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Retail Globalization and Household Welfare: Evidence from Mexico

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Abstract
The arrival of global retail chains in developing countries is causing a radical transformation in the way that households source their consumption. This paper draws on a new collection of Mexican microdata to estimate the effect of foreign supermarket entry on household welfare. The richness of the microdata allows us to estimate a general expression for the gains from retail FDI, and to decompose these gains into several distinct channels. We find that foreign retail entry causes large and significant welfare gains for the average household that are mainly driven by a reduction in the cost of living. About one quarter of this price index effect is due to pro-competitive effects on the prices charged by domestic stores, with the remaining three quarters due to the direct consumer gains from shopping at the new foreign stores. We find little evidence of significant changes in average municipality-level incomes or employment. We do, however, find evidence of store exit, adverse effects on domestic store profits and reductions in the incomes of traditional retail sector workers. Finally, we show that the gains from retail FDI are on average positive for all income groups but regressive, and quantify the opposing forces that underlie this finding.

Keywords: Supermarket revolution, foreign direct investment, gains from trade
JEL codes: F15; F23; F63; O24

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1 Introduction

A radical transformation is occurring in the way households in developing countries source their consumption. A key driver of this so called 'supermarket revolution' has been the arrival of global retail chains in developing countries (Reardon et al., 2003; Humphrey, 2007).[1] This process of retail globalization has led to heated policy debates. Those against foreign retailers point to the large share of employment in the traditional retail sector, while those in favor emphasize potential benefits from lower consumer prices.

Importantly, these debates have also led to stark differences in policies towards retail FDI across developing countries. While some countries such as Argentina, Brazil, Mexico and most of Eastern Europe chose to fully liberalize retail FDI at the beginning of the 1990s, several developing countries including India continue to severely restrict foreign retail entry and others such as Indonesia, Malaysia and Thailand re-imposed regulatory barriers on foreign retailers after initially allowing entry (Dufey et al., 2008; Wrigley and Lowe, 2010).[2] These policy differences matter because retail is a key sector of the economy in terms of both employment and consumption, on average accounting for 15-20 percent of total employment, 10-15 percent of total GDP, and more than 50 percent of total household expenditure in developing countries.[3]

Despite the rapid globalization of retail in the developing world and widespread policy interest, the existing literatures in trade and development have so far paid relatively little attention to this facet of international integration. This paper seeks to fill that gap. We bring together a new and uniquely rich collection of microdata to assess the consequences of retail FDI in the context of Mexico, a country whose retail landscape underwent a dramatic transformation as foreign retailers came to dominate its market over the last 20 years. Our analysis coincides with the major wave of foreign store expansion in Mexico. Over our sample period, January 2002 to March 2014, the number of foreign supermarkets close to quadrupled from 365 to 1,335 stores. This rapid expansion provides an ideal empirical setting to study the impact of retail globalization.

This paper aims to contribute to our understanding of three central questions: 1) What is the effect of retail FDI on average household welfare in the municipality of entry?; 2) What are the channels underlying this effect?; and 3) To what extent do the gains from retail FDI differ across the pre-existing income distribution? In answering these questions, the paper also makes two methodological contributions to the literature that focuses on quantifying the gains from trade and FDI. The first is that rather than imposing structure ex ante to limit the data requirements to a set of readily available cross-country moments, we instead exploit newly available and extremely detailed microdata that allow us to estimate a very general expression for the welfare gains from re-

[1] Between 2000 and 2012, foreign affiliate sales of the 250 largest global retailers grew by 400 percent reaching 1 trillion USD (Deloitte, 2014). The stock of inward retail FDI in developing countries grew more than twenty-fold since the 1990s, and the developing country share also more than doubled to 25 percent (UNCTAD World Economic Report 2014).

[2] For example, it took India's Congress Party until 2012 to finally approve foreign entry into multi-brand retail. This process was accompanied by street protests, and several Indian states subsequently blocked foreign entry. Most recently, the BJP government announced it would move back to an outright nationwide ban of foreign retailers.

