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Income Inequality in Mexico and Import Exposure: Estimating the Impacts of the Expenditure Channel*

Juan Blyde♦
Inter-American Development Bank

ABSTRACT

A rise in import competition can put downward pressure on local prices, increasing consumer welfare, but these gains might be unequal across households depending on the basket of goods they consume. Using a consumer price index for Mexico that varies at the product and city level, this paper analyzes the impact of import competition from low-wage countries, particularly China, on price growth between 2002 and 2017. I find that the trade shock impacted prices. Had import competition remained unchanged, the 15-year change in the consumer price index would have been 7 percentage points higher, on average across all goods, with a much larger impact on products that are highly exposed to import competition. Second, using microdata from a household expenditure survey, I find that all households benefited from this access to cheaper goods, but low-income households benefited more. Finally, I look at these results in the context of income inequality in Mexico, noting that overall income inequality in the country declined during the period of analysis. I show that the pro-poor bias of the China shock contributed to this decline in inequality but only slightly, suggesting that additional factors might have been behind this trend.

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* The views and interpretations in this paper are strictly those of the author and should not be attributed to the Inter-American Development Bank, its board of directors, or any of its member countries

♦ Correspondence address: Juan Blyde. Inter-American Development Bank, 1300 New York Ave., NW, Washington DC, 20755. US Phone: (202) 623–3517. E-mail: juanbl@iadb

1. INTRODUCTION

Ever since China emerged as a manufacturing powerhouse over a decade ago, much has been written to show that the persistent increase in competition from China has disrupted manufacturing activity in other countries and negatively affected the jobs of many workers (e.g., Bernard, Jensen, and Schott, 2006; Autor, Dorn, and Hanson, 2013; Acemoglu et al. 2016; Mion and Zhu, 2013; Iacovone, Rauch, and Winter, 2013; Utar and Ruiz, 2013; Pierce and Schott, 2016; Utar, 2018).

Much less work, however, has been devoted to studying the potentially positive impacts that such import competition might have had on consumer welfare through access to cheaper goods. Exceptions to this are the general equilibrium models that account not only for the direct adverse effects of increased competition on labor but also for the impacts that arise through the expenditure channel. In Caliendo, Dvorkin, and Parro (2015), for example, even though the United States' exposure to China decreases employment in the manufacturing sector, the US economy is better off as it benefits from access to cheaper goods from China.

Within the context of the China shock, the focus of this study is to examine whether the welfare gains associated with access to cheaper goods differ across individuals with different income levels. Such a differential impact might be expected as households across the income distribution tend to consume different baskets of goods (e.g. Deaton and Muellbauer, 1980). Since exposure to Chinese competition differs across sectors, households whose consumption baskets are more concentrated in sectors that are highly exposed to Chinese import competition might benefit more from a basket of products that is cheaper overall.

The role of the expenditure channel in explaining unequal gains from trade has been analyzed before by Fajgelbaum and Khandelwal (2016). Using a trade model with nonhomothetic preferences, the authors show that when the economy opens up to trade, the gains are typically biased toward the poor because low-income households tend to concentrate their expenditure in sectors that are traded more.

Evidence of heterogeneous gains from trade across the income distribution has also been found in empirical studies that employ household expenditure surveys. Using data for Argentina, for example, Porto (2006) estimates the welfare impacts of Mercosur across income levels. He finds that while the impacts from changes in factor returns were pro-poor, the gains from the expenditure channel were pro-rich as the trade agreement increased the relative price of food and beverages, products which low-income households spend a significant share of their budgets on. Nicita (2009) studies the impact of trade liberalization in Mexico from 1990 to 2000. He finds that trade liberalization increased the welfare of all income groups but had a pro-rich bias because trade generated an increase in the skill premium and because the pass-through of the tariff reduction on local prices decays with distance. The latter implies that the more remote and rural areas of Mexico with large concentrations of poor households, particularly in the south, benefited relatively less from the expenditure channel. Faber (2014) also analyzes Mexico's gains from trade using expenditure surveys. Focusing specifically on the impact of NAFTA, he finds that the trade agreement had a pro-rich bias. The analysis is designed to measure the effect of the tariff reduction via cheaper intermediate inputs. As prices of imported US inputs decline, this reduces the relative price of goods that make intensive use of those inputs, which tend to be high-quality final products. The author shows that high-quality products are consumed more heavily by high-income households, leading to the pro-rich bias result. Finally, Ural (2012) estimates the distributional welfare gains from trade liberalization in India. Using household consumer expenditure surveys, she finds that welfare gains were higher among poorer households as their share of expenditure on traded commodities is higher.

While the studies listed above have been illuminating, using them to infer the impact of increased exposure to Chinese imports is not straightforward. Indeed, the impact is far from obvious, as the impressive growth of exports from China since the early 2000s has encompassed a wide range of manufacturing sectors. These include apparel, which could induce a pro-poor bias, but also electronic equipment, which could yield the opposite. A structural model of trade calibrated to the US finds that import exposure to Chinese imports reduced consumer prices and had a pro-poor bias (He, 2017). In this model, Chinese manufacturing goods tend to be low-income elastic and thus their lower prices benefit more the poor households who spend relatively more on these goods.

Using consumer price index (CPI) data for the US, Jarabel and Sager (2018) confirmed He's (2017) findings that the increase in Chinese import competition reduced US consumer prices. The authors find, however, that the impact was larger among product categories that are consumed more intensively by college graduates, a result that the authors interpreted as evidence of a pro-rich impact. Instead of relying on indirect measures of income, like education, the analysis in this paper uses detailed microdata that includes information about expenditures and income levels at the household level. My analysis thus provides the first household expenditure survey-based analysis regarding the distributional impact of the China shock. Specifically, I analyze how the impact of Chinese import exposure on price growth affects consumption across income levels between 2002 and 2017. Following Faber (2014) and, in particular, Nicita (2009) and Porto (2006), the analysis involves two steps: first, calculating the impact of the trade shock on local prices, and second, calculating the effect of these price changes on household welfare.

I find that the increase in Chinese import competition indeed impacted domestic prices. Had import penetration remained unchanged, the 15-year change in the CPI would have been about 7 percentage points higher, on average, across all industries. This average, however, hides a lot of heterogeneity: the prices of goods in industries that were highly exposed to import competition were much more affected. The results are robust to a number of controls and procedures including addressing potential endogeneity concerns. Regarding the effect on household welfare, I find that access to cheaper goods benefited all households, but that households at the bottom of the income distribution benefited relatively more. For example, the increased purchasing power of households in the 10th percentile of the income distribution was 81% higher than the increase in the purchasing power of the households in the 90th percentile.

My results are compatible with a declining trend in inequality that Mexico has experienced during the 2000s. Nevertheless, my calculations reveal that the pro-poor bias of the China shock only contributed slightly to this reduction in inequality, suggesting that other factors might be at play.

This paper relates to two different bodies of literature. By employing a household survey on expenditures and estimating consumer effects across the income distribution, this paper contributes to a growing body of literature that examines the extent to which trade shocks generate unequal gains across households of different income levels (Porto, 2006; Nicita, 2009; Ural, 2012; Faber, 2014; Fajgelbaum and Khandelwal, 2016; and Zhe, 2017).

My paper also contributes to an established body of literature regarding the impact of import competition from low-wage countries, particularly from China (e.g. Bernard, Jensen and Schott, 2006; Autor, Dorn, and Hanson, 2013; Acemoglu et al. 2016; Mion and Zhu, 2013; Iacovone, Rauch and Winter, 2013; Utar and Ruiz, 2013; Pierce and Schott, 2016; Caliendo, Dvorking, and Parro, 2015; Utar, 2018). The vast majority of this literature focuses on the adverse effects of import competition on labor. This paper is therefore particularly relevant because it provides balancing evidence relating to the China shock by highlighting the gains in consumer welfare that arise from access to cheaper goods.

The rest of the paper is divided as follows. Section 2 describes the empirical methodology used in the analysis. This section also provides a description of the various datasets used and a preliminary summary of the statistics. Section 3 presents the results of the econometric analysis and discusses the main findings.

Section 4 combines the results of the econometric model with the household expenditure survey to estimate the impacts on welfare across income levels. Section 5 provides some concluding remarks.

2. EMPIRICAL METHODOLOGY AND DATA DESCRIPTION

The empirical methodology in this study involves estimating the extent to which Chinese import exposure affects domestic prices and then calculating the extent to which these price changes affect household welfare. I first describe the procedure behind the estimation of how Chinese import competition affects prices. China's share in Mexican imports went from a mere 2% in 2001 to 18% in 2016, so I focus on the change in import penetration over a 15-year period starting in 2001, which is also the year when China entered the WTO.

My measure of import penetration mimics the formulation in Acemoglu et al. (2016), who studies the effect of changes in Chinese import penetration at the industry level. The measure takes the following form:

$$\Delta IP_j = \frac{\Delta M_j^{MC}}{Y_{j,01} + M_{j,01} - E_{j,01}} \tag{1}$$

where ΔM_j^{MC} is the 15-year change in Mexican imports from China in industry *j* from 2001 to 2016, and $Y_{j,01} + M_{j,01} - E_{j,01}$ is the initial level of absorption, measured as industry output plus industry imports minus industry exports.

