New Mexico	2.19	1.56	2.20	2.23
Texas	2.06	1.91	2.26	2.42

Source: Anderson and Gerber (2008); U.S. Census Bureau (2007); INEGI (2005).

Given the growth rates in Table 2, border population was doubling approximately every 16.5 and 21 years in Mexico and the United States, respectively, from 1950 to 1980, and every 23 and 33 years from 1980 to 2005. While the latter period experienced a significant slowing of population growth, population growth continues to pose a major challenge for the supply of housing, schools, health care, transportation, and utilities.

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Urban Growth and Dependency Ratios

Much of the high growth of the border was concentrated in urban areas. Since at least 1950, the border regions of both countries have been more urban than the average for either country alone, but growth intensified this difference so that by 2000, the percent urban was above 90 percent in both border regions while national figures for both Mexico and the United States remained in the upper 70 percent range.⁴ The difference is probably due in large part to the fact that the Sonoran and Chihuahuan Deserts span the border and cover much of its land area. Large stretches of the 2000-mile long border are severely constrained by the scarcity of water and as a result, population growth is more concentrated in places where water is abundant or at least available. On the U.S. side, this is reflected in the fact that 10 of the 25 counties touching the border accounted for more than 96 percent of the border population in 2005.⁵

Table 3: Dependency Ratios, 2006

Region	Dependency ratio	Region	Dependency Ratio
United States	35.6		
California	35.6	New Mexico	37.0
Imperial County	38.7	Dona Ana County	38.3
San Diego County	35.1	Texas	36.3
Arizona	37.6	Cameron County	43.9
Cochise County	39.1	El Paso County	40.8
Pima County	37.1	Hidalgo County	43.8
Yuma County	44.6	Webb County	44.8

Source: U.S. Census Bureau (2007).

Along the U.S. border, the high rates of population growth are partly due to migration but also a result of higher rates of natural increase (Anderson and Gerber, 2008, p. 44). High fertility levels imply a younger population and a higher dependency ratio. Table 3 shows the overall dependency ratio for the United States, the four U.S. border states, and the ten U.S. border counties that account for more than 96 percent of the total U.S. border population. Dependency ratios are calculated as the population share under 18 plus the share over 66. With the exception of California, border states have more dependents per capita than the United States overall, and border counties have more dependents than border states (with the exception of San Diego, California). In several cases, border counties have dependency ratios that exceed the U.S.

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average by 20 or even 25 percent (Yuma, Hidalgo, and Webb counties; Hidalgo includes the McAllen MSA and Webb includes Laredo).

Dependency ratios have implications for regional income since it tells us about the share of the population that is potentially working, and the regional infrastructure needs. A younger population implies a need for more schools, while a concentration of retired people implies a greater need for health care facilities. Looking exclusively at youth dependency ratios, given in Table 4 and defined as the share of the total population that is under 18, only one county in the sample (Pima, the home of Tucson), and none of the U.S. border states, have relatively fewer youth dependents than the United States as a whole. Several counties, including all four of those in Texas, exceed the U.S. ratio by more than 25 percent, and Cameron (Brownsville), Hidalgo (McAllen) and Webb (Laredo), by nearly 50 percent. As a consequence of the age structure of the population, and all else equal, incomes in the U.S. border regions should be lower than in the United States overall, and educational needs should be greater.

Table 4: Youth Dependency Ratios, 2006

Region	Dependency ratio	Region	Dependency Ratio
United States	24.6		
California	26.1	New Mexico	26.1
Imperial County	29.5	Dona Ana County	28.5
San Diego County	25.3	Texas	27.7
Arizona	26.4	Cameron County	34.1
Cochise County	25.1	El Paso County	31.6
Pima County	24.2	Hidalgo County	35.5
Yuma County	29.0	Webb County	37.5

Youth dependency ratios are the share of the total population under 18.

Source: See Table 3.

Labor Force Participation Rates

The ability of border communities to provide for the educational needs of their children is based in large part on the resources available locally. In turn, that implies that income levels are important indicators of the abilities of local communities to satisfy the needs of its school age population. Income levels depend on a variety of factors, some demographic, some having to do

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with the human capital embodied in the working age population, and some having to do with the physical infrastructure available for private and public enterprises. The implicit assumption of the analysis that follows is that the structure of the economy—the complement of industries and occupations—is a reflection of the population and is not given exogenously. This implies that if jobs are low wage, it is in large part if not entirely due to the fact that the skills and infrastructure required for higher wages do not exist in sufficient quantity or quality to attract the investment needed. Furthermore, wages might be high but per capita income or household income can still be lower than average if a smaller share of the population is working age, or if a smaller share of the working age population is in the labor force.

Table 5: Labor Force Participation Rates, 2006

Region	Labor Force Participation Rate	Region	Labor Force Participation Rate
United States	78.5		
California	76.3	New Mexico	76.1
Imperial	65.2	Dona Ana	72.3
San Diego	79.6	Texas	76.0
Arizona	77.1	Cameron	66.0
Cochise	73.0	El Paso	67.1
Pima	75.4	Hidalgo	67.8
Yuma	74.1	Webb	69.0

Source: U.S. Census Bureau (2007); Bureau of Labor Statistics (2007).

Table 5 shows that border populations have lower rates of labor force participation. Since this characteristic of the population is calculated as the sum of the employed and unemployed, divided by the population 18 to 66, the fact that the border region has higher dependency ratios is not a direct factor. The data in Table 5 indicate that in the border counties, a smaller percentage of the working age population (ages 18 through 66) participates in the labor force. This may be by choice, or reflect their inability to work even though they would like to, or it may be due to the fact that they are discouraged by the labor market conditions they encounter and have given up looking for work. San Diego is the only exception to this pattern. Comparing the national labor force participation rate to rates in individual states, the data in Table 5 show that a smaller share of the working age populations in each state participates in the labor force. The gap between national and county levels is dramatic in several cases. For example, seven of the 10

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counties in Table 5 have more than a 5 percentage point gap with the U.S. average, and four of the counties have more than a 10 percentage point gap, including three of the four Texas counties.