[3] Figures based on developing country samples from the 2013 ILOSTAT Database (employment), 2012 UN National Accounts data (GDP), and the World Bank LSMS household consumption surveys from 2000-2010 (retail expenditures).

tail FDI. In particular, data on barcode-level consumer prices and consumption quantities, worker-level incomes and store-level profits allow us to capture all major components of household welfare without shutting down any potential channels—such as gains from variety or pro-competitive effects on prices in domestic stores—ex ante. The second contribution is that, rather than relying on cross-sectional moments that may or may not capture the causal effects of integration, we propose an event study design to credibly identify the moments we feed into the welfare expression.

At the center of the analysis lies the construction of a new collection of microdata. We combine data on all foreign-owned supermarket locations and opening dates over the period 2002-2014 with five additional datasets: i) monthly store-level consumer prices at the barcode-equivalent level (e.g. a 16 pill package of Bayer Aspirin with 300 mg dosage) from the confidential microdata of the Mexican CPI; ii) daily household-by-store level data on consumption quantities and prices at the barcode-equivalent level from the consumer panel of the Mexican operation of a large international market research company; iii) store-level revenues, costs and profits for the universe of urban retail establishments from two cross-sections of the confidential microdata of the Mexican retail census; iv) quarterly worker-level incomes by occupation and sector from Mexico's urban employment and occupation surveys; and v) household-level income shares by occupation and sector matched to consumption shares across products and store formats from Mexico's biannual income and expenditure surveys.[4]

The analysis proceeds in three steps. In Step 1, we write down a general expression for the effect of retail FDI on household welfare in the municipality of entry. We decompose the total effect into six distinct effects: three effects on household cost of living (the price index) and three effects on household nominal incomes. On the cost of living side, we distinguish between the effect on consumer prices at pre-existing domestic retailers (the pro-competitive price effect); the effect due to exit of domestic retailers (the pro-competitive exit effect); and the direct price index effect which encompasses all the consumer gains derived from being able to shop at the foreign store itself, including different prices for pre-existing products, new product variety as well as different store amenities. The nominal income effect comprises a retail labor income effect (from employment in either traditional or modern retail), a retail profits effect for domestic store owners, and an indirect effect on other sources of household income from non-retail sectors of the local economy.

In Step 2, we estimate the empirical moments required to quantify the six effects that underlie the total household gains from retail FDI. To tackle the pro-competitive price effect, we estimate how prices fell in domestic stores in response to the first entry of a foreign supermarket in the municipality. The first empirical challenge is that the composition of goods and stores changes over time. We address this by exploiting the Mexican CPI microdata which allow us to construct monthly time series of prices for barcode-equivalent products sold in a particular retail outlet in a particular municipality over the full span of our 12 year sample period. The second empirical challenge is non-random entry of foreign retailers across municipalities and over time. We propose an event study design that allows us to test whether foreign retailers targeted store openings towards

[4]Note that we refer to all retail establishments as "stores" in this paper even though the data include all types of retail units (e.g. street markets, street vendors, convenience stores, supermarkets).

municipalities with pre-existing price trends. The store opening data suggest that, over our period of study, foreign retailers operated under the objective of rapidly establishing store presence across all of urban Mexico. If so, the timing of opening will be determined by the speed of obtaining zoning permits and building delays, and uncorrelated with location-specific price or income trends. We test this identifying assumption by estimating a full set of monthly treatment effects beginning in the years before the store opening event and continuing for several years after. By looking for evidence of pre-trends in these monthly treatment effects we are able to transparently and non-parametrically test for the validity of the identifying assumption.

While our data allow us to observe the consumer price changes within continuing domestic shopping outlets in order to estimate the pro-competitive price effect, the two remaining cost of living effects are more difficult to quantify. The issue is that the implicit changes in the price index that result from either the arrival of a new foreign store (the direct price index effect) or the exit of domestic stores (the pro-competitive exit effect) are inherently unobservable. To quantify the cost of living implications of these changes in the available consumer choice set, we require further assumptions about consumer demand essentially to estimate 'virtual prices'—the price at which demand would be zero—for foreign stores before they entered and domestic stores after they exited.

To this end, we use two different approaches. Our preferred approach is an exact estimation of the cost of living effect under a multi-tier CES preference structure where, within a broad product group, consumers have asymmetric CES preferences over store-level consumption aggregates. These aggregates are themselves optimal bundles chosen from the specific products available in each store. The direct price index effect under this approach requires information on the ex post household expenditure shares on foreign stores across households and product groups in combination with estimates of the elasticity of substitution across local stores. To obtain these estimates, we exploit the uncensored consumer panel microdata which contain prices and household consumption quantities at the barcode-equivalent level matched to individual retailer identities. For the supply-side variation needed to identify the elasticity of substitution, we exploit the fact that supermarket chains often set prices uniformly across stores at the national or regional level rather than in response to local demand shocks.