In order to address potential endogeneity concerns between import penetration and my dependent variable, the change in prices, I construct an instrument for ΔIP_j. My intuition is that the observed changes in import penetration might not be entirely driven by China but instead might be partly due to internal shocks in Mexican industries that affect Mexican import demand. I am only interested in the supply-driven component of Mexican imports from China. Therefore, similarly to Acemoglu et al. (2016), I construct an instrument for ΔIP_j by substituting the change in the Mexican imports from China in expression (1) with the change in the imports of other countries from China:

$$\Delta IPO_j = \frac{\Delta M_j^{OC}}{Y_{j,98} + M_{j,98} - E_{j,98}} \tag{2}$$

where ΔM_j^{OC} is the 15-year change in other countries' imports from China in industry *j* from 2001 to 2016. The identifying assumption is that the change in other countries' imports from China is uncorrelated with potential shocks to Mexican industries that affect Mexican import demand. In this study, the group of other countries consists of 17 Latin American economies.[1] I also follow Acemoglu et al. (2016) and lag the initial level of absorption in (2) by three years to address concerns regarding potential anticipation effects from the China shock.

One potential weakness of this identification strategy is that Mexican shocks might correlate with outcomes in other Latin American countries, thereby implying that changes in Latin American imports from China are not truly exogenous for Mexico. While this is potentially possible and would threaten my identification strategy, in practice it should not be a major concern given that the transmission of Mexican shocks to the rest of Latin America is likely to be minimal due to the low trade ties between the country and the region—Latin America's shares in Mexican imports and exports are 4% and 6%, respectively. In the next section, besides relying on

[1] For the US, Acemoglu et al. (2016) substitute the change in US imports from China with the change in imports from China of eight high-income countries. In this paper, the 17 Latin American countries are: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Jamaica, Nicaragua, Panama, Peru, Paraguay, Uruguay, and Venezuela.

weak identification tests to gage the appropriateness of my instrument, I also provide an additional exercise in the form of a placebo to examine the consistency of my identification exercise.

I estimate the effect of the import penetration on prices using the following specification:

$$\Delta lnP_{ijc} = \hat{\beta} \cdot \Delta IP_j + \delta \cdot lnP_{ijc} + \theta_c + e_{ijc} \quad (3)$$

where ΔlnP_{ijc} is the 15-year log-price change for product *i* in industry *j* and city *c* from 2002 to 2017, while ΔIP_j is the 15-year change in the import penetration from China in industry *j* from 2001 to 2016.[2] Following Faber (2014), I also include variable lnP_{ijc} in the estimation, which is the initial log price of good *i* in 2002. A negative δ will point to the existence of price convergence. The variable θ_c indicates a city fixed effect. Standard errors are adjusted for clustering at industry level *j*. Being a cross-section, the model does not require a time fixed effect, but in some specifications I also include a broad sector fixed effect to control for potential common trends in the prices of products within sector categories (more details below).

A. Data description

The data on imports and exports in this paper are from the UN Comtrade Database. This data is converted from the Harmonized System (HS) to the North American Industry Classification System (NAICS, version 2002) using the concordance in Pierce and Schott (2012). The industry output used in the import penetration variable is obtained from Mexico's National Accounts, which are compiled and published by the Mexican statistics agency, the National Institute of Statistics and Geography (*Instituto Nacional de Estadística y Geografía*, INEGI). All industry penetration variables are measured at the 4-digit NAICS level. I use 4-digit NAICS because at this level of aggregation, INEGI provides an exact correspondence between the product categories available in the price index that I describe below and the NAICS classification.[3] There are a total of 48 NAICS industries, including agriculture, mining and manufactures.

National data on the CPI comes also from INEGI. This data used to be published by the Central Bank of Mexico, but since 2011, it has been mandated by law that all the country's price indices are to be prepared and published by INEGI.[4] The CPI data is available for 284 distinct product categories across 46 Mexican cities.[5] One appealing feature of this data is that there is an almost exact match between the CPI product categories and those of the household expenditure survey described below. Another convenient aspect is that households in the expenditure survey reside in localities that correspond exactly to the 46 Mexican cities available in the CPI dataset.[6] Accordingly, the internal consistency between these two datasets facilitates using them together.

After excluding the utilities and service categories, 220 product categories across 46 cities remain. To illustrate the level of disaggregation of the CPI data, table 1 presents some examples of products available in the index and their corresponding NAICS industry categories.

B. Preliminary statistics

Figure 1 presents the evolution of both Mexico's import exposure to China and the CPI index. Import exposure increased by more than 10 percentage points during the period, an indication of the persistent

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[2] I employ a 15-year change in the estimations mainly because the changes in the CPI and the import exposure are fairly stable during this period: there were no significant fluctuations in particular subperiods, as shown below.
[3] INEGI employs this concordance when presenting Mexico's inflation rate at the industry level.
[4] This data is used by the government to report the official CPI index.
[5] Faber (2014) uses this same this level of product aggregation, although he employs confidential store price data.
[6] The sampling framework of the household data has been designed to match the information for the CPI data.

increase in competition from China. The CPI index also shows an upward trend during the period of analysis, although there are no major fluctuations.[7]

FIGURE 1. EVOLUTION OF IMPORT EXPOSURE FROM CHINA AND THE CPI INDEX

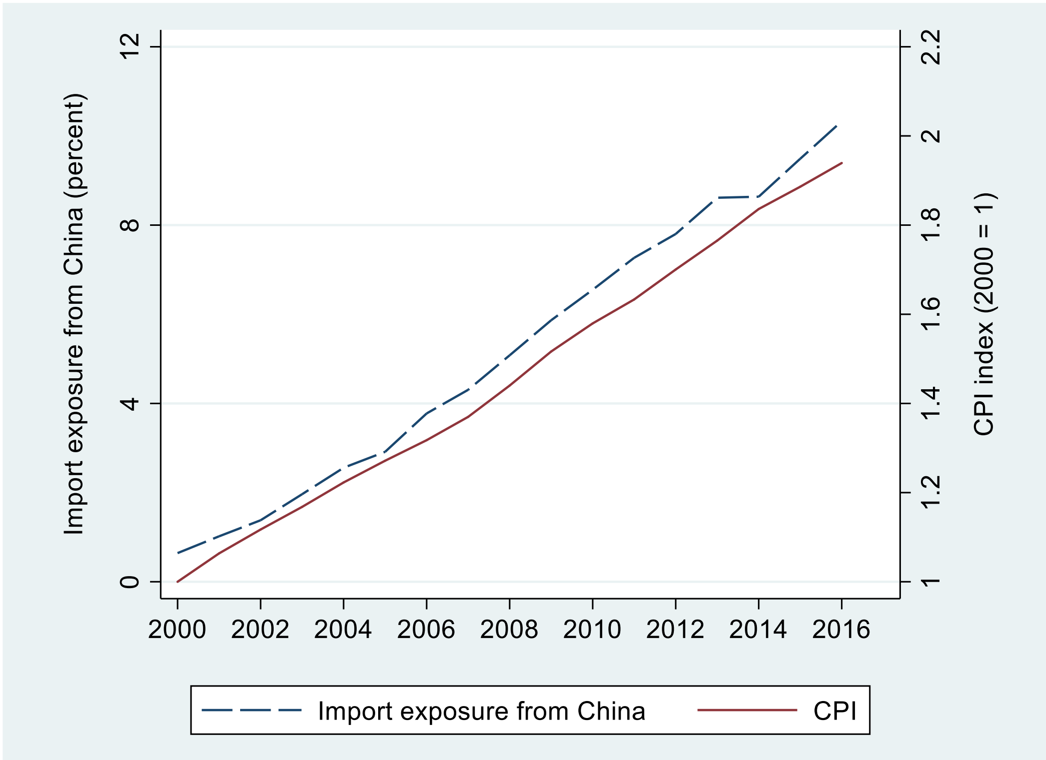


Table 2 presents further descriptive statistics of the measure of import exposure to China. While the first row shows the magnitude of the average increase during the 15-year period, it is worth noting that there is significant heterogeneity across industries. For example, in the industry that corresponds to the 90th percentile of the change in exposure, penetration increased by 28.69 percentage points, while in the industry that corresponds to the 25th percentile, the import exposure increased by only 0.33 percentage points.

Table 3 provides additional insight into the patterns of cross-industry and cross-time variation in the import exposure. To ease the illustration, the data have been aggregated at the 3-digit NAICS level. The table reveals that the largest import exposures are observed in the textiles and apparel industries (314, 315, and 316), fabricated metal products (332), machinery manufacturing (333), computer and electronic equipment (334) and electrical equipment (335). China's increasing penetration across a wide range of sectors is remarkable.[8] Table 3 also shows the 15-year log change in the CPI. Interestingly, some of the smallest increases in prices seem to be associated with sectors with large import exposures. This can be seen more clearly in figure 1, which plots the last two columns of table 3. A negative correlation between the two variables is clearly observed.