Labor force participation rates are not directly related to dependency ratios, but it is conceivable that there is an indirect connection if the ability to work is constrained by the need to care for children. It is beyond the scope of this paper to examine the situation with respect to affordable and readily available day care, but if the supply of day care spots is limited, *ceteris paribus*, a higher youth dependency ratio would cause lower labor force participation rates as parents or other working age members of the household stay out of the labor force in order to care for children.

In addition to the child care hypothesis, there are at least two additional possible explanations for the lower labor force participation rates. The first concerns domestic, seasonal migration. If significant numbers of adult males are agricultural laborers who seasonally migrate and are gone for long periods, it would reduce the local share of the working age population that is in the labor force. Further research would be necessary to determine if this is a factor or not. The second hypothesis concerns the overall health status of the border population, which is problematic in a number of areas. They suffer higher rates of hepatitis A (two to three times greater than the national average) and tuberculosis (twice the national average; Pan American Health Organization, 2005); diabetes is the third leading cause of death on the U.S. side of the border (and the leading cause on the Mexican side; Pan American Health Organization, 2007). While tuberculosis rates, even high ones, are still too low to have much of a direct impact on labor force status, diabetes rates may make a marginal impact as the Pan American Health Organization (2007) estimates that 1.1 million border residents (both sides) over the age of 18 have type 2 diabetes. Even if the direct effects of morbidity rates are unlikely to explain lower labor force participation rates, they may have a ripple effect on family members and other informal health care providers who are forced to have more tenuous links to the labor force.

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Human Capital and Education

Once individuals join the labor force, the amount they earn is a function of the human capital they bring with them and the private and public capital available at work and in the wider economy. Beyond income, human capital is also important to the development of human capabilities. Nobel Laureate Amartya Sen (1999) provided the theoretical basis for viewing human capital as a central component of human development within a framework that emphasizes the capacity for humans to make meaningful choices, while Mahbub ul Haq and his colleagues in the United Nations Development Program (UNDP) operationalized the concept of “people-centered development” in the form of a human development index (HDI) (Haq, 1995; UNDP, 2005). Human capital is multi-dimensional but in both Sen’s work and the measurements of the UNDP, it focuses on education and health as key. Therefore, this section will turn toward an examination of education and health issues.

Table 6: Educational Attainment

	<i>Percent of population 25 and older:</i>		
	Did not complete high school	With bachelor's degree or beyond	Speaks Spanish at home
United States	15.9	27.0	11.1
California	19.9	29.0	25.6
Imperial	37.7	10.6	65.7
San Diego	15.1	33.3	21.7
Arizona	16.2	25.5	19.8
Cochise	15.5	20.4	22.1
Pima	13.7	29.6	22.5
Yuma	27.3	11.1	39.3
New Mexico	18.5	25.3	29.7
Dona Ana	26.2	24.9	55.0
Texas	21.4	24.7	28.1
Cameron	36.8	15.1	72.1
El Paso	31.7	17.8	75.2
Hidalgo	39.8	14.5	83.2
Webb	40.9	12.7	93.2

Source: U.S. Census Bureau (2007).

Education along the U.S. side of the border with Mexico lags other regions of the country. The data in Table 6 show the share of the population 25 and over that did not complete high school and the share that has a bachelor’s degree or higher. As is clear from the data, seven of the 10

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counties, and all of the border states, have a larger share of their population without high school completion; eight of 10 counties and three of four states have smaller shares with college degrees. In the case of high school completion rates, five of the 10 counties have double the national level of population without high school.

There are several factors behind this, but probably none more important than the constant flow of Mexican migrants into the U.S. border regions. The fact that migration is a continuous and ongoing activity warrants caution when interpreting the meaning of lower educational attainment in the U.S. border counties. Mexican migrants 15 years of age and older arrive in the United States with 8.1 years of schooling if they are average for Mexico (INEGI, 2005). While 91.6 percent of the population is literate, the great disparity between the standards for school-leaving in the United States and Mexico (high school and the equivalent of middle school, respectively) means that the flow of migrants into the border region will pose an educational challenge for border communities indefinitely into the future.⁶ Migration flows complicate the job of providing high quality education and stretch community resources. Using the variable of language at home as a proxy for migration, the simple correlation between the share of the population 25 and older that speaks Spanish at home (Table 5, column 4) and the share without a high school diploma (column 2) is +0.96; between Spanish at home and a college degree (column 3) is -0.75.⁷

When comparisons are made to the United States as a whole, Mexican migrants to the United States arrive not only with fewer years of schooling but also with a lower quality of schooling. Comparisons of school quality between the U.S. border region and the overall U.S. average are less certain, but international comparisons between the United States and Mexico show that while neither country is doing well, Mexico in particular is lagging. According to the Organisation for Economic Co-operation and Development's (OECD) Program of International Student Assessment (PISA), both Mexico and the United States rank significantly below the OECD average on assessment tests of the science and mathematics knowledge and skills of 15-year-olds (OECD, 2007). Against a comparison group of 57 OECD and non-OECD countries that make up close to 90 percent of the world's population, Mexico ranked near the bottom (between 46th and 48th) on both tests in 2006. While the U.S. performance did not shine either

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(e.g., between 32nd and 36th on the science test), the data indicates that the quality of education in Mexico is below that in the United States.

