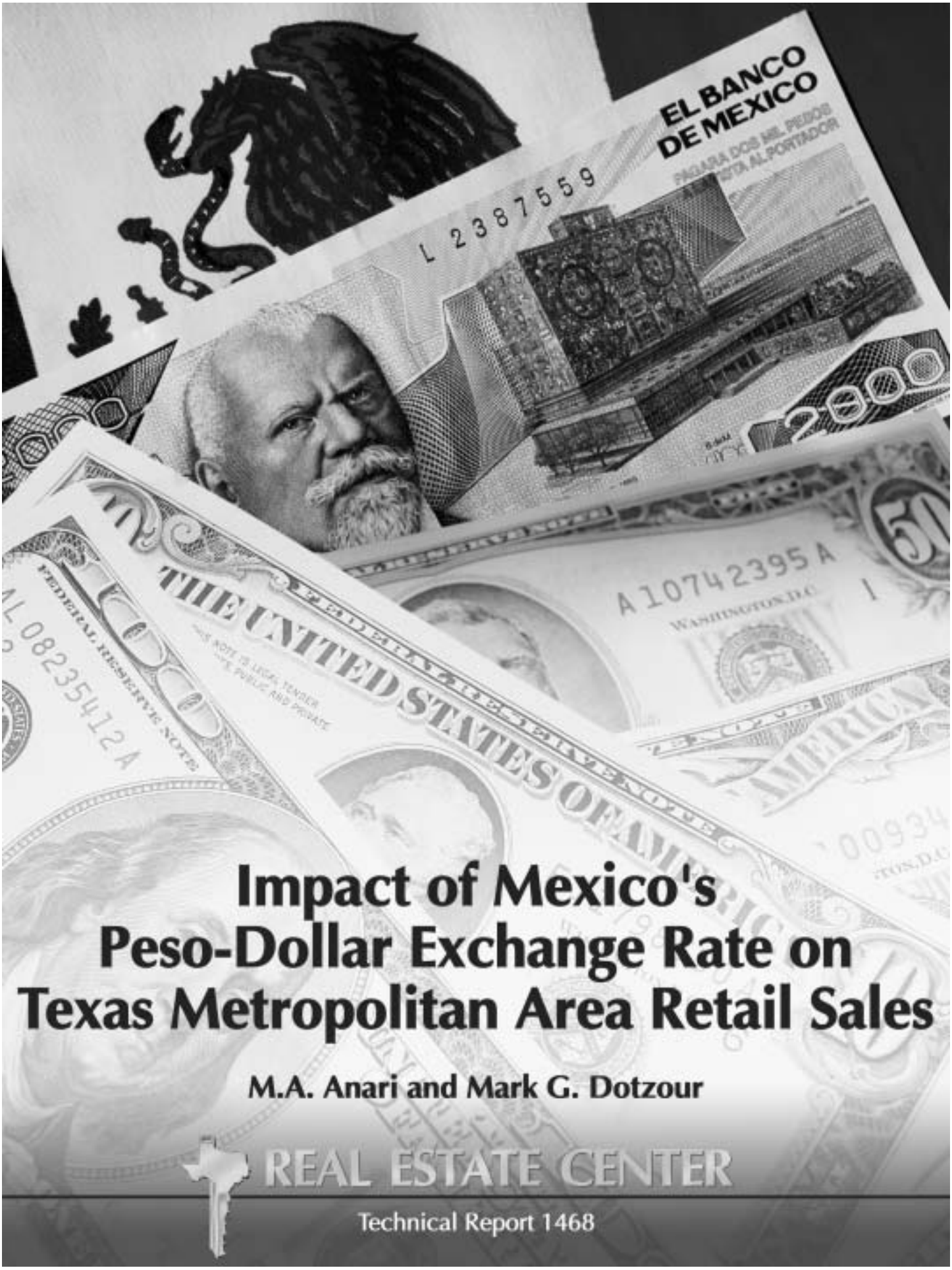

Impact of Mexico's Peso-Dollar Exchange Rate on Texas Metropolitan Area Retail Sales

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Introduction

In the past, peso devaluations have often been followed by negative or smaller growth rates of retail sales in several Texas metropolitan statistical areas. After the December 1994 peso devaluation, 1995 retail sales in the Brownsville-Harlingen metro area fell by 7.4 percent, compared to an increase of 6.8 percent in 1994. The McAllen-Edinburg metro area's retail sales grew 6.6 percent in 1994 and decreased by 7.4 percent in 1995.

The association of Texas retail sales and the peso-dollar exchange rate is an outcome of more integration of the U.S. and Mexican economies. During the 1980s, Mexico removed or reduced a number of restrictions on foreign trade and investment (Lustig 1992, and Lustig, Bosworth, and Lawrence 1992).

The passage of the North American Free Trade Agreement (NAFTA) in January 1994 further reduced trade barriers between the United States and Mexico. The impact on the U.S. economy of the liberalization of trade and investment between the United States and Mexico brought about by NAFTA has been the subject of academic research as well as intense public debate (Brown, Deardoff, and Stern 1992; Francois, Shiells 1994). The academic research has focused on regional economic integration, distribution of costs and benefits of economic integration and impact of trade policies on the location of cities and industries.