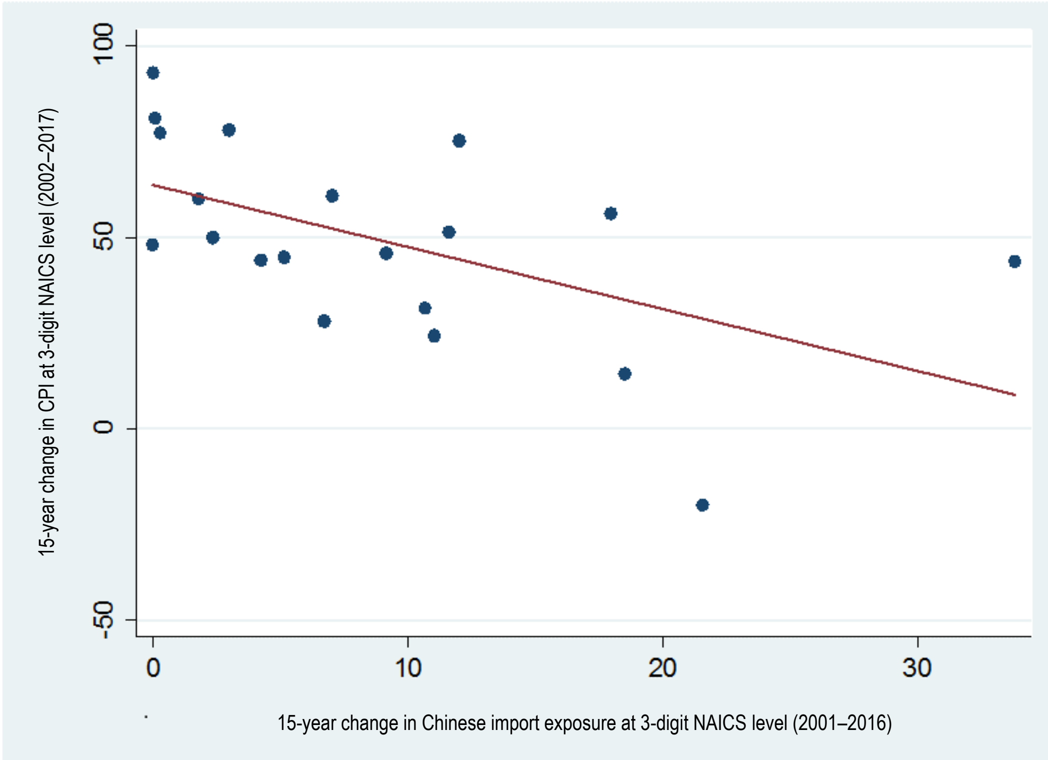
As shown in equation (3), in the econometric specification, I let the change in the CPI vary at the product and city level, while the change in the import exposure varies at the 4-digit NAICS level. To provide a closer graphic representation of that regression, figure 2 shows the correlation between prices and import exposure at these levels of aggregation. Note that the vertical lines correspond to changes in the CPI for multiple

[7] Similar stable patterns are observed in the CPI indexes and import exposures from China for individual industries. See figures B1 and B2 in appendix B.

[8] In the regression analysis in section 3, the import penetration is calculated at the 4-digit NAICS level.

products and cities that are associated with the same NAICS industry. In spite of the larger heterogeneity observed in this figure, there is still a negative correlation between the two variables.

FIGURE 2. 15-YEAR CHANGE IN CPI AND 15-YEAR CHANGE IN IMPORT EXPOSURE AT 3-DIGIT NAICS



3. ESTIMATION RESULTS

Table 4 shows the results of estimating equation (3). Columns 1–3 present the results of the OLS estimation under alternative sets of fixed effects. Specifically, column 2 includes a city fixed effect while column 3 introduces a sector (3-digit NAICS level) fixed effect. The coefficient for the change in exposure to Chinese imports is negative and significant in all the three columns, indicating that there is a negative relationship between the increase in import penetration from China and price growth. The coefficient for the initial log-price level is also negative, providing evidence of price convergence—that is, initially high prices are associated with lower price growth.[9] Column 4 presents the results of the 2SLS estimation. The coefficient for import exposure is once again negative, significant, and larger (in absolute value) than the coefficient for the OLS regressions.[10] The value of -0.641 indicates that a 1-percentage-point increase in import exposure to China reduces price growth by 0.641 percentage points. The F statistic of 52.7 suggests that the specification does not seem to suffer from a weak instrument problem.

One general concern with the specification in (3) is that the increased import penetration from China might just reflect an increase in overall import penetration in Mexico, not just from China. In other words, Mexico's import penetration from many other countries may also be increasing. If this is the case, the import variable

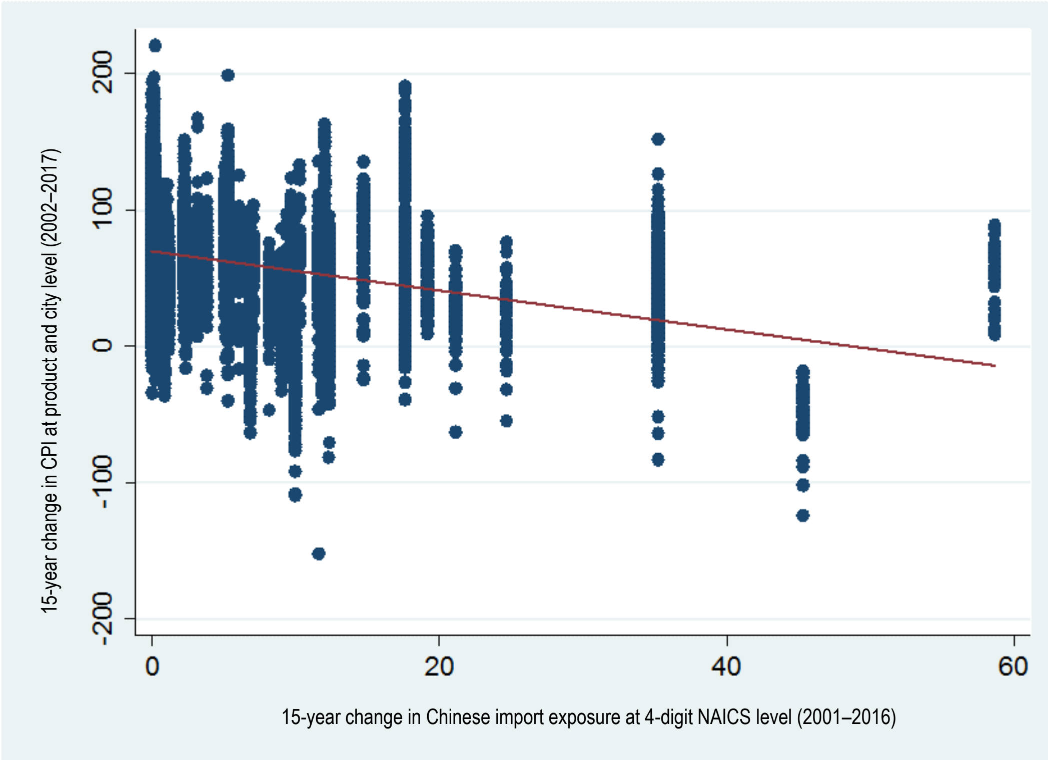
[9] In column 1, the estimated coefficient for the initial log-price level implies that the price growth of a good whose initial price is 100% higher is 105.5 percentage points lower.

[10] Note that the absolute size of the coefficient is smaller for the OLS estimation. This could be the case if actual imports are reflecting a positive demand shock that increases domestic prices at the same time as raising imports from China. In such a case, the increase in prices from the positive demand shock dampens the reduction in prices from the Chinese import competition, leading the OLS to underestimate the China shock. The IV, on the other hand, captures the change in imports that arise only from supply shocks in China. Iacovone et al. (2013) find the same type of result with a different outcome variable.

from China might be capturing the penetration from other countries as well, possibly overstating its effect. Figure 3 presents the evolution of overall import penetration in Mexico (measured as total imports from all countries over Mexico's apparent consumption) together with import penetration from China and the US, Mexico's main trade partner. As shown, US import penetration did not increase. Indeed, from 2001 to 2010, US import penetration actually declined and only started to rise again after 2010, not returning to its 2001 levels until 2016. The increase in the overall import exposure observed in figure 3 is mainly the result of China's growing import penetration. Nevertheless, I still control for the import penetration from the rest of the world (ROW) in column 5 of table 4.[11] The results show that the estimated coefficient for this variable is not statistically significant, while the coefficient for the import exposure to China remains the same.

[11] Following the same specification in (2), I instrument this variable by the change in the import penetration of the ROW in Latin America.

FIGURE 3. 15-YEAR CHANGE IN CPI AT PRODUCT AND CITY LEVEL AND 15-YEAR CHANGE IN IMPORT EXPOSURE AT 4-DIGIT NAICS LEVEL



In order to control for different trends in price growth across products, in column 6, I include a 4-digit NAICS sector-specific characteristic, consisting of the 15-year change in labor productivity. A sector-specific covariate should mitigate concerns about industry confounds. Specifically, the column includes the ratio of labor productivity in 2014 relative to 1999.[12] While the estimated coefficient of this variable is negative, suggesting that sectors that experienced larger productivity increases are associated with lower price growth, it is not statistically significant. Importantly, the estimated coefficient for import exposure to China is not affected by the inclusion of the control.

Appendix B presents a robustness test where I employ an alternative set of countries for the instrumental variables in expression (2). The rationale behind using Latin American countries to construct the instruments has been that a shock in Mexico is likely to be uncorrelated with the import demand of Latin American countries from China due to the relatively limited trade linkages between Mexico and the rest of Latin America. I modify this instrument so that exogenous demand is constructed by Chinese exports to a group of developing countries without restricting it by region. Specifically, I employ a group of alternative countries based on their similarities with Mexico in terms of economic development. This group is made up of Argentina, Brazil, Colombia, Costa Rica, Malaysia, Peru, Poland, and Romania.[13] The idea is that due to similarities in economic structure and levels of development, these countries and Mexico are similarly exposed to growth in imports from China. Changing the countries employed in the construction of the instruments does not alter the results in any significant way. Indeed, the impact of Chinese import penetration seems to be larger in absolute values,

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[12] Labor productivity is measured by the ratio of output over total employment in the 4-digit NAICS sector. The data for this comes from the Mexican Economic Censuses of 1999 and 2014.