Looking at the U.S.-side population on the border that speaks English at home, there are much smaller gaps in educational attainment between the border counties and the U.S. national average. For example, among the population that speaks English at home, seven out of 10 counties have better high school completion rates, and five of 10 have more college graduates than the U.S. national averages. The point here is not to disparage Spanish speakers; it should be fairly clear to nearly everyone that we need more Spanish, not less, in the United States today. Rather, the point is to acknowledge that there is a significant educational challenge to U.S. communities that receive large numbers of migrants from Mexico. Communities are relatively aware of the expenditure issues associated with educating a non-English speaking population, and for regions that have had time to adjust teacher training and recruit Spanish speakers, the challenges of providing education to students who do not speak English may not be as great as they once were. There is, however, another challenge, which is the one associated with trying to strengthen local economies by recruiting or developing high wage employers when a large share of the population lacks basic education and speaks English “less than well.” The lack of English imposes a penalty on individuals and, in the aggregate, on communities. The wage penalty associated with a lack of English has been demonstrated empirically for male workers in the United States who speak Spanish (McManus, Gould and Welch, 1983), for female workers who speak Spanish (Mora and Dávila, 1998), and for workers in the border region where Spanish is more common and probably more accepted (Dávila and Mora, 2000).⁸

Income

Given the discussion so far, we should expect per capita border incomes to be lower since several of the indicators point in that direction. Border counties have, in general:

- More dependents, with a smaller share of the population in prime working ages
- A lower rate of labor force participation for those who are working age
- Fewer years of schooling in the adult population
- An indeterminately lower quality of education
- A large share of the population that speaks English “less than very well”⁹

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The one factor pointing in the other direction, towards possibly higher incomes, is the high rate of urbanization along the border.

Table 7 shows real per capita personal income for the border.¹⁰ The numbers in Table 7 reflect the variables just mentioned and consequently, it is not surprising that the border, including border counties and border states, are less well off than the nation as a whole. California and San Diego are exceptions, but that is not surprising either, particularly since they are exceptional in several other areas as well, and many of their characteristics are not representative of the other parts of the border.¹¹ Given that San Diego County is an outlier, data for the border counties are calculated with and without San Diego. Since it is nearly one-half of the border population, it has a disproportionate impact on border data that are weighted by population. Note that the border incomes per capita drop from 87 percent of the national average with San Diego included, to 65 percent when it is omitted.

Table 7: Real Per Capita Personal Income and Income Growth

<i>Region</i>	<i>Real per capita personal income, 2005</i>	<i>Share of U.S. level</i>	<i>Average annual growth rate</i>	
			1990-2000	2000-2005
United States	34,757		1.51	0.60
U.S. Border*	30,321	87.2	1.27	1.71
Border w/o San Diego	22,642	65.1	0.98	2.04
California	37,462	107.8	1.30	0.42
Imperial	22,074	63.5	-1.72	1.92
San Diego	40,383	116.2	1.78	1.74
Arizona	30,386	87.4	1.36	0.95
Cochise	26,958	77.6	0.79	3.87
Pima	29,658	85.3	1.37	1.66
Yuma	21,081	60.7	-0.94	2.47
New Mexico	28,175	81.1	1.19	2.40
Dona Ana	23,216	66.8	0.70	2.88
Texas	33,253	95.7	2.11	0.77
Cameron	17,760	51.1	1.40	1.04
El Paso	24,081	69.3	1.38	2.79
Hidalgo	16,738	48.2	1.05	1.74
Webb	19,342	55.6	1.97	2.57

*The border includes all counties, not only the ones shown.

Source: Bureau of Economic Analysis (2006); author's calculations.

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What is perhaps surprising is the extent to which the income of some counties falls below the national average. This is particularly true for the eastern side of the border and also reflects an east-west gradient in which incomes rise as we move from east to west. While income levels are significantly lower, one bright spot is that the growth rates for the last few years, 2000 to 2005, are encouraging. While it is too soon to determine if this is a long run trend, it is consistent with the idea that increased trade flows have made the local border economies more resilient. For example, Webb County which contains Laredo, the busiest port on the U.S.-Mexico border, was one of the fastest growing counties in the 2000-2005 period. Similarly, El Paso, Texas, and Dona Ana, New Mexico, which picks up trade overflow from El Paso, also grew relatively rapidly.

The Challenge of Human Infrastructure

One of the key features of contemporary economics is the increase in wage and income inequality. Rising inequality has been underway in the United States since at least the mid-1970s, and while there does not seem to be a consensus among social scientists about the causal factors, there is agreement that the less skilled and less educated suffer disproportionately.¹² Workers at the lower end of the wage spectrum have had stagnant wages for more than two decades, with a brief respite in the 1990s. Given the level of educational attainment along the border, and in spite of the higher growth since 2000, eliminating the income gap between border communities and the national average seems very distant. If the primary cause of the border/non-border income gap is the level of human capital embodied in the border population, then the policy options for closing the income gap are fairly obvious, although they are likely to be difficult to implement. Policies that include more educational expenditure, more English instruction, and an increase in the quantity and quality of schools, along with campaigns to ensure that students remain in school, are called for. This is a difficult challenge given that public school finances in the border states leave them near the bottom in per pupil revenue and expenditure.¹³ In addition, overall state revenue is very limited: Texas ranks 49th in state tax revenue per capita and Arizona is 40th. New Mexico and California do better (or worse, depending on your view), ranking 21st and 10th, respectively (U.S. Census Bureau, 2006). Whether a lean state government is better or worse is not the point here. Rather it is to note the empirical fact that it is difficult to invest in closing the education gap or in providing easier

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access to child care (which may raise labor force participation rates) when state finances are limited.

Given the limited space and time to produce this essay, it is also not certain what the precise source of the education gap might be. Is the gap a reflection of the presence of adults who were educated in Mexico, or is it a result of lower levels of education attainment among native born Spanish-speaking residents of the border regions? It would be worth investigating this since strategies for addressing the problem will vary depending on whether the education gap is a result of conditions among less educated Mexican adults or Spanish-speaking U.S. children.

Physical Infrastructure

Between 1990 and 2007, U.S. exports to Mexico grew from \$29.8 billion to \$117.6 billion in inflation adjusted 2000 dollars, for an average annual compound rate of growth of 8.4 percent per year. Imports were even more impressive, increasing in real terms from \$33.3 to \$173.5 billion and racking up a real annual growth of 10.2 percent (International Trade Administration, 2008; U.S. Bureau of Labor Statistics, 2008). In 2007, as in 1990, a majority of the exports from the United States to Mexico originated in border states (58 percent in 2007). While there is some doubt as to the accuracy of the origin of exports estimates, most analysts agree that Texas is the primary source of U.S. exports (41 percent), followed by California (13 percent) and Arizona (4 percent). New Mexico's share is less than one percent.

