

# Chapter 7: International Competition and Industrial Evolution: Evidence from the Impact of Chinese Competition on Mexican Maquiladoras

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In this presentation, Luis Bernardo Torres Ruiz, research economist at the Real Estate Center at Texas A&M University, discussed the results of his joint research with Hale Utar. Their study addressed the question of how intensified competition from China affects Mexican export assembly plants, or *maquiladoras*—in particular, their entry, growth, productivity, and exit. Utar and Torres concluded that maquiladoras' entry, employment, plant growth, and survival probabilities all respond negatively to Chinese competition. In presenting these findings, Torres first introduced the dataset and research methodology used in the analysis, then explained in detail the type of regression models used and the variables included in each regression. Finally, he discussed the study's major findings and its contribution to the direction of future research.

## Data and Methodology

The data used in the analysis comes from surveys carried out from 1990 to 2006 by the Instituto Nacional de Estadística, Geografía e Informática (INEGI), Mexico's National Institute of Statistics and Geography. The INEGI surveys, which consisted of 27,548 plant-year observations, included 3,769 plants and 1,455 firms in 11 maquiladora industries. Torres noted that the unique value of using this resource is that it is a plant-level dataset.

Torres explained that in the Utar-Torres study, the key independent variable is the measure of Chinese competition with maquiladoras, denoted as  $IMPCH_{jt}$ ,

$$IMPCH_{jt} = \frac{M_{jt}^{CH}}{M_{jt} + Q_{jt} - X_{jt}}$$

where  $M_{jt}^{CH}$  denotes the value of imports of industry  $j$  products coming from China to the United States at period  $t$ .  $M$ ,  $Q$ , and  $X$  denote total U.S. imports, U.S. production, and U.S. exports, respectively. The dependent variables are plant-level sales, employment, employment growth, entry and exit, and productivity (all for maquiladoras only), for each regression model. Torres stated that the model also uses other control variables. These include time-varying plant-level controls (such as multi-plant dummy variables and age dummy variables) and time-varying industry controls (such as U.S. import penetration with China and Mexico, U.S. industry hourly wages, and U.S. industry production).

According to Torres, the regression models also include interaction terms  $IMPCHjt \cdot productivity$ ,  $IMPCHjt \cdot skill\ intensity$ , and  $IMPCHjt \cdot capital-labor\ ratio$ . Torres noted that the idea behind including these interaction terms is to look at the effects of Chinese competition with maquiladoras that weigh most heavily on low-skilled, low-capital maquiladoras. The regression model also controls for state-by-year fixed effects.

Torres further noted that in order to correct for the endogeneity problem of the regression models—that is, unobserved factors that affect the dependent variables of interest and the Chinese share of import penetration for the matched U.S. industry— they used two different instrumental variables for robustness checks. The first instrument was Chinese worldwide imports entered as a share in total world imports interacted with 1999 Chinese import penetration rate in the corresponding U.S. NAICS for each maquiladora sector. The idea behind using this instrument is that the worldwide Chinese import share must be exogenous from the perspective of Mexican/U.S. plants, as it is expected to be driven by supply-side factors within China itself.

Torres explained that while this instrument should be free from most of the endogeneity concerns by extracting the exogenously driven growth component in world Chinese imports in the wake of its WTO accession, this instrument could still be sensitive to possible correlation between the initial conditions of U.S. industries and future technology or demand shocks. To address this, Torres introduced a second version of the instrumental variable—used as the default instrument in the analysis, which was constructed using the 1999 shares of Chinese imports in eight other advanced/high-income countries—, Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain and Switzerland. The instrument is denoted as

$$\frac{OAdvCHIMP_{j99} * CHIMP_t}{OAdvTOTIMP_{j99} WIMP_t}$$

where  $OAdvCHIMP_{j99}$  is the total imports into eight high-income countries from China (excluding the United States) in the corresponding industry  $j$  at year 1999, and  $OAdvTOTIMP_{j99}$  denotes the total imports in the corresponding industry  $j$  at year 1999.  $\frac{CHIMP_t}{WIMP_t}$  is the worldwide merchandise imports from China as a percentage of total worldwide merchandise imports.

### Major Research Findings

When the natural logarithm of plant employment rate is the dependent variable, the regression model, without using the instrumental variable, shows that an increase of 1 standard deviation in the Chinese share of import penetration for the matched U.S. industry is associated with a decrease of 25 percentage

points in the logarithm of employment. Torres emphasized that this result is statistically significant at the 1 percent significance level, and remains large and robust when using the two above mentioned instrumental variables.

Another regression model uses the log of employment growth as the dependent variable, with the same independent variables. Torres stated that the results show that an increase of 1 standard deviation in the Chinese share of import penetration for the matched US industry (a 6.4 percentage point increase) is associated with a decrease of 12 percentage points in annual plant employment growth. Moreover, instrumental variable regression results confirm the finding that higher Chinese imports in the U.S. market lead to lower employment growth in maquiladora industries. Moreover, when using the dummy variable plant exit as the dependent variable, the probit model shows that a marginal increase (6 percent) in the average import penetration rate leads to a 27 percent increase in the probability of plant exits. When productivity is the dependent variable, the regression result shows that a 1 standard deviation increase in the Chinese share of import penetration for the matched U.S. industry increases the logarithm of plant productivity by 3 percentage points.

In the case of plant entry, Torres noted that the analysis is done on the industrial level rather than the plant level, since INEGI's maquiladora survey doesn't give extra information about a plant's decision to enter or not to enter. The regression results demonstrate that impact of Chinese competition, as well as labor cost savings and demand in U.S. markets, are important factors affecting entry.

Torres finally stated that none of the interactive terms in different regression models are significant, which means that there is no indication that intensified Chinese competition causes a disproportionate decrease in employment growth, especially in low-productivity, low-skill, and low-capital plants. However, when using skill intensity as the dependent variable, the regular ordinary least squares (OLS) regression as well as the regressions using instrumental variables both indicate that an increase in the share of Chinese import penetration rate triggers an increase in skill intensities.

## **Conclusions**

Torres summarized the research findings by stating that in Mexican maquiladoras, probabilities of entry, employment, plant growth, and survival are found to respond negatively to Chinese competition. Moreover, competition led to shrinkage or exit of firms in low-skill labor-intensive sectors, leading their former employees to find work in other sectors. Torres also concluded that there is strong evidence that heightened competition from China improved maquiladoras' within-plant productivity. All the major research findings indicated that competition from China has played a substantial role in the recent

slowdown of the Mexican maquiladora industry. Specifically, competition affected the most unskilled labor-intensive sectors being the most threatened by Chinese competition, which led to significant sectoral reallocation. Torres finally noted that the results open the discussion to whether and how competition from lower-wage locations can compel traditionally labor-intensive industries in low-wage countries to move up in the global production chain.

## References

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