[13] The selection of the countries is based on a World Bank algorithm that chooses countries with similarities on a 5-dimensional space (GDP per capita, physical capital, human capital, population and export basket composition)

as shown in table B1 of appendix B. In the rest of the paper, I continue to use the Latin American countries for the instrument.

I can assess the economic significance of the estimated coefficient in terms of the effects of the dependent variable of an interquartile shift in the change in import penetration. The estimated coefficient indicates that the price growth of the products at the 75th percentile of the increase in import exposure grew by 12 percentage points less than the price growth of the products at the 25th percentile.[14]

A. Placebos and upstream import exposure

Table 5 presents a placebo exercise to further examine the consistency of my identification strategy. The idea is to use changes in prices prior to the changes in import exposure. Specifically, the dependent variable in column 1 is the 15-year log-price change from 1983 to 1998, while the main explanatory variable continues to be the 15-year change in Chinese import exposure from 2001 to 2016. In other words, I am regressing past changes in prices on future changes in import exposure. If I find a significant effect in this regression, it could imply that the β coefficient in equation (3) might be capturing the existence of other long-run factors that commonly affect domestic prices, in addition to imports from China. Reassuringly, the coefficient estimated for Chinese import exposure in column 1 is not statistically significant.[15] In columns 2 and 3, I employ alternative subperiods for the change in the dependent variable, but the coefficient for Chinese import exposure remains insignificant.

In a different exercise, the dependent variables used in the placebo regressions of table 5 are employed as controls in table 6. I do this to control for the possibility that Chinese import exposure might be capturing pretrends in inflation which potentially might bias the results. For comparison purposes, column 1 of table 6 repeats the results shown in column 5 of table 4. None of the coefficients for the CPI changes are statistically significant, indicating that there are no clear pretrends in the data. The coefficients for Chinese import exposure continue to be significant but the estimations of these are less precise than before. This is mostly due to the drop in the number of observations, as there are some gaps in the earlier years of the CPI data at product-city level.

Another exercise that I perform is to examine the extent to which increased Chinese import penetration affects prices via the intermediate inputs channel. Greater import competition from China in upstream industries in Mexico could expand input supply and put downward pressure on local input prices. This could reduce the costs of the firms in the industries that consume those inputs (Goldberg, Khandelwal, Pavnick, and Topalova, 2010). Faber (2014), for example, finds that tariff reduction under NAFTA reduced the price of US imported inputs which in turn led to a decline in the relative price of the products that make intensive use of those inputs.

To incorporate the intermediate inputs channel, I need a measure of import penetration from China that is similar to expression (1) but for upstream industries. To this end, I follow Acemoglu et al. (2016) and construct upstream industry measures of Chinese import penetration using input-output linkages. The following

[14] That is, moving from the 25th percentile of the increase in import penetration to the 75th percentile (from 0.33% to 19.44%) implies a reduction of 12 percentage points in price growth [-0.6263 * (19.44 – 0.33) = -11.97]

[15] There are a number of missing observations in the CPI data for this earlier subperiod (1983–1998), which explains the drop in the number of observations.

expression presents the author's approach to measuring Chinese import penetration in the upstream industries that sell intermediate inputs to industry *j*:

$$\Delta IP_j^{Upstream} = \sum_r \frac{u_{rj}}{\sum_r u_{rj}} \cdot \Delta IP_r \quad (4)$$

where u_{rj} is the value of "upstream" industry *r* used in US$1 of industry *j*, and ΔIP_r is the change in Chinese import penetration in industry *r*. Accordingly, expression (4) is a weighted average of the change in import penetrations in all the industries that provide inputs to industry *j* where the weights are based on the input-output linkages.

Following expression (4), I construct upstream measures of import penetration from China using a Mexican input-output table for 2008 prepared by INEGI. The table is disaggregated at the 4-digit NAICS level, which is the same level of disaggregation as the import penetration variable that I use. I construct the IV for this variable analogously, that is, a weighted average of the IVs of import penetrations in all industries that provide inputs to industry *j*, while the IV for each of these industries is defined as before, that is, the Chinese share of Latin American imports in that industry (see the instrument in expression 2).

Table 7 reports these results. For comparison purposes, column 1 of table 7 repeats the baseline regression that appears in column 5 of table 4. The measure of upstream exposure to Chinese imports is introduced in column 2 of table 7. The estimated coefficient is not statistically significant, which suggests that there is no impact on prices through the intermediate inputs channel. Column 3 repeats the exercise using upstream exposure to ROW imports. Once again, the coefficient is not statistically significant. Importantly, relative to the baseline regression, the coefficient for the exposure to Chinese imports in the same industry does not change significantly in these regressions.[16]

B. Counterfactual

I now present a counterfactual exercise. This is particularly useful for putting the magnitude of the results in perspective. I follow the general idea behind the studies by Autor, Dorn, and Hanson (2013) and Acemoglu et al. (2015), who construct counterfactuals by asking what the change in the variable of interest (in their case, employment) would have been if Chinese import exposure had not changed during the period of analysis. In my case, I ask what the price growth would have been between 2002 and 2017 if import exposure from China had remained at 2001 levels. I compare these hypothetical changes in prices with actual changes in prices. Table 8 presents the results.

The first row of table 8 reports the counterfactual for the mean in all products, while rows 2 and 3 report the counterfactuals for two selected industries. Starting with the first row, column 1 shows that during the 15-year period from 2001 to 2016, Chinese import exposure increased by 10.86 percentage points on average across all industries. Column 2 reports the average estimated effect of this change in import exposure on prices. The value is calculated by multiplying the estimated beta coefficient in column 1 of table 6 (-0.6263) with the 15-year change in Chinese import exposure presented in column 1 (10.86) multiplied by the partial R-square of the first-stage regression (0.933). This R-square gives the variation in import exposure that is explained by the instrument in (2). Accordingly, the variation in import exposure multiplied by the R-square of the first stage is a proxy for the supply-driven component of ΔIP_j (see Acemoglu et al., 2016). The result is -

[16] The lack of significance for the coefficient of the upstream exposure variable is somewhat surprising. Using changes in tariffs, Faber (2014) finds that tariff reductions for intermediate inputs from the US reduces the relative prices of Mexican goods that make intensive use of those inputs. One economic intuition behind the different results is that Chinese import penetration in Mexico is much less biased toward intermediate inputs than US import penetration in Mexico. I calculate the share of intermediate inputs in total imports from China and the US between 2002 and 2016 using the Broad Economic Categories (BEC) classification (http://unstats.un.org/unsd/tradekb/Knowledgebase/Intermediate-Goods-in-Trade-Statistics). This method has already been employed in Baldwin and Taglioni (2014), for instance. The share of intermediate inputs from the US in total imports is 73%, while the share of intermediate inputs from China in total imports is 49%.

6.34 percentage points. In other words, if the import exposure from China had remained at the 2001 level, the average 15-year change in CPI would have been 6.34 percentage points higher. Since the actual 15-year change in CPI (simple average across all products) was 60.81%, as reported in column 3, then the 15-year counterfactual change in CPI would have been 67.15% (or 10% higher).

While the row 1 of table 8 puts the magnitude of the results in perspective, the mean hides a lot of heterogeneity. It is thus useful for the exercise to be repeated for some individual industries. Row 2 of table 8 considers products related to industry 3113 (sugar and confectionery product manufacturing). This industry lies at the 20th percentile of the change in import exposure—in other words, China's import penetration in it is not very large. As shown in column 1, the 15-year change in Chinese import exposure in this industry was only 0.28 percentage points, and the estimated effect on prices was -0.16 percentage points. Accordingly, the impact of China on the price growth of the products related to this industry was practically nil. The third row considers the opposite case. The example is for industry 3262 (rubber product manufacturing), which experienced a large increase in Chinese import exposure of 28.69 percentage points. With an estimated effect on prices of -16.76 percentage points, this result implies that without the China shock, the 15-year price change for products associated with this industry would have been 40.36% instead of the actual price change of 23.6% (or 71% higher), a very large difference.[17] This exercise illustrates that the downward pressure on prices exerted by the import exposure to Chinese imports was, on average, relatively moderate, but the impact was substantial for those products that were highly exposed to Chinese import competition.

4. ESTIMATION OF WELFARE IMPACTS

In this section, I combine the results from the econometric estimation presented above with microdata from the household expenditure survey to estimate the welfare effects associated with the price changes. The Mexican Household Expenditure Survey (*Encuesta Nacional de Ingresos y Gastos de los Hogares*, ENIGH) is conducted every two years by INEGI to provide information on the amount and the structure of the income and expenditures of Mexican households. Importantly, the survey provides information on the value of the purchases made by every member of the household for several product categories. As mentioned before, the product categories in the ENIGH match the product categories of the CPI almost exactly. I use this survey to calculate the welfare impact of the price changes induced by the China shock. Specifically, the survey allows me to obtain the share of income spent by each household on each product category, a key variable for calculating the welfare impact, as I will describe below.[18]

Before I present the full exercise, it is useful to look at the expenditure patterns that exist across households with different income levels, which is presented in table 9. The figures are based on the year 2000. The first row shows that for the median-income household, total expenditure represents about 70% of total income. For low-income households (percentile 10), however, the share of income on aggregate expenditure is about 89.4%, while this share is 59.3% for high-income households (percentile 90).