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Table 8: South to North Truck and Personal Vehicle Crossings, 2005

	<i>Trucks</i>	<i>Personal Vehicles</i>	<i>Annual growth rate of truck crossings, 1995-2005</i>
TX: Del Rio	64,075	1,808,457	2.72
CA: Tecate	69,586	1,028,854	2.63
TX: Eagle Pass	97,729	3,665,861	3.10
TX: Brownsville	234,640	7,103,553	0.24
AZ: Nogales	266,233	3,445,984	1.29
CA: Calexico/Calexico East	320,212	9,506,563	3.04
TX: Hidalgo	491,077	6,969,846	5.22
CA: Otay Mesa/San Ysidro	730,253	19,170,293	2.50
TX: El Paso	740,654	15,971,739	1.00
TX: Laredo	1,455,607	6,262,697	3.39

Source: Bureau of Transportation Statistics (2008).

In addition to rapid growth, another characteristic of U.S.-Mexico trade is that the majority of it is land based. Consequently, the state of land based ports of entry and exit are central to the efficiency of the trading system. Table 8 shows the number of truck and personal vehicle crossings (northbound) in 2005 and growth in the volume of truck traffic since 1995. Data are shown for only the top-10 ports (in terms of trucks headed north) and several ports (Laredo, for example) have more than one bridge or one entry point.

The data in Table 8 are ordered from fewest to most truck crossings. The ranking for personal vehicle crossings is closely correlated, although there are exceptions. For example, Laredo and Hidalgo (McAllen area) are the busiest and fourth busiest points of entry for freight, and also have the two fastest rates of growth of truck traffic. Both are in Texas, both are near Monterrey, and both are on the main routes from Mexico's industrial centers to markets and industry in the United States.

The ports in Table 8 will continue to see significant growth, perhaps even an increase in the rate of growth. This is due to several factors. First, trade between the United States and Mexico is likely to continue to grow as manufacturing sectors across North America continue to develop tri-national networks and planning perspectives. Led by the automakers, but followed by building materials, medical devices, electronics, and other sectors, firms continue to integrate and rationalize their production across the NAFTA countries. This has led to the growth of

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manufacturing sectors in Texas, for example, that were not present before the 1990s (Gerber, 2002).

Second, the Calderon administration in Mexico launched a National Infrastructure Program (2007-2012) which, among other things, is developing the capacity of its seaports to handle the overflow of goods entering North America from Asia. Four Pacific Coast ports are central to the National Infrastructure Program: Manzanillo in Colima, Lazaro Cardenas in Michoacán, Guaymas in Nogales, and the future port of Punta Colonet in Baja California. Given the saturation of U.S. West Coast seaports, the options for handling increased trade volumes from Asia are limited to building more ports, expanding existing ports, and/or diverting trade flows to the East Coast. For a variety of reasons, the United States is probably unable to expand its capacity significantly, leaving a land bridge from Mexico as the primary option (Randolph, 2008). Furthermore, the Calderon administration views infrastructure development as a key to Mexico's long-run economic prosperity, and has moved to significantly expand the capacity of its seaports, their rail linkages, and intermodal transportation networks. Manzanillo has seen enormous growth, beginning before the Calderon administration, and is currently the most heavily used Pacific Coast port in Mexico.¹⁴ Lazaro Cardenas is receiving significant investment from Kansas City Southern de Mexico, the Mexican arm of a U.S.-based rail firm, and will provide increased links to the United States via Laredo. Guaymas is a much smaller port but could be used to ship Chilean winter vegetables via Nogales into the United States, as well as other regional and niche products. Punta Colonet does not yet exist, but the projected date for beginning operations is the middle of the next decade, with some forecasts that it will equal the size of Los Angeles-Long Beach by the middle of the 2020s. Much remains to be done before ground is broken at Punta Colonet and it begins to handle cargo, and while its ultimate size is subject to debate, no one should doubt the determination of the Mexican government to realize a major investment in infrastructure a mere 150 miles south of San Diego.

Much of the new traffic will flow via rails and intermodal systems, including new and refurbished rail systems that are part of Calderon's National Infrastructure Program. Rail crossings are inherently more efficient to inspect than trucks and current Mexican efforts to expand its rail capacity are directly linked to its seaport expansion. Yet little seems to be

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happening in the United States to either reduce the border congestion that currently exists, or to prepare for future significant increases in cargo volumes. For example, the United States has not yet expressed a preference regarding the future crossing point for merchandise that will flow out of Punta Colonet and head towards Mexicali, Nogales, or some other point of entry on a new rail network which has yet to be specified. The lack of adequate border crossing infrastructure will limit the growth of trade flows and block the realization of the full extent of potential economic benefits that might stem from large infrastructure investments. Empirically, there are strong reasons to believe that border communities lose significantly when border crossing—commercial and personal—cannot be done quickly and efficiently.

The Costs of Border Wait Times

Measuring the costs of lost output, jobs, and incomes that result from increased wait times at the border crossings is difficult at best. While it may be impossible to put precise figures on the opportunity costs of inadequate physical infrastructure, recent empirical work has produced numbers that should give any serious policy maker a reason to consider the benefits of increased investment in border crossing infrastructure. The most recent work by a team of researchers at El Colegio de la Frontera Norte (COLEF, 2007) attempts to evaluate the cost of wait times at four major crossings, including the three busiest (Ciudad Juárez-El Paso, Tijuana-San Diego, Nogales-Nogales, and Laredo-Nuevo Laredo). The researchers at COLEF interviewed 15,848 pedestrians, vehicles drivers, and truck drivers in the four locations (15,600 were southbound from the north; 1,248 were northbound from the south). Table 9 shows the distribution of wait times for the three categories of crossers in the four locations.

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Table 9: Percent Experiencing Selected Waits, South-to-North Traffic, 2006

	<i>Pedestrians</i>	<i>Personal Vehicles</i>	<i>Trucks</i>
<i>Wait > 60 minutes</i>			
Tijuana-San Diego	22	86	89
Nogales-Nogales	25	89	52
Ciudad Juárez-El Paso	18	94	80
Nuevo Laredo-Laredo	19	79	86
<i>Wait > 90 minutes</i>			
Tijuana-San Diego	10	54	65
Nogales-Nogales	6	35	27
Ciudad Juárez-El Paso	3	42	43
Nuevo Laredo-Laredo	8	19	29

Source: COLEF (2007).