This CES approach has several benefits. First, as shown by Anderson et al. (1992), these preferences generate the same demands as would be obtained from aggregating many consumers who make discrete choices over which store to shop in. Second, this approach has the appeal of being widely used in the trade literature starting with Feenstra (1994), in part because it yields a very parsimonious expression for the welfare gain from new products (or stores in our case). Third, the CES approach allows us to relate our results to the recent quantitative literature on the gains from trade as the expression for our direct price index effect is identical to the well known import share sufficient statistic for the gains from trade in Arkolakis et al. (2012) and extended to horizontal FDI by Ramondo and Rodriguez-Clare (2013). The additional terms in our welfare expression allow us to provide empirical evidence on the importance of pro-competitive effects, to separately estimate cost of living and nominal income effects, and to explore heterogeneity in these estimates across the income distribution.

While the assumption of CES preferences has its virtues, it also imposes a particular structure on household demand. As an alternative approach, we also estimate a first order approximation of the cost of living effect that is solely based on observable price changes due to foreign entry. The advantage of this alternative approach is that it yields a Paasche price index that approximates the consumer gains that arise from foreign store entry without imposing preference assumptions. The disadvantage is that, since this approach essentially assumes that the foreign stores were always present and lowered their prices at the time of entry, we are necessarily abstracting from any gains due to the new product and store variety provided by foreign stores or the fact they may provide better amenities to shoppers. For this reason, the difference between the direct price index effect under CES and the first order approach is also informative as it provides an approximate estimate of the proportion of the gains that come from new variety and store amenities as opposed to lower prices on pre-existing products.

To estimate the effects on nominal household incomes, we construct a quarterly time series of individual incomes, occupation, sector and employment status using the Mexican employment and occupation surveys. The identification issues are very similar to those we address in the price regressions. Accordingly, we follow a similar event study approach. To capture the effects on retail profits for owners of domestic stores, as well as the effects on store exit, we complement these data with the confidential microdata on store counts and profits from the Mexican retail census.

In Step 3, we combine the estimated effects on consumer prices, consumption quantities and household incomes from Step 2 with the theoretical framework in Step 1 in order to quantify the household welfare effects of foreign entry. To do so, we require pre-entry household consumption shares across various product groups and store types, as well as labor and business income shares from various occupations and sectors. We obtain this information from the Mexican income and expenditure surveys which allow us to estimate a predicted welfare change for each household in the sample depending on their particular work and consumption patterns (restricting attention to urban locations without a foreign store at the time of the survey).

We find that foreign supermarket entry causes large and significant welfare gains for the average household equal to 6.2 percent of initial household income. The majority of this effect is driven by a significant reduction in the cost of living. While there is a 0.7 percent increase in the cost of living due to pro-competitive exit effects, this is more than compensated by a reduction of 1.6 percent due to pro-competitive effects on consumer prices charged by pre-existing domestic stores and a reduction of 5.5 percent due to the direct price index effect (i.e. foreign supermarkets offering cheaper prices, new varieties and different shopping amenities to consumers).[5] The relatively large direct effect is consistent with raw moments in the data that we present as motivating evidence: foreign retailers charge on average 12 percent lower prices for an identical barcode in the same location and time, offer five times the number of products compared to modern domestic stores, and constitute on average more than one third of total household retail spending after foreign entry. The first order approximation of the direct price index effect is 40 percent of the

[5]Note that these price index changes refer to the entirety of household consumption, and take into account that retail accounts for on average only half of household consumption in Mexico during the estimation period.

size of the CES estimate suggesting that just under half of the direct effect can be accounted for purely by the cheaper prices at foreign stores, with the remainder due to the additional benefits from product and store variety and differences in foreign store amenities. The nominal income effects are small in comparison. We find no effect on average municipality-level household incomes or employment rates. We do, however, find evidence of store exit and adverse effects on domestic store profits, employment and labor incomes for workers in the traditional retail sector. While these adverse income effects are sizable, they affect only a fraction of households and so are muted in the aggregate by reductions in the cost of living that benefit all households.