There are also significant differences across types of expenditures. Low-income households spend about 43.3% of their income on "food, beverages, and tobacco" while high-income households spend only 14.9% on this. Low-income households also spend a larger share of their income on "apparel"—5.5%, relative to 4.0% for high-income households. Since Chinese import penetration in apparel has been high, the impact of this category could have a pro-poor bias. The situation is similar for "personal care products," which includes items like creams, shampoo, deodorant, lotion, soap, toothpaste, and toothbrushes, among others. Once again, low-income households spend a larger share of their income on these products, so since there is some

[17] Another interesting industry, given its size in Mexico, is motor vehicle parts manufacturing (3363). Chinese import exposure in this industry increased only moderately, by about 6.4 percentage points. Accordingly, this gave a relatively small estimated impact on prices of -3.7 percentage points

[18] The design of the ENIGH sample is multistage, stratified, and by conglomerates, where the last unit of selection is the dwelling and the observation unit is the household. At the same time, the design of the sample is characterized as probabilistic, consequently, the results obtained from the survey are generalized to the entire population.

import penetration from China in this category, the impact could be also pro-poor. The same can be said of the category “household furnishing, equipment, and supplies,” which includes items like furniture, appliances, and household textiles. In comparison with poor households, high-income households spend a larger share of their income on “entertainment.” This category not only comprises activities like going to the cinema or the theater, but also includes the purchase of products such as audio and visual equipment, toys, and many electronic gadgets. China’s import penetration is high for this category of products, so there may be a pro-rich bias. Accordingly, while in principle the import penetration effect on prices could be pro-poor because of categories like apparel, personal care products, and household furnishing, it is not clear what the final result would be because the rich spend a much larger share of their income on electronic equipment and related products than the poor, and these are goods that experienced significant import competition from China. In the following paragraphs, I present the full exercise for calculating the welfare impact across the income distribution.

To measure welfare change, I follow Nicita (2009), which in turns follows Deaton (1997). In essence, welfare change is defined by the negative of the compensating variation or the amount of additional income that a household needs in order to maintain its level of welfare from before the price change. A simple example can be used to illustrate the procedure. Consider that import exposure from China induces a reduction in the price of good *i*. If the price change is dp_i (for example, the price of the product goes from US$12 to US$10, so dp_i=- US$2), then the following expression gives the amount of income saved by household *h* after purchasing the same quantity of good *i* at the lower price:

$$dy_h = -\, q_{hi} \cdot dp_i \qquad (5)$$

where y_h is the income of household *h* and q_i is the quantity of good *i* consumed. Note that since dp_i is negative (a price decline), household *h* has now dy_h additional income available after purchasing good *i* at the lower price. Expression (5) can also be expressed as follows:[19]

$$dy_h = -\, q_{hi} \cdot p_i \cdot\ dlnp_i \qquad (6)$$

Dividing both sides by y_h, (6) can be expressed in percentage terms, that is, as a fraction of the initial household income:

$$\frac{dy_h}{y_h} = -\left(\frac{q_{hi} \cdot p_i}{y_h}\right) \cdot\ dlnp_i \qquad (7)$$

It is worth noting that expression (7) can be derived more formally by taking the derivative of an indirect utility function with respect to price p_i (see for instance Deaton, 1989). Indirect money metric utility functions (in which the household utility is written as a function of its income and prices) are normally used to measure welfare changes expressed in dollar units or as a fraction of the household income (Deaton, 1997).[20] Expression (7) therefore refers to the percentage change in money metric utility, which is the negative of the compensating variation as a fraction of the initial household income level.

The intuition behind (7) is straightforward: the extent to which household *h* is impacted by the price change in good *i* depends on the share of the income spent on the consumption of that good. For instance, if household *h* does not consume good *i*, the expression in parenthesis becomes 0, meaning that the price change has no impact on the household. Conversely, if the household spends all its income on consuming

[19] Noting that $dp_i = p_i \cdot dlnp_i$ for sufficiently small changes in prices

[20] Money metric indirect utility functions are utility functions in which the indifference curves are labeled by the minimum amount of money (or income) that is necessary to reach them at specific reference prices (Deaton and Muellbauer, 1980)

good *i*, the expression in parenthesis becomes 1 and thus a decline in the price of good *i* would induce a similar percentage-change impact on the household's income.

Expression (7) can be generalized for the case of many goods as follows:

$$\frac{dy_h}{y} = - \sum_i \theta_{ih} \cdot dlnp_i \quad (8)$$

where $\theta_{ih} = \frac{q_{hi} \cdot p_i}{y_h}$.

This is the expression that I use to calculate how changes in prices that result from the increase in Chinese import penetration impact each household. Specifically, for each household *h*, the share of income spent on good *i* (θ_{ih}) is calculated directly from the household expenditure survey, while $dlnp_i$ is the 15-year price change induced by the increase in Chinese import competition, which is estimated from the econometric analysis presented above. It is clear from (8) that differences in θ_{ih} across households will generate differences in the impact of Chinese competition on welfare: households with consumption bundles that are more (less) biased toward goods whose prices decline more exhibit larger (smaller) increases in welfare.[21]

It is worth stressing that this exercise features a partial equilibrium effect in the sense that expression (8) accounts for the effect of Chinese import penetration on household income through the consumption channel only. Import competition could also affect labor income when price changes affect factor returns. Those supply-side effects are not considered in this analysis.

Before presenting the changes in welfare using equation (8), it is worth providing a back-of-the-envelope calculation to anticipate what the order of magnitude of these changes would be. Starting from table 8, column 2, it is worth noting that the change in Chinese import penetration induced a 15-year decline in price growth of 6.3 percentage points (6.3%)[22]. On the other hand, table 9, column 1 shows that the median-income household spent about 70% of its income on aggregate expenditures. After excluding nontradables (housing, healthcare, education, and some entertainment activities), this share falls to 55%. Therefore, a very raw estimate of the change in welfare for the median-income household is about 3.7% [3.5 = - 0.55 x (-6.3)]. It is very likely, however, that effects will generally be smaller than this. The main reason is that the category on which households spend most of their income is "food, beverages, and tobacco" (see table 9), which is precisely one of the categories that exhibit low import penetration from China (see table 3) and thus only experience a small price impact. In terms of the welfare expression in (8), this implies that the products in the category "food, beverages, and tobacco" tend to have large values of θ and small values of $dlnp$, which dampen the overall impact.

I am now ready to calculate the welfare impacts. I use the information from the expenditure survey for the year 2000 to construct θ_{ih}. As mentioned before, $dlnp_i$ is the estimated 15-year price change induced by

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[21] This methodology can be readily applied to study the impact of import competition on household welfare through changing consumer price indices in other countries.

[22] The estimated impact of Chinese import exposure on prices is measured in percentage points. For instance, the value -6.82 in column 2 of table 6 means that over the 15-year period, prices grew 6.82 percentage points less than they would have grown because of the China shock. But since price growth is measured in log changes, the estimated impact is also equivalent to a percentage change. This can be shown with the following example. Denote P_t and P_{t+1} the actual prices of a good in years *t* and *t+1*, and π, the inflation rate. Then:

$$\pi = lnP_{t+1} - lnP_t \quad \text{(i)}$$

Denote P'_{t+1} and π' the price and the inflation rate that would have prevailed without the China shock. Then:

$$\pi' = lnP'_{t+1} - lnP_t \quad \text{(ii)}$$

Finally, denote $\hat{z}$ the estimated effect of Chinese import exposure on prices measured in percentage points. The inflation rate that would have prevailed without the China shock (π') can thus also be expressed as follows:

$$\pi' = \pi - \hat{z} \quad \text{(iii)}$$

Using (iii) in (ii) and solving for lnP'_{t+1} yields:

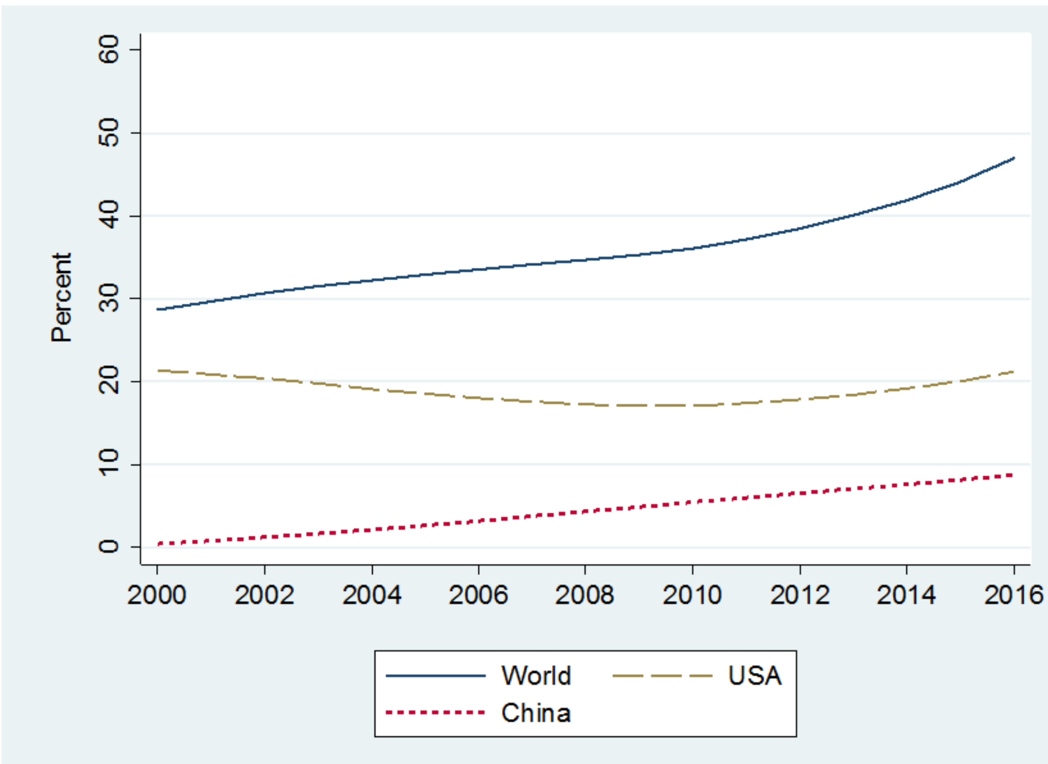
$$lnP'_{t+1} = lnP_t + \pi - \hat{z} \quad \text{(iv)}$$