What stands out in Table 9 are the overall long waits, and the extent to which Tijuana-San Diego is an outlier. The COLEF survey, consistent with a number of others that have been conducted over the years, shows the most frequently cited reasons for crossing the border from south to north are work and shopping, while border crossers going from north to south are mostly residents returning to Mexico or commuters going to work in Mexico. Both patterns reflect a growing integration of regional labor markets and give weight to the idea that border crossing is a basic necessity for people living in the border region. While the percent experiencing 60 minutes or more of waiting in line is not very different across the four ports of entry, the overall wait-times are burdensome for people that cross frequently. Excessive waits of 90 minutes or more are less uniform along the border. Tijuana-San Diego an outlier. It is not only one of the busiest crossings, but has the weakest infrastructure of the major ports of entry, particularly with respect to access roads to the port of entry and the number of inspectors and gates for commercial vehicles, pedestrians, and personal vehicles.¹⁵ The inadequacy of local roads and clear routes to the border crossing is a complaint that was frequently expressed by the respondents to the COLEF survey (for south to north traffic), not only in Tijuana, but also in Nogales and Nuevo Laredo. Another frequent complaint in all four ports of entry was the inadequate number of inspectors for pedestrians. The lack of professional behavior on the part of inspectors was also cited as a problem for south to north crossers in all locations except Nuevo Laredo-Laredo.

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The cost of wait times for delayed freight crossings was estimated by valuing the cost per truck at the rental rate of \$50 per hour. For personal vehicles and pedestrians the methodology involved the use of input-output multipliers which attempt to capture the interdependencies of cross-border economies such as Tijuana and San Diego. The ultimate bill comes to a loss of \$7.5 billion in foregone output and a loss of 296,400 potential additional jobs (COLEF, 2007). Unlike the COLEF model, the SANDAG study considers only the Tijuana-San Diego county crossings¹⁶ and it uses input-output multipliers to estimate the impacts of both personal crossings and freight. It estimates the losses from border wait times in the United States and Mexico combined to be nearly \$6 billion in lost output and over 51,000 jobs (SANDAG, 2006). Most of the losses accrue to San Diego County and Baja California, although some are dispersed over a wider area. Sectors most affected include retail, machinery and equipment manufacturing, and agriculture. Neither the COLEF study nor the one done by the San Diego Association of Governments (SANDAG, 2006) are capable of considering the costs associated with foregone investment and are therefore underestimates of the losses in output and jobs due to delayed border crossings.

The lack of adequate infrastructure to support current volumes of personal and commercial traffic has been known for some time. For example, the U.S. Government Accountability Office (GAO, 2000) issued a report in 2000 stating that the growth in commercial traffic has overwhelmed a number of ports of entry.¹⁷ Given the distances to the border from Washington, D.C., and Mexico, D.F., it is not surprising that there is a persistent tendency to under-invest in border infrastructure. Nevertheless, a countervailing tendency has supported some additional investment along the Texas border, particularly during the 1990s as U.S.-Mexico integration began to enter the public consciousness and Texas communities sought to take advantage of their location next to Mexico.¹⁸ Many local governments in the Texas borderlands invested in the construction of new bridges or the refurbishment of existing ones, as sources of local revenue (Phillips and Manzanares, 2001). Unlike the situation in border regions with no river to dividing the countries, Texas border communities have been able to construct new bridge crossings which they regulate with user fees. This has been a steady source of revenue for communities such as Laredo, Pharr, Brownsville, and El Paso.

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The U.S. response to the terrorist attack of September 11, 2001, and the resulting reorganization of federal agencies under the newly created Department of Homeland Security (DHS) has complicated efforts to address problems of inadequate border crossing infrastructure and made it more difficult to plan for future cross-border traffic. The large freight movements that will eventually be generated by Punta Colonet, for example, do not seem to have entered the planning horizon of DHS, which has received billions of dollars for a number of new security initiatives, for example the Secure Border Initiative and US-VISIT. But to date, DHS has devoted little effort to facilitating (as opposed to inspecting) the movement of people and goods. The reorganization of customs and border inspection in the newly formed DHS, a new national focus on anti-terrorism, and the surfacing of public concerns over undocumented immigration, have all taken attention away from the issues of trade facilitation and border crossing for everyday, peaceful, purposes.

Border infrastructure planning is also affected by the sheer institutional complexity of the task. For example, the Otay Mesa-Mesa de Otay planning task force, under the auspices of the San Diego Association of Governments, is planning for a new border crossing which will be located east of the existing Otay Mesa port of entry. A new border crossing has transportation, housing, environmental and economic development implications (in addition to security) and it is not surprising that there are a large number of stakeholders that must be consulted. SANDAG has identified seven local agencies in the United States and four in Mexico, four state agencies in the United States and two in Mexico, and seven federal agencies in the United States and six in Mexico, for a total of 18 United States and 12 Mexican agencies (SANDAG, 2005).¹⁹ In addition to these 30 local, state, and federal agencies in the United States and Mexico, both countries have private, non-state actors with a stake, such as environmental groups, academics, and chambers of commerce.

There are a number of contentious issues to be found in the border region, migration policy and security initiatives among them, but regardless how the debates over undocumented immigrants and border fencing might ultimately be settled, there are significant potential economic gains that could be realized with investment in additional border infrastructure. That the volume of commercial traffic will grow seems beyond doubt, and as border populations and border

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businesses become more integrated, the flow of personal vehicles and pedestrians will also grow. Hence there is a two-fold reason to address the infrastructure deficit: to catch up with past growth and to plan for future growth. Given the complexity and long time horizon for planning new ports of entry or expanding existing ones, some urgency to get started seems warranted.