Texas, with its long border with Mexico and established tradition of trade between the state's residents and Mexican nationals, has been in a position to gain or lose the most from liberalization of trade and investment between the two countries. Consequently, the impact of more integration of the U.S. and Mexican economies on the Texas economy has been an important topic in literature devoted to study of trade and investment liberalization's impacts on national and regional economies.

Hanson (1996) investigated whether the growth of export manufacturing in Mexican border cities affects the demand for goods and services produced in neighboring U.S. border cities. He notes that border city pairs are natural laboratories for the study of trade policy. Using data on the six largest border-city pairs (Brownsville-Matamoros, El Paso-Ciadad Juarez, Laredo-Nuevo Laredo, McAllen-Reynosa, Imperial-Mexicali and San Diego-Tijuana) from 1975–1989, he found the growth of export manufacturing in Mexico accounted for a substantial portion of economic activity in U.S. border cities during the period.[1]

This report examines the impact of the peso-dollar exchange rate on Texas metro area retail sales. The study indicates that the dollar-peso exchange rate has a statistically significant positive effect on retail sales in six Texas metropolitan areas: McAllen-Edinburg, Brownsville-Harlingen, Laredo, El Paso, San Antonio and Corpus Christi. The first four areas have a common border with Mexico, while San Antonio and Corpus Christi are close to Mexico. These findings are evidence of increased integration of the U.S. and Mexican economies.

Theoretical and Empirical Framework

Retail sales in an area during a period is the aggregate value of merchandise purchased by households for final consumption. Retail sales can be considered a measure of aggregate demand for two reasons. First, if the amount of a good demanded and purchased by a consumer is less than the amount of supply of the good, then the quantity purchased (sold) is equal to the demand. Second, if the demand exceeds the amount of supply, then the price of the good will increase until demand is reduced to a point at which it is equal to supply. Because retail sales and consumption are equivalent to demand, the theory of demand can be used to develop a model of aggregate retail sales based on classical demand theory. This assumption also permits use of demand theory for identification of econometrics models of retail sales.

The theory of demand posits that the quantity a household demands of some commodity is determined by the price

of the commodity, prices of other commodities (substitutes and complements) and a budget constraint:

(1) $X_{ij} = F_{ij}(P_1...,Pn, Bj)$ $\quad i=1, \ldots n$

where X_{ij} is demand for product *i* by household *j*, P_i is the price of product *i* and *Bj* is the budget constraint for household *j*. Retail sales is a flow variable and for a geographic area is an aggregate of all retail goods purchased by all consumers in that area in a given period of time. Thus, Equation (1) can be respecified as:

(2) $RS = F(PR, DI)$

where *RS* is aggregate retail sales, *PR* is a commodity price index for retail goods, and *DI* is total disposable income (income minus income taxes) allocated for the consumption of retail goods by consumers.

Consumers of retail goods in an area may include the area's residents, tourists and migrant workers. Texas shares a long border with Mexico and an established tradition of trade between the two countries. Thus, disposable incomes of consumers of retail goods in Texas include incomes of Mexican nationals who exchange their pesos for dollars before purchasing goods in the United States. Consequently, Equation (2) is extended as:

(3) $RS = F(PR, DI, DP, IR)$

where *DP* is dollar per peso. Because consumers may rely on credit for their purchases of retail goods and their purchases may depend on interest rates charged by retailers, Equation (3) includes *IR* for interest rates.

In Equation (3), retail sales, disposable personal income, an index of retail prices and interest rates must be in real terms. Nominal values for retail sales, disposable income and an index of prices of retail goods must be divided by an appropriate consumer price index to obtain *RS*, *DP* and *PR* in real terms. The real interest rate series is estimated by deducting the inflation rate series from the nominal interest rate series.

Because of the impact of the interest rate on the exchange rate, personal income, price level and retail sales, there are a multitude of relationships between the variables in Equation (3). Because Ordinary Least Squares (OLS) may not fully capture these relationships, Zellner's method for the estimation of Equation (3) also was used.

Empirical Results

This section reports the empirical results of fitting Equation (3) to data on Texas metropolitan areas using quarterly data from the first quarter of 1986 to the fourth quarter of 1999. Because personal income data are not available on a quarterly basis for metropolitan areas, employment data for metro areas were used as proxies for personal income variables. Thus, Equation (3) was respecified as:

(4) $RS = F(PR, EM, DP, IR)$

where *EM* is nonfarm employment.