The effect of Chinese import exposure on prices measured as a percentage change is: $lnP_{t+1} - lnP'_{t+1}$. Using (i) and (iv), that is:

$$lnP_{t+1} - lnP'_{t+1} = \pi + lnP_t - lnP_t - \pi + \hat{z} = \hat{z}$$

Chinese import competition. More precisely, $dlnp_i$ is calculated for each of the 220 products by multiplying the 15-year change in Chinese import penetration for industry *j* associated with product *i* multiplied by the estimated coefficient of the import penetration on prices, which is -0.6263 (see table 7, column 1), multiplied by the R-square of the first-stage regression.[23] Figure 4 presents the results by income percentiles. The positive values in the figure indicate that all households gain from this price reduction. However, the declining trend in the figure means that the impact was pro-poor: low-income households benefit more from access to cheaper goods than high-income households. For example, the 15-year increase in purchasing power for households in the 10th percentile of the income distribution was about 1.73%, while the increase in purchasing power for households in the 90th percentile was about 0.96%, an 81% difference.

FIGURE 4. IMPORT PENETRATIONS IN MEXICO



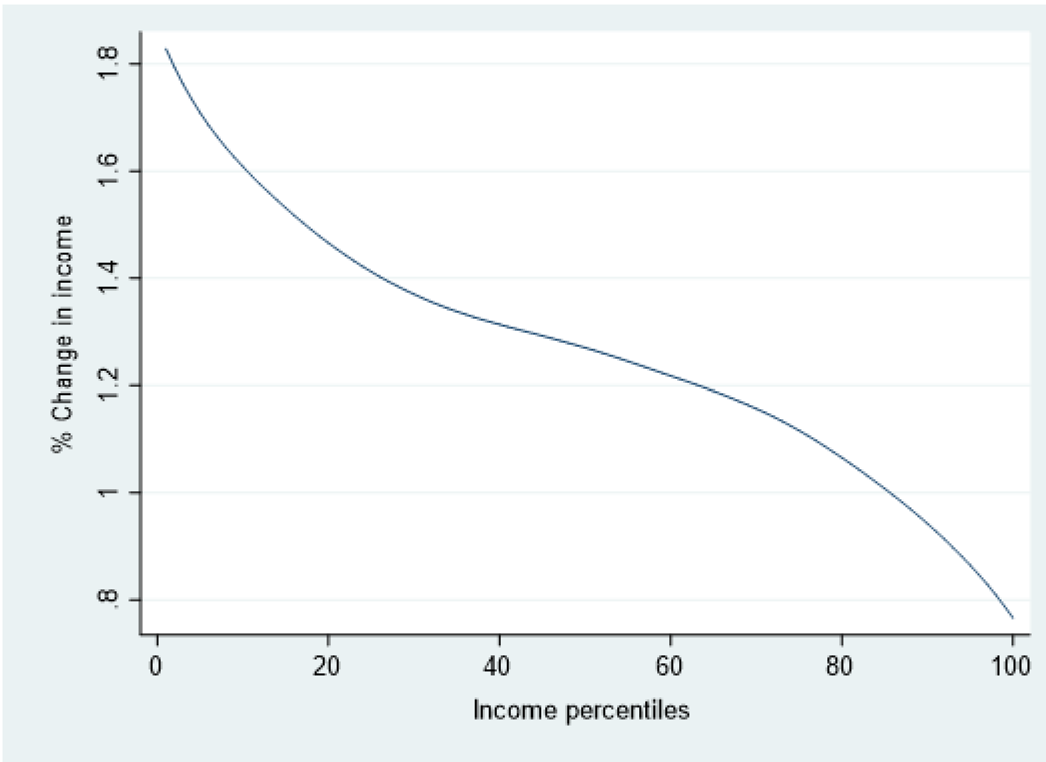
It is worth noting that the sizes of these welfare gains are in the same order of magnitudes as those found in similar exercises, albeit under different trade shocks. According to Nicita (2009), for example, trade liberalization in Mexico generated an increase in income of 1.6% (on average across all households) due to a cheaper expenditure basket. In Porto (2006), the gains from the expenditure channel were below 1%. While these changes seem small, they are not the result of any particular model but are derived directly from expressions similar to (8). It is clear from this expression that the size of the welfare gain is related to two factors: the magnitude of the trade shock and to the share of income spent on tradables. As mentioned before, the share of income spent on tradables is about 55% for the median-income household and about 28% after excluding food, beverages, and tobacco, the category of products where the China shock is practically zero. The fact that the share of income spent on goods that were hardly affected by the China shock is simply not that large goes a long way to explaining the seemingly small welfare gains.

I now perform a robustness check on the estimation of the welfare change. The expression in (8) measures the change in welfare only through the change in prices. In other words, it is assumed that the quantities

[23] Note that the variation in the import exposure times the R-square of the first stage is a proxy of the supply-driven component of ΔIP_j

purchased by the households stay the same. But the households might change their expenditure shares in response to the price changes that take place. Different expenditure shares might lead to welfare changes that are different from those presented in figure 4. Accordingly, for robustness, I now calculate the expenditure shares (θ_{ih}) with data from 2016 instead of 2000. Combined with the results already presented in figure 4, this exercise provides a range of plausible values for each percentile of the income distribution. Figure B3 in appendix B shows the results. The messages from figure 4 remain the same, that is, all households gain from the price reduction but low-income households benefit relatively more than the high-income households.

FIGURE 5. CHANGE IN WELFARE BY INCOME PERCENTILES



Before concluding, it is worth placing the results of this study within the context of the income inequality discussion in Mexico. Note first that the pro-poor gains from Chinese import competition found in this analysis are consistent with a downward trend in income inequality observed in Mexico. Rodríguez-Castelán et al. (2016), for example, show that Mexico has experienced a decline in income inequality since 2000, a trend also observed in other Latin American countries during the same period. Similar evidence is found in Cord et al. (2014), who show that between 2003 and 2012, the ratio of income between the households in the 90th and 10th percentiles of the income distribution fell from 10 to 8.5.

I can use the ENIGH dataset to calculate measures of income inequality, which I do for the years 2000 and 2016. I employ expenditure shares (with shares being a proportion of total expenditures) to deflate nominal incomes by price indices that reflect the household's expenditure patterns.[24] Panel A of table 10 shows the income ratios between percentiles 90 and 10. The values are similar to those reported by Cord et al. (2014). Specifically, in 2000, the ratio was equal to 9.9 and in 2016 it was 8.6. Accordingly, panel A supports the evidence reported in Rodríguez-Castelán et al. (2016) and in Cord et al. (2014) that income inequality in Mexico has experienced a reduction since 2000. Panel B shows the respective incomes of the households in these percentiles. The incomes were normalized to 1 in 2000 to facilitate comparison. Income levels clearly

[24] For this, I use expenditures in both tradables and nontradables

increased for both households, but this was much more marked for the households in the 10th percentile. Specifically, the income of the households in the 90th percentile increased by 7% while that for the households in the 10th percentile increased by 22%. These are much larger increases in income than those estimated from the China shock, which were 0.96% and 1.73% for the households in the 90th and 10th percentiles, respectively. Panel B also shows that the income of the households in the 10th percentile increased by 15 percentage points more than the households in the 90th percentile. Again, this is a much larger difference than that induced by the China shock. The Chinese-induced increase in income of the households in the 10th percentile was only 0.77 percentage points larger than the increase in income of the households in the 90th percentile [0.77 = 1.73 - 0.96]. If I reconstruct the income ratio between the 90th and 10th percentiles considering only the income growth due to the China shock, the ratio would only have fallen from 9.88 to 9.81. This clearly shows that even though the pro-poor bias of the China shock contributed to the decline in income inequality in Mexico, its role was minor, and additional forces might have been behind it.

5. CONCLUDING REMARKS

Not only might import competition provide greater access to cheaper imports, it might also reduce local prices as firms might eliminate excess costs, adjust profit margins, and potentially become more efficient. As local prices decline, consumers' welfare increases, but these gains might be unequal across households depending on the basket of goods purchased. As individuals with different income levels tend to consume different baskets of goods, the impact of the trade shock could be pro-poor or pro-rich, depending on which basket of goods experiences the largest price decline. In this paper I study the impact of import competition from low-wage countries, and particularly China, on local prices in Mexico and ask whether the price impact had a pro-poor or a pro-rich bias.