Finally, we quantify the distribution of the gains from retail FDI. While, on average, all household income groups experience significant gains from foreign entry, the richest income groups gain about 50 percent more than the poorest. We find that the key driver is the fact that richer households substitute over 50 percent of their retail consumption to foreign stores, while the poorest households substitute less than 15 percent. Since the elasticity of substitution is broadly similar for both income groups, these market share differences imply that wealthier households in Mexico value the consumption choices on offer at foreign stores far more than poorer ones (for example, due to the rich placing a higher value on foreign brands, high quality varieties and large pack sizes; as well as store amenities such as parking, car accessibility, wide aisles, security and hygiene).

The paper closely relates to a small body of work that explores the economic consequences of foreign supermarkets in developing and emerging countries (Iacovone et al., 2015; Javorcik and Li, 2013).[6] Relative to these papers that have focused on the spillover effects on domestic suppliers in both agriculture and manufacturing, this paper instead focuses on the consequences for consumers, workers and business owners located in the municipality where the foreign store entry occurs. To the best of our knowledge, this is the first paper to provide empirical evidence on these first order effects of retail globalization. We note that in order to do so convincingly, this paper's focus is on quantifying the effects of foreign retail entry on local household welfare within the municipality of entry. This focus allows us to credibly estimate impacts of foreign entry by comparing the municipality of entry to other locations that did not experience a foreign store opening in the same period. The limitation of such an approach is that it is silent on potentially interesting national level effects such as changes in manufacturing productivity that are absorbed by the time fixed effects in our empirical setting. Our work also relates to Lagakos (in press) who emphasizes the role of endogenous store format choices in explaining cross-country differences in retail sector TFP. Consistent with our finding of much larger gains for richer households, he finds that car ownership rates are a significantly related to the adoption of modern store formats.

The paper is also closely related to the recent literature that estimates the gains from international integration for developing countries and the distribution of those gains (Porto, 2006 ; Goldberg and Pavcnik, 2007; Topalova, 2010; Atkin, 2013; Donaldson, in press; Faber, 2014; Fajgelbaum and Khandelwahl, 2014). Relative to the existing literature, we focus on the consequences of retail globalization, a channel of integration that has received relatively little attention. Methodologi-

[6] Varela (2013) uses Walmart's entry decisions into local markets in Mexico to estimate a structural model of diseconomies of scale in outlet expansion.

cally, this paper differs in its careful empirical evaluation of all major components of household welfare and, in particular, the cost of living implications. Rather than relying on state level price deflators (e.g. Topalova, 2010; Deaton and Tarozzi, 2000), household consumption surveys in combination with simulated price changes at the level of aggregate product groups (e.g. Porto, 2006; Deaton, 1989), or cross-country trade flows (e.g. Caron et al., 2012; Fajgelbaum and Khandelwal, 2014), this paper draws on price and consumption data at the level of individual households, barcode-equivalent products, and stores to provide a more precise and complete estimate of changes in the price index.[7]

Finally, since Walmart de México is the major foreign retailer expanding during our estimation period, the paper relates to an extensive literature on the effects of Walmart in the United States (e.g. Basker (2005), Jia (2008), Hausman and Leibtag (2007), and Holmes (2011)). This paper offers two main innovations relative to the existing literature. First, studying a developing country allows us to shed light on the impact of exposing a largely traditional retail environment to what is arguably the world's technological frontier in retailing. Second, in contrast to the piecemeal approach adopted by the literature to date, this paper is the first to set up a unified empirical framework and estimate the effect of store entry on both cost of living and nominal incomes.

We structure the remainder of the paper as follows. Section 2 describes the Mexican context and provides motivating evidence. Section 3 presents the theoretical framework. Section 4 describes the six data sets. Section 5 presents the empirical strategy and estimation results. Section 6 draws on these estimation results in combination with estimates of household demand parameters to quantify the gains from retail FDI. Section 7 concludes.

2 Background and Motivating Evidence

2.1 Background

Prior to the 1980s, retail FDI into Mexico had to be approved on a case by case basis, and generally required a minimum 51 percent Mexican ownership. These restrictions were gradually relaxed in the 1980s with foreign companies able to own up to 49 percent of a Mexican firm without explicit authorization. The 1993 FDI law allowed foreign firms full ownership rights and full freedom to repatriate profits. FDI was further protected with the NAFTA third-party dispute resolution mechanisms starting in 1994.