Environmental Infrastructure

The United States Government Accountability Office defines environmental infrastructure as “infrastructure designed to protect human health and the environment” (GAO, 1999). It is physical infrastructure in the form of public and private facilities and equipment, including public works and other capital goods necessary for preventing or reducing air, water and soil pollution. In other words, it is part of the stock of physical infrastructure that a nation or region must have in order to ensure the health and safety of its people and its environment.

No one knows for certain how much investment is needed in border environmental infrastructure. The estimates that are tossed about seem to have thin analytical backing, but in 1999 the GAO cited pre-NAFTA (1993) estimates of \$8 billion.²⁰ This is a commonly cited figure, with the range of estimates usually running in the \$5-12 billion range.²¹ The North American Development Bank (NADB) and the Border Environmental Cooperation Commission (BECC) were created by the Environmental Side Agreement to NAFTA as a means of marshalling and directing the needed funding to address the border’s environmental deficits. To date (end of 2006), they have allocated less than \$1 billion and disbursed less than \$0.5 billion (North American Development Bank, 2007). Consequently, even if there are no analytically precise estimates of the sums that are needed, the gap between the lowest estimates (around \$5 billion in the mid-1990s) and actual expenditures is sufficiently large so that any feasible amount of additional funding is unlikely to be an “over expenditure.”

Sources of Environmental Needs

There is a general consensus that the most pressing environmental issues along the border are primarily the result of rapid population growth. The physical geography of the border is a key factor, as air and water are both stressed by the rapid growth of population in a region not ideally suited for large numbers. Two major deserts, the Chihuahuan and the Sonoran, bisect the border

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and occupy more than half of its physical landmass. On the Mexican side, and in places on the U.S. side where zoning restrictions are limited, informal housing has been built in the new colonias that have sprung up around the urban centers, where manufacturing jobs are plentiful. Sewage lines, potable water, and pavement lag behind housing construction, often for many years. Car ownership is high in the border region, so that new neighborhoods with dirt roads throw significant amounts of dust into the air, and when there is no connection to sewage and water utilities, the air becomes a toxic stew of household and human wastes. Statistics on rates of asthma and other respiratory problems are limited, but for example, Imperial County has the highest rates of asthma of any county in California (CCBRES, 2003).²² The North American Development Bank and state and local governments in Mexico have partially addressed this issue by providing funds to pave the dirt roads that connect new colonias on the outskirts of urban areas.

In addition to problems of air quality, water issues are at the forefront of environmental infrastructure needs. Large parts of the border population rely on imported water (California, Arizona, Baja California) and other parts are using their aquifers faster than they can be recharged (Nogales, El Paso). Joint planning for the use of surface waters between the United States and Mexico is the responsibility of the International Boundary and Water Commission (IBWC), while aquifer regulation and discharge is in state hands in the United States. The IBWC is widely criticized for its inefficiencies and lack of transparency, and large scale conservation efforts are beyond its mandate. Furthermore, it has no authority over subsurface waters and when aquifers are shared between states or across the border, it creates the familiar problem of the commons and incentives to overdraw. Beyond the draw down of underground aquifers and fragility of imported water supplies, a second major water issue is the treatment of wastewater. While Mexico made significant efforts to provide sewage connections to border residents in the 1990s (Anderson and Gerber, 2008, 108-109), rapid population growth on both sides of the border, together with the absence of binational agreements to use gray water or to recycle used water, have left gaps in water supply and treatment systems. The importance of this issue is evidenced by the fact that water projects have been the primary target of loans and grants administered by the North American Development Bank. Of the 84 active projects at the end of

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2007, 37 were for water and wastewater programs on the U.S. side, while another 26 water projects were active on the Mexican side of the border (NADB, 2008, p 16-22).

New Environment Infrastructure: The Record

Air quality, and water and wastewater are precisely the problem areas responsible for the creation of the NADB and Border Environment Cooperation Commission (BECC). Formed as symbiotic institutions in the lead-up and ratification of NAFTA, the BECC's role is to certify the viability of proposed environmental infrastructure projects on the border; the NADB's is to assist with financing once the program is certified by BECC. The NADB provides financing in a variety of forms, including both loans and grants. The NADB has authority to provide loans at both market and below market interest rates, and it offers grants to cover part of the costs of projects through three distinct funds: the Border Environment Infrastructure Fund (BEIF) which is funded by the U.S. Environmental Protection Agency and provides resources for the implementation of municipal drinking water and wastewater infrastructure projects; the Water Conservation Investment Fund (WCIF) for infrastructure projects to increase water efficiency; and the Solid Waste Environmental Program (SWEP) for municipal solid waste projects (NADB, 2007). The data in Table 10 show the amounts allocated, contracted, and dispersed, to date (end of 2006) since the inception of the NADB.

Table 10: NADB Financing through 2006

<i>Programs</i>	<i>Allocated</i>	<i>Contracted</i>	<i>Disbursed</i>
Loan programs			
Market-rate	\$188,954,038	\$64,945,353	\$60,459,449
Low-interest	71,699,809	55,494,067	33,862,729
Total Loans	260,653,847	120,439,420	94,322,178
Grant programs			
Border Environmental Infrastructure Fund (BEIF)	493,923,118	486,885,666	291,013,734
Solid Waste Environmental Program (SWEP)	4,488,865	3,988,865	2,947,955
Water Conservation Investment Fund (WCIF)	76,352,859	76,352,859	70,146,526
TOTAL	\$835,418,689	\$687,666,810	\$458,430,393

Source: North American Development Bank (2007).

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Even if one assumes that all of the funds allocated will eventually be spent, there remains a large gap between the original assessments of border environmental infrastructure needs at the time NAFTA was passed (\$5-12 billion) and the amounts that have been allocated more than 12 years later. The gap is particularly large when it is recognized that the assessments made at the beginning of NAFTA's implementation were usually couched in terms of "\$X billion *over the next 5 years*" and that population growth on the border continues to outpace growth elsewhere. Furthermore, the NADB and BECC recently were given a mandate to expand their definition of the border, from 100 kilometers on either side, to 300 kilometers on the Mexican side and 100 on the U.S. side. Deepening the area of action into Mexico is a positive move, but it also increases the needs for funding and technical expertise and widens the gap between needs and available resources.