First, I employ a CPI that varies at the product and city level and measure the impact of the increase in Chinese import competition on price growth between 2002 and 2017. I find that the competition from abroad indeed put downward pressure on local prices. This price impact was substantial for products that were highly exposed to Chinese import competition. Second, I use microdata from a household expenditure survey to calculate the welfare change from this price impact. I find that all households benefited from this access to cheaper goods, but that low-income households benefited more. For instance, the welfare increase for households in the 10th percentile of the income distribution was 81% higher than the welfare increase for households in the 90th percentile. Finally, I place these results within the context of income inequality in Mexico, noting that overall income inequality declined during the period of analysis. The results show that the pro-poor bias of the China shock contributed to this declining inequality but its role was only minor, suggesting that additional forces might have been at play.

The results of this paper provide an important contribution to a growing literature that has mostly focused on the adverse effects of import competition from low-wage countries. By highlighting the gains in consumer welfare that arise from access to cheaper goods, this paper provides balancing evidence relating to the China shock. Additionally, by showing that the gains are heterogeneous across households of different income levels, the paper adds new evidence to earlier studies indicating that the gains from trade can have a distributional impact on consumers.

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TABLE 1. EXAMPLES OF PRODUCT CATEGORIES IN THE CPI

CPI product	NAICS industry	
	4-digit code	Description
Soda	3121	Beverage manufacturing
Bottled water	3121	Beverage manufacturing
Beer	3121	Beverage manufacturing
Tequila	3121	Beverage manufacturing
Blanket	3141	Textile furnishings mills
Bed sheet	3141	Textile furnishings mills
Towel	3141	Textile furnishings mills
Curtain	3141	Textile furnishings mills
Fridge	3352	Household appliance manufacturing
Washing machine	3352	Household appliance manufacturing
Blender	3352	Household appliance manufacturing
Microwave	3352	Household appliance manufacturing

TABLE 2. IMPORT EXPOSURE

	2001	2016	15-year change
Import exposure to China (%)	1.02	11.87	10.85
Percentiles			15-year change
90th percentile			28.69
75th percentile			19.44
50th percentile			6.94
25th percentile			0.33
10th percentile			0.01

TABLE 3. SUMMARY STATISTICS

	Import exposure to China (%)		15-year change in import exposure (% points)	15-year change in CPI (%)
NAICS	2001	2016	2001–2016	2002–2017
111 Crop Production	0.4	3.4	3.0	78.1
112 Animal Production and Aquaculture	0.0	0.0	0.0	93.1
114 Fishing, Hunting and Trapping	0.6	12.6	12.0	75.3
311 Food	0.0	0.3	0.3	77.3
312 Beverage and Tobacco	0.0	0.0	0.0	48.0
314 Textile Products	0.4	9.5	9.1	45.9
315 Apparel	0.1	10.8	10.7	31.5
316 Leather and Allied Products	1.2	12.2	11.0	24.3
322 Paper	0.4	2.7	2.3	50.1
324 Petroleum and Coal	0.2	0.2	0.1	81.2
325 Chemicals	0.3	2.1	1.8	60.2
326 Plastic and Rubber Products	0.7	7.8	7.0	61.0
327 Nonmetallic Mineral Products	0.6	5.8	5.1	44.9
332 Fabricated Metal Products	1.3	12.9	11.6	51.3
333 Machinery Manufacturing	2.8	21.3	18.5	14.3
334 Computer and Electronic Equipment	2.2	23.7	21.5	-20.0
335 Electrical Equipment	2.1	35.9	33.8	43.8
336 Transportation Equipment	2.1	6.3	4.2	44.1
337 Furniture and Related Products	0.6	7.3	6.7	28.2
339 Miscellaneous Manufacturing	5.5	23.5	18.0	56.2

TABLE 4. EFFECT OF IMPORT EXPOSURE ON PRICES: OLS AND 2SLS ESTIMATES

				2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
Change in exposure to Chinese imports	-0.3213**	-0.3231**	-0.3044**	-0.6418**	-0.6284**	-0.6263**
	(0.131)	(0.132)	(0.131)	(0.318)	(0.309)	(0.309)
Log of initial CPI	-105.15***	-104.96***	-93.09***	-92.98***	-93.10***	-93.17***
	(8.211)	(8.317)	(7.954)	(8.004)	(7.987)	(7.976)
Change in exposure to ROW's imports					0.1243	0.1251
					(0.145)	(0.144)
Labor productivity ratio						-1.5813
						(7.567)
City fixed effect	no	yes	yes	yes	yes	yes
Sector (3-digit NAICS) fixed effect	no	no	yes	yes	yes	yes
Observations	9568	9568	9568	9568	9568	9568
R2	0.772	0.772	0.772	0.817	0.817	0.817
				2SLS first-stage estimates		
Change in exposure to Chinese imports (in LAC)				0.1492***	0.1401***	0.1404***
				(0.021)	(0.028)	(0.031)
Weak identification test F statistic				52.71	24.96	19.79

Notes: The dependent variable is the change (in logs) of the CPI between 2002 and 2017. The explanatory variables are the log of the CPI in 2002, the change in exposure to Chinese imports in Mexico between 2001 and 2016, the change in exposure to ROW's imports between 2001 and 2016, and the ratio of the labor productivity in 2014 relative to 1999. The instruments are the change in exposure to Chinese imports in Latin American countries and the change in exposure to the ROW's imports in Latin American countries. Robust standard errors adjusted for clustering at the sector (4-digit NAICS) level are in parentheses. The weak identification test is the Kleibergen-Paap Wald F statistic

***; **; * significant at the 1%, 5%, and 10% level respectively

TABLE 5. PLACEBOS

	Pre-exposure: 1983–1998	1983–1990	1991–1998
	(1)	(2)	(3)
Change in exposure to Chinese imports	-0.2890	-0.2515	-0.0898
	(0.402)	(0.441)	(0.256)
Log of initial CPI	-66.71***	-32.43***	-48.15***
	(2.356)	(2.345)	(2.762)
Change in exposure to ROW's imports	-0.2273	-0.4657	-0.2642
	(0.414)	(0.430)	(0.219)
Labor productivity ratio	-21.69*	-13.20	-17.84**
	(11.191)	(10.922)	(6.620)
City fixed effect	yes	yes	yes
Sector (3-digit NAICS) fixed effect	yes	yes	yes
Observations	5163	5163	5163
R2	0.744	0.419	0.611

Notes: The dependent variable is the change (in logs) of the CPI between 1983 and 1998 (1), between 1983 and 1990 (2) and between 1991 and 1998 (3). The explanatory variables are the log of the CPI in 1983 (1 and 2) and in 1991 (3), the change in exposure to Chinese imports in Mexico between 2001 and 2016, the change in exposure to the ROW's imports between 2001 and 2016, and the ratio of the labor productivity in 2014 relative to 1999. The instruments are the change in exposure to Chinese imports in Latin American countries and the change in exposure to the ROW's imports in Latin American countries. Robust standard errors adjusted for clustering at the sector (4-digit NAICS) level are in parentheses.

***; **; * significant at the 1%, 5% and 10% level respectively

TABLE 6. CONTROLLING FOR PRETRENDS

	(1)	(2)	(3)	(4)
Change in exposure to Chinese imports	-0.6263**	-0.6063*	-0.5865*	-0.6084*
	(0.309)	(0.341)	(0.334)	(0.337)
Log of initial CPI	-93.17***	-91.44***	-91.69***	-91.56***
	(7.976)	(9.066)	(9.388)	(9.075)
Change in exposure to ROW's imports	0.1251	0.1683	0.1594	0.1849
	(0.144)	(0.339)	(0.330)	(0.336)
Labor productivity ratio	-1.5813	0.8604	1.6893	0.5085
	(7.567)	(10.412)	(9.916)	(10.470)
CPI change 1983–1998		-0.0011		
		(0.028)		
CPI change 1983–1990			0.0284	
			(0.038)	
CPI change 1991–1998				-0.0135
				(0.022)
City fixed effect	yes	yes	yes	yes
Sector (3-digit NAICS) fixed effect	yes	yes	yes	yes
Observations	9568	5163	5163	5163
R2	0.817	0.795	0.795	0.795

Notes: The dependent variable is the change (in logs) of the CPI between 2002 and 2017. The explanatory variables are the log of the CPI in 2002, the change in exposure to Chinese imports in Mexico between 2001 and 2016, the change in exposure to the ROW's imports between 2001 and 2016, and the ratio of the labor productivity in 2014 relative to 1999. Additional controls are pretrends in inflation. Specifically, the change (in logs) of the CPI between 1983 and 1998 (2), between 1983 and 1990 (3), and between 1991 and 1998 (4). The instruments are the change in exposure to Chinese imports in Latin American countries and the change in exposure to the ROW's imports in Latin American countries. Robust standard errors adjusted for clustering at the sector (4-digit NAICS) level are in parentheses. The weak identification test is the Kleibergen-Paap Wald F statistic

***; **; * significant at the 1%, 5% and 10% level respectively

TABLE 7. UPSTREAM IMPORT EXPOSURE

	(1)	(2)	(3)
Change in exposure to Chinese imports	-0.6263**	-0.6125**	-0.5414*
	(0.309)	(0.301)	(0.302)
Log of initial CPI	-93.17***	-93.22***	-93.15***
	(7.976)	(7.912)	(8.136)
Change in exposure to ROW's imports	0.1251	0.1155	0.1346
	(0.144)	(0.1340)	(0.1533)
Labor productivity ratio	-1.5813		
	(7.567)		
Change in upstream exposure to Chinese imports		0.9313	
		(2.169)	
Change in upstream exposure to ROW's imports			1.1728
			(0.805)
City fixed effect	yes	yes	yes
Sector (3-digit NAICS) fixed effect	yes	no	yes
Observations	9568	9568	9568
R2	0.817	0.817	0.817

Notes: The dependent variable is the change (in logs) of the CPI between 2002 and 2017. The explanatory variables are the log of the CPI in 2002, the change in exposure to Chinese imports in Mexico between 2001 and 2016, the change in exposure to the ROW's imports between 2001 and 2016, the ratio of the labor productivity in 2014 relative to 1999, the change in exposure to Chinese imports in Mexico between 2001 and 2016 in upstream sectors, and the change in exposure to the ROW's imports between 2001 and 2016 in upstream sectors. The instruments are the change in exposure to Chinese imports in Latin American countries, the change in exposure to the ROW's imports in Latin American countries, the change in exposure to Chinese imports in Latin American countries in upstream sectors, and the change in exposure to the ROW's imports in Latin American countries in upstream sectors. Robust standard errors adjusted for clustering at the sector (4-digit NAICS) level are in parentheses.