For the estimation of Equation (4), nominal values of retail sales and interest rates must be transformed into real terms using an appropriate consumer price index. For Texas, the U.S. Bureau of Labor Statistics and the Federal Reserve Bank of Dallas compile two sets of consumer price indexes (CPI), one for Houston, the other for Dallas. The CPI-commodities for Houston was used to deflate nominal retail sales figures. CPI-commodities for Houston deflated by CPI-Urban for Houston was used to obtain a price indiex for retail goods in real terms. For nominal interest rate the bank prime loan rate series was used. Inflation rate is calculated as $INF=100*(-1+CPI_i/CPI_{i-4})$. The real interest rate is calculated by deducting *INF* from the nominal interest rate.

Initially, ordinary least squares regression was employed for estimating Equation (4). It was found that the peso-dollar exchange rate and employment variables for metro areas are correlated and, as employment was used as a proxy for personal income, Zellner's method, also called multivariate regression or seemingly unrelated regression method (Zellner 1962), was used. Zellner's method is a system approach for the estimation of the coefficients of variables and estimates an entire system of equations simultaneously.

The estimation results using OLS and Zellner's regressions for fitting Equation (4) to data on Texas metropolitan areas show that over the sample period changes in dollar per peso have significantly influenced retail sales in six metro areas: Brownsville-Harlingen, McAllen-Edinburgh, El Paso, Laredo, San Antonio and Corpus Christi. Retail sales in the other metro areas in Texas were not influenced to a significant degree by the peso-dollar exchange rate.

Tables 1 and 2 present OLS and Zellner's estimation results for the coefficients of dollar per peso rate, employment and the retail price index for the six Texas metro areas. The estimated coefficients for the interest rate variable were not statistically significant and consequently the interest rate variable was dropped from the final estimation. Since all variables are in logarithms, the estimated coefficients are elasticities of retail sales in response to dollar-peso, employment and retail price index.

As Table 2 shows, McAllen retail sales have been most influenced by changes in the exchange rate. An increase of 10 percent in dollar per peso is expected to increase McAllen's retail sales by 4.9 percent. The McAllen metro area also has the largest elasticity of retail sales in response to an increase in employment. Because employment is used as a proxy for personal income, the coefficients of employment reflect the number of people employed as well as their wages and salaries. Corpus Christi has the smallest elasticity of retail sales in response to changes in the dollar per peso exchange rate.

McAllen-Edinburg, Brownsville-Harlingen, El Paso and Laredo have a common border with Mexico and represent four "border city pairs." The Corpus Christi and San Antonio metro areas are also close to the Mexico border. The proximity of these areas to Mexican markets and manufacturing centers and the significance of the influence of the peso-dollar rate on the areas' retail sales support Hanson's findings that more U.S.-Mexico economic integration may cause more economic activity in the U.S.-Mexico border region.

An important limitation of this study was that consumer price indexes are not available for each local metro area. Consumer price indexes are needed to deflate nominal retail sales for the construction of a price index for retail goods in an area and for the estimation of real interest rates. For these estimations, consumer price indexes for Houston, which may not be an appropriate index for representing prices of retail goods in metro areas located in El Paso, Laredo, McAllen, and San Antonio, were used.

Table 1. Estimates of Retail Sales Equations, Ordinary Least Squares Method

Metro Area	Elasticities			Regression Statistics	
	Dollar per Peso	Employment	Retail Price	RSQ	Durbin-Watson
Brownsville-Harlingen	0.23(4.10)**	1.60(6.69)**	–2.44(2.90)**	0.78	2.12
El Paso	0.16(3.78)**	2.15(7.16)**	–0.90(1.35)	0.66	1.98
Laredo	0.24(2.31)**	3.59(7.43)**	–1.02(0.73)	0.93	2.42
McAllen-Edinburgh	0.49(5.41)**	5.40(9.91)**	0.70(0.41)	0.85	2.09
San Antonio	0.17(3.08)**	1.77(5.81)**	–0.19(0.21)	0.63	2.05
Corpus Christi	0.08(1.83)*	1.63(4.74)**	0.26(0.36)	0.55	2.07

Figures in parentheses are t-values.
** denotes significant at 5 percent significance level.
* denotes significant at 10 percent significance level.

Table 2. Estimates of Retail Sales Equation, Zellner's Method

Metro Area	Elasticities			Regression Statistics	
	Dollar per Peso	Employment	Retail Price	RSQ	Durbin-Watson
Brownsville-Harlingen	0.19(4.07)**	1.46(7.19)**	–1.97(2.72)**	0.77	1.98
El Paso	0.17(4.01)**	2.16(7.55)**	–0.95(1.51)	0.66	1.98
Laredo	0.24(3.13)**	3.66(10.02)**	0.17(0.16)	0.94	2.42
McAllen-Edinburgh	0.49(5.79)**	5.48(10.70)**	0.73(0.53)	0.85	2.07
San Antonio	0.15(3.12)**	1.67(6.07)**	–0.30(0.35)	0.63	1.99
Corpus Christi	0.08(2.04)**	1.66(5.23)**	0.26(0.40)	0.55	1.97

Figures in parentheses are t-values.
** denotes significant at 5 percent significance level.

Endnote

[1] Brownsville, El Paso, Laredo, and McAllen are located on the Texas border with Mexico; Imperial and San Diego are in California.

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