The North American Development Bank has been undercapitalized from the start, but even if it had unrestricted funding, there would have remained serious obstacles to bringing the resources to the projects that need them most. The most serious obstacle is the lack of human capital in border communities. This means that there are significant shortages of people with the technical expertise to identify problems and their solutions, and then manage the systems that need to be built. To this end, the NADB has developed a series of technical assistance and training programs with the goal of building human capacity in border communities, along with their physical infrastructure investments.²³ Nevertheless, without outside interventions, both with money and expertise, the funding gap will remain and the environmental infrastructure of the border region will continue to lag behind the needs of its growing population.

Conclusion: Public Policy Challenges

The border population has been one of the fastest growing segments of the United States and Mexico since at least 1950. Over the last 55 years, it has had an 8-fold increase in the population on the Mexican side, and a 4.5-fold increase on the U.S. side, both signifying rates of growth well beyond their respective national averages. Rapid population growth has been a defining characteristic of the U.S.-Mexico border and has determined or partially determined a number of the challenges confronting border communities such as educational needs, the adequacy of the

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border's physical infrastructure and housing, its public health systems, and environmental infrastructure.

Population growth and the integration of local labor markets has turned border communities into dynamic, energetic, cultural experiments in U.S.-Mexico integration, and has led the way for a new U.S.-Mexico relationship. Nevertheless, the challenges are significant as the U.S.-side border population is younger, less educated, less established in the labor force, and prey to a host of health problems at rates far above national averages, such as diabetes, tuberculosis, hepatitis A, asthma, and other respiratory problems. The strains of rapid population growth in a region which is a desert throughout much of its territory, raises the need for significant investments in water conservation, recycling, and waste water treatment, yet the low incomes of most border communities mean that there are serious limits to investment in public goods. Low levels of tax revenue make it difficult to impossible for communities to borrow from the NADB since there are inadequate revenue streams for repayment.

One of the bright spots for many communities is the role they are able to play in trade facilitation through warehousing and transportation services, and on the U.S. side, the opportunity to provide retail services to Mexican border crossers. Even this opportunity is constrained, however, by the failure of both governments to invest in the necessary physical infrastructure and border inspectors. So, while *trucks sit in line at the border, spewing toxics into already compromised air basins*, billions of dollars of revenue are lost from border communities that are not able to realize the full effects of the gains from trade. And while the United States pours billions of dollars into inspecting people and goods crossing the border, it has so far failed to view the facilitation of the movement of people and goods in an equally serious way.

The challenges for U.S. policymakers are clear. These include the following:

- Reduce border wait times for both persons and goods
- Ensure adequate financing, expertise, and training to overcome the deficits in environmental infrastructure
- Close the education attainment gap between border residents and the rest of the United States

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- Increase funding for English instruction
- Address the numerous, serious public health problems of the border region.

These action items would significantly increase the quality of life for border residents, but not them alone. Each of these items also affect the rest of the nation, and gains made in the border region would spill over into other parts of the United States and into Mexico. In other words, there are economic incentives not to ignore these issues. Beyond the economy, however, human compassion for some of the poorest communities in the United States justifies the directing of resources towards the needs of border residents, especially as they have born a disproportionate share of the costs of security enforcement along the border.

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Endnotes

¹ The concept of the border is slippery. Many scholars avoid a tight operationalization of the term and refer implicitly to the areas in physical proximity to the international boundary. For example, one of the leading scholars of border history (Martinez, 2006) does not define the term other than its implicit meaning as an international boundary. This works for cultural and historical studies which do not seek to examine contemporary economic conditions and do not use statistical data. Measurement of current conditions, however, requires a definition of the area over which the measurements will be taken. The North American Development Bank initially defined the border in legal terms for purposes of its funding as the area on both sides falling within 100 kilometers of the border. They recently amended this to include an area within 300 kilometers on the Mexican side, while retaining the 100 kilometer limit on the U.S. side. Ganster and Lorey (2008, p8-9) operationalize the concept as the ten U.S. and Mexican states and the “fourteen U.S. and Mexican border twin cities that lie within the border counties and municipalities” that are “on or very near the international boundary.” The use of state level data is forced by the fact that many statistics (the origin of exports for example) are not available at a local level. Most definitions attempt to include a cultural component, but this runs into the problem that cultural characteristics vary across and along the border, making cultural definitions less well suited for examining the entire border. Arreola (2001), for example, identifies at least seven cultural regionalizations of south Texas Latinos in the scholarly literature between 1948 and 1984. One of them is Jordan’s (1984) “Hispanic Borderland,” which seems the most comprehensive description of a swath of counties on the southern border of Texas. Ultimately, any definition is somewhat arbitrary. The definition adopted in this paper has the virtues, however, of definability, measurability, symmetry with respect to the United States and Mexico, and proximity to and inclusion of the international boundary.

² This includes Grant County, New Mexico, although it does not quite touch the border.

³ Also in Nuevo Leon, but since it only has one (small) municipio on the border, its case is insignificant.

⁴ In 2000, the U.S. and Mexico border counties and municipios were 92 and 93 percent urban, respectively, while the figure for the United States as a whole was 79 percent, and for Mexico, 75 percent (Anderson and Gerber (2008), p. 41).

⁵ Author’s calculations using Census Bureau mid-year population estimates (Census, 2007). The counties are Imperial and San Diego counties in California; Cochise, Pima, and Yuma counties in Arizona; Dona Ana county in New Mexico; and Cameron, El Paso, Hidalgo, and Webb counties in Texas. The smallest population among these counties was Cochise in Arizona, with 125,521 inhabitants in 2005.

⁶Based on Mexican and U.S. census data, Anderson and Gerber (2008, pp. 180-182) report that in 2000, 30 percent of Mexicans 25 and above had the equivalent of a high school diploma. For

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the United States, the comparable figure was 80 percent nationally and 74 percent in the border counties.

⁷ Anderson and Gerber (2008, pp. 187-188) show that in the border region between 1950 and 2000, and particularly after 1980, there is a significant correlation between the percent of the county population with less than a ninth grade education and the percent foreign born. The quantitative effect appears to have increased substantially after 1980.