***; **; * significant at the 1%, 5% and 10% level respectively

TABLE 8. COUNTERFACTUALS

	NAICS	15-year change in Chinese import exposure (% points)	Estimated effect of import exposure on 15-year change in CPI (% points)	15-year actual change in CPI (%)	15-year counterfactual change in CPI (%)
		(1)	(2) = $\hat{\beta}$ x (1) x R2	(3)	(4) = (3) - (2)
Mean	All	10.86	-6.34	60.81	67.15
20th pctl	3113	0.28	-0.16	93.03	93.19
90th pctl	3262	28.69	-16.76	23.60	40.36

TABLE 9. EXPENDITURE AS A SHARE OF INCOME, PERCENT

	Per capita household income		
	Median	Percentile 10th	Percentile 90th
Aggregate expenditure	70.1	89.4	59.3
Food, beverages, and tobacco	27.3	43.3	14.9
Apparel	4.7	5.5	4.0
Personal care products	3.8	4.9	2.4
Household furnishings, equipment, and supplies	6.4	7.7	5.4
Housing	7.4	8.0	6.4
Entertainment	1.7	1.0	3.1
Transportation	8.1	8.2	8.3
Health care	2.2	2.8	2.0
Education	4.5	6.2	5.1
Other	4.0	1.8	7.7

TABLE 10. INCOME INEQUALITY

		2000	2016
Panel A	Real per capita income ratio: pctl 90 /pctl 10	9.88	8.64
Panel B	Real per capita income (as a share of 2000 income): pctl 90	1.00	1.07
	Real per capita income (as a share of 2000 income): pctl 10	1.00	1.22

APPENDIX A: DATA DESCRIPTION AND SOURCES

Variable	Description	Source
Change in import penetration from China (ROW) in Mexico	15-year change in import penetration from China (ROW) between 2001 and 2016. Import penetration is measured as the Mexican imports from China (ROW) divided by Mexican apparent consumption (output + imports - exports), at the 4-digit NAICS level	Based on UN Comtrade and Mexican National Accounts from INEGI
Instrument for import penetration variables	Numerator: imports from China (ROW) of 17 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Jamaica, Nicaragua, Panama, Peru, Paraguay, Uruguay, and Venezuela), at the 4-digit NAICS level. Denominator: Mexican apparent consumption (output + imports - exports), at the 4-digit NAICS level	Based on UN Comtrade and Mexican National Accounts from INEGI
Import penetration from China in upstream industries	Weighted average of the import penetrations in all the industries that provide inputs to industry *j* where the weights are based on the input-output linkages	Based on UN Comtrade, Mexican National Accounts from INEGI and input-output table from INEGI
Price growth of product *i* in industry *j* and city *c*	15-year log-price change of product *i* in industry *j* and city *c* from 2002 to 2017	Based on CPI from INEGI
Share of income of household *h* spent on consumption of product *i*	Share of income of household *h* spent on consumption of product *i*, for year 2000	Based on ENIGH from INEGI

APPENDIX B: ADDITIONAL FIGURES AND TABLES

FIGURE B1. EVOLUTION OF CPI INDEX BY 3-DIGIT NAICS INDUSTRIES

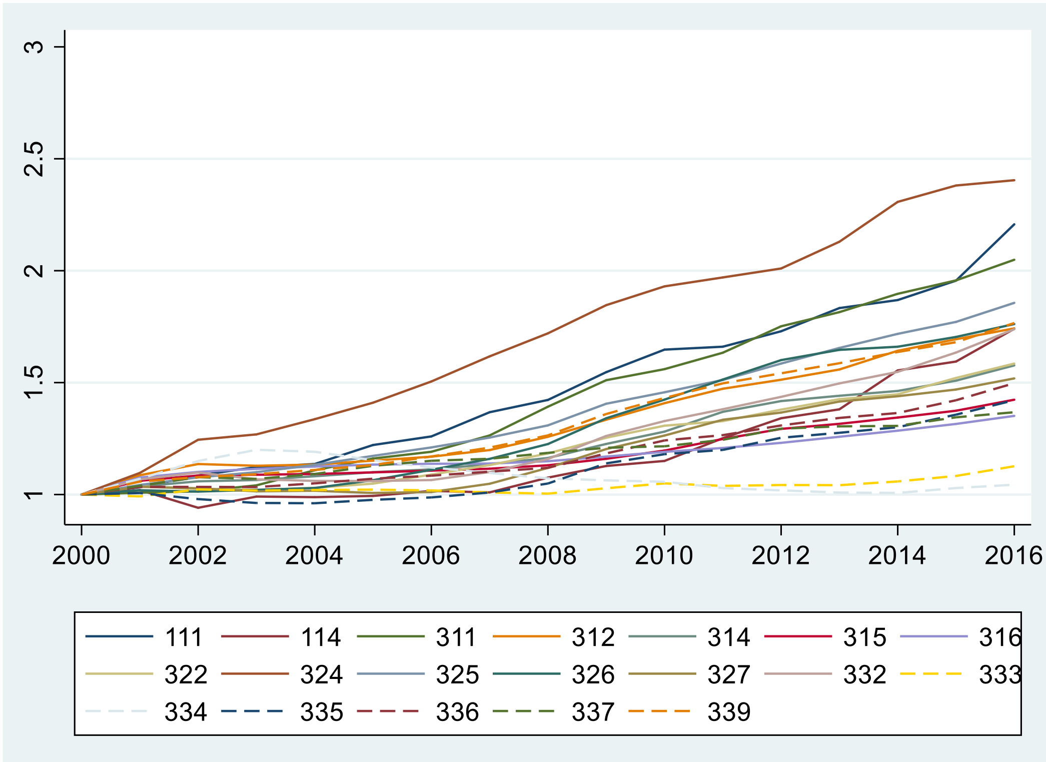

FIGURE B2: EVOLUTION OF IMPORT EXPOSURE FROM CHINA BY 3-DIGIT NAICS INDUSTRIES

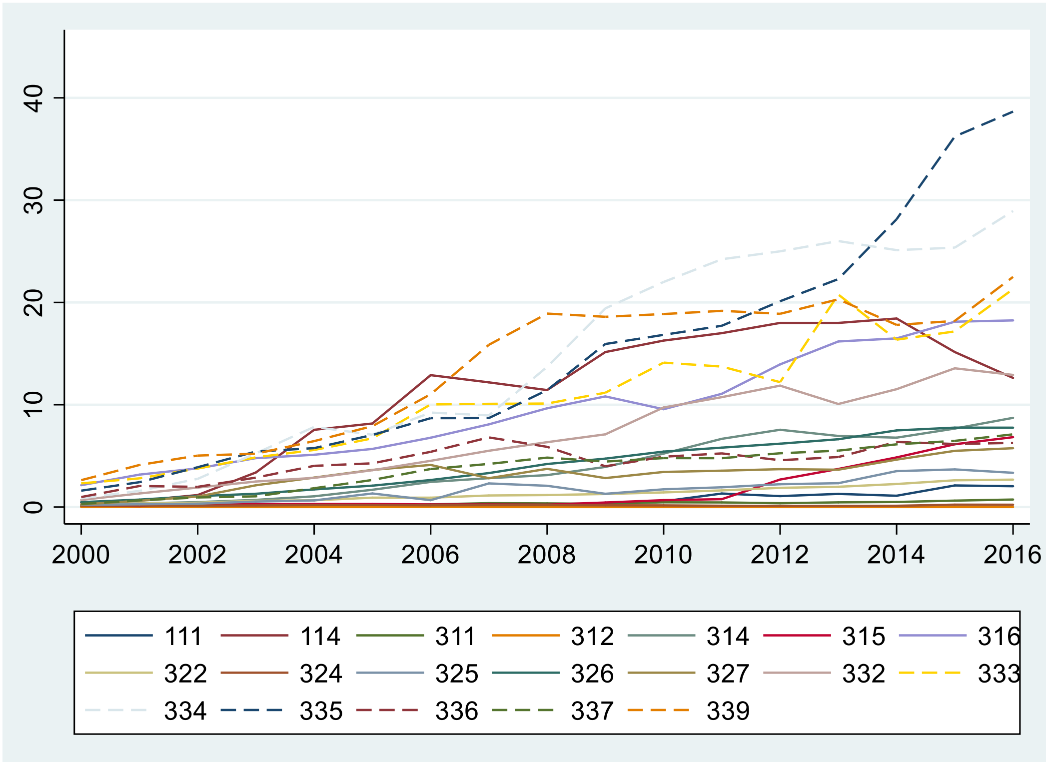

FIGURE B3. CHANGE IN WELFARE BY INCOME PERCENTILES BASED ON EXPENDITURE SHARES OF 2016