⁸ Note, however, that the wage penalty associated with speaking English “less than very well” is less for women than for men. It is still significant, however (Mora and Dávila, 1998).

⁹ The U.S. Census Bureau attempts to identify and count the number of non-native English speakers who speak English, in their terms, “less than very well.”

¹⁰ The BEA defines personal income as “income received by all persons from all sources... the sum of net earnings by place of residence, rental income of persons, personal dividend income, personal interest income, and personal current transfer receipts.” Real income is obtained by deflating by the CPI and per capita income is real personal income divided by population. Growth rates are calculated using a compound growth formula.

¹¹ San Diego has several inherent economic advantages that are not shared by the rest of the border. Perhaps most importantly over the long run, it has several advantages conferred by geography, including its mild climate. In historical terms, the existence of San Diego Bay, the region’s many days a year of sunshine, and its location away from East coast population centers, led to large defense expenditures through much of the 20th century as both the Navy and the aircraft industry found it a useful location. While defense expenditures waned after the Cold War, the advantages of an economic cluster of aerospace engineering and avionics was replaced with wireless communications and biotechnology, in part due to the active participation of the region’s universities. Biotechnology was not an outgrowth or spillover from the defense industry, but the mild climate and high living standards made it easier to attract highly sought after scientists and engineers. In addition, the geographical advantage of San Diego’s proximity to Los Angeles and other wealthy California markets, along with its trans-Pacific relations, are significant. These advantages show up in many ways, including as a more-or-less guaranteed market for its tourism services which mostly draw from southern California and Arizona. A further advantage held by San Diego is its greater social and cultural diversity as compared to other border cities. Assuming that the arguments of Richard Florida (2003) are correct, and that local prosperity is significantly influenced by the openness of local society and culture, the greater diversity of San Diego enables it to attract more of the “creative class.” Undoubtedly, some of the economic advantages of California may be duplicated elsewhere through appropriate public policies, such as raising educational standards.

¹² The dominant explanations are technological change, which favors skilled workers, and globalization, which may also favor skilled workers. Among economists, the technological change explanation is most widely supported although there is also agreement it is not the whole

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explanation and trade and economic integration play a role as well. See Beaulieu (2007) for a review of the trade-wage relationship, and Lawrence (2007) for a review of the debate.

¹³ On the revenue side, Arizona is 49th (out of 50 states and the District of Columbia) in per pupil spending for public elementary and secondary schools; Texas is 44th; New Mexico is 38th, and California is 25th. See U.S. Census (2008), Tables 8 and 11.

¹⁴ According to Randolph (2008), Manzanillo's cargo activity expanded from 64,000 TEUs (twenty foot equivalents, a standard measure of cargo volume) in 1994 to 1.41 million TEU's in 2007. Manzanillo has rail links to border crossings at Eagle Pass, El Paso, Nogales, and Calexico.

¹⁵ This is the conclusion of the COLEF study, but is also born out by the fact that although San Ysidro and Otay Mesa (San Diego-Tijuana's two crossings) have only two personal and one commercial port. El Paso, by comparison, has three bridges, two serving commercial needs and all three serving personal vehicles and pedestrians. Laredo has four bridges, two for commerce and three for non-commercial uses. Even Nogales has three crossings, although only one is commercial and one is exclusively for pedestrians, but it has a fraction of the traffic volumes the move between San Diego and Tijuana (U.S. Customs and Border Protection, 2008).

¹⁶ These include San Ysidro, Otay Mesa, and Tecate, a small crossing in San Diego county about 30 miles east of the city of San Diego.

¹⁷ In addition, long lines of trucks waiting to cross contributes to a significant deterioration in urban air quality and probably have health effects which neither the COLEF nor the SANDAG studies attempt to include in their estimates of costs.

¹⁸ See Anderson and Gerber (Chapter 3, 2008) for a discussion of the shift in the orientation of the Texas business community and government officials towards greater integration with Mexico as an economic strategy.

¹⁹ In the United States at the local level they identify SANDAG, City of San Diego, City of Chula Vista, County of San Diego, San Diego Regional Airport Authority, San Diego County Water Authority; at the state level they include Caltrans, Cal-EPA, Department of Fish & Game, California Highway Patrol; and at the federal level Customs and Border Protection, General Services Administration, International Water and Boundary Commission (IBWC), Bureau of Land Management, Federal Highway Administration, Federal Transit Administration, U.S. Fish and Wildlife Service. In Mexico at the local level they identify the Instituto Municipal de Planeación (IMPlan), Ciudad de Tijuana, Comité de Planeación y Desarrollo Municipal (COPLADEM), Comisión Estatal de Servicios Públicos de Tijuana (CESPT); state agencies include Secretaría de Infraestructura y Desarrollo Urbano (SIDUE), Dirección de Ecología; and federal agencies are Consulado General de México, Instituto de Administración y Avalúos de Bienes Nacionales (INDAABIN), Comisión Internacional de Límites y Aguas (CILA), Secretaría

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deComunicaciones yTransporte (SCT), Aeropuerto Internacional de Tijuana, Secretaría del Medio Ambiente y Recursos Naturales (SEMARNAT).

²⁰ Need is relative. In this case, we are referring to the amount of money necessary in order to raise environmental conditions to the average of the United States.

²¹ For example, Hufbauer and Schott (1993) estimated that \$5 billion was needed for environmental programs and another \$2 billion for environmental infrastructure (p 107). They are unclear on the distinction between programs and infrastructure, and elsewhere (p 105) they estimate that \$8 billion is needed for labor, environmental, and transportation programs.

²² Other diseases may have environmental causes as well. For example, hepatitis A, which was previously mentioned as two to three times more prevalent in the border region, is carried by contaminated food and water.

²³ These include the Institutional Development Cooperation Program (IDP) for improvement of the local utilities, the Project Development Program (PDP) to assist in the design and planning of projects that will be submitted to the BECC and the NADB, and the Utility Management Institute (UMI) which assists in training water utility managers in financial administration and planning.