The first significant retail FDI into Mexico was the US company Safeway's purchase of 49 percent of Casa Ley (a regional retailer in Northern Mexico). More transformative was Walmart's decision to enter the Mexican market in the early 1990s as NAFTA was being negotiated. Walmart entered initially in a joint venture with the Mexican retailer Cifra, a chain from Mexico City with around 100 supermarket units at the time. In 1997, Walmart bought out Cifra and in 2000

[7]The paper is also related to the trade literature that estimates the gains from new imported product variety (Feenstra, 1994; Broda and Weinstein, 2006; Feenstra and Weinstein, 2013). In addition to focusing on the gains from a new store variety, the richness of our data allows us to directly trace foreign production shares across the consumption baskets of individual households at the level of disaggregated product groups. To the best of our knowledge, this is the first time such a match has been possible in order to quantify the variety gains from integration.

changed the name of the company to Walmart de México (WALMEX). Unlike in the US, WALMEX focused heavily on food retail and targeted relatively affluent Mexican consumers. In the ensuing years, WALMEX and its multiple supermarket brands (Walmart, Sam's Club, Superama, Aurrera and Bodega Aurrera) became the largest retail chain in Mexico and its largest employer, with over 210,000 workers in January 2014.[8] Although Walmart has been the most notable foreign entrant, two large French supermarket chains also entered and subsequently left the market (Auchan and Carrefour), while several other US firms continue to operate in Mexico (Costco, HEB, S-Mart, Smart and Final, and Waldos).

The expansion of Walmart and other foreign supermarket chains proceeded relatively slowly during the second half of the 1990s, predominantly serving the main metropolitan centers of Mexico. As depicted in Figure 1, the number of foreign supermarkets in Mexico expanded from 204 stores at the end of 1995 to 365 stores at the end of 2001. In both periods, the presence of foreign stores was strongly concentrated in a handful of locations in the major cities of Mexico. Between 2002 and 2014, the sample period for our empirical analysis, the number of foreign retailers increased by a factor of four, from 365 to 1335 supermarkets. As is apparent in Figure 1, this period saw the expansion of foreign supermarkets beyond the centers of large metropolitan cities to more remote corners of the country and to smaller cities. At the start of our sample in 2002, foreign stores were present in 96 municipalities. By 2014 foreign stores were present in 461 municipalities.

2.2 Motivating Evidence

How do foreign-owned supermarkets differ from the domestic retailers that they compete with after they enter? In this subsection, we use the consumer panel microdata and the administrative records of the Mexican National Retail Association (ANTAD)—both described in Section 4 below—to document a set of stylized facts about how these stores differ.

Column 1 of Table 1 regresses log prices on a dummy for whether the store is foreign-owned and municipality-by-barcode-by-month fixed effects. On average, foreign stores charge approximately 12 percent lower prices for identical barcodes compared to domestic retailers in the same municipality during the same month. Interestingly, the sign of this difference is reversed and its magnitude doubles when we replace the municipality-by-barcode-by-month fixed effects by municipality-by-product-group-by-month fixed effects (column 2). Thus, foreign stores appear to offer a much higher quality product mix (where quality is proxied by price) and/or larger pack sizes within product groups (with anecdotal evidence suggesting both are true).

Foreign stores also sell a much larger set of product varieties. Column 3 regresses the count of barcodes across all households in the consumer panel on a foreign store dummy and municipality-year fixed effects. As many domestic stores are small traditional stores that clearly carry a smaller set of products, we restrict the comparison to only domestic supermarket chains. Even with this restriction, a foreign-owned supermarket offers approximately five times as many barcode products. This difference in consumer choice is also clear when comparing the floor space records

[8] In this paper we only consider supermarket retail (which we take to be stores of 10,000 square feet and above) and so exclude WALMEX's recently introduced small store format, Bodega Aurrera Express (2,690 square foot on average).

using the ANTAD data. Column 4 of Table 1 shows that the average foreign-owned store is approximately six times the size of a domestic retailer that is also a member of ANTAD.

Finally, there are a number of differences in the shopping amenities offered by foreign-owned supermarkets compared to the domestic retailers. Two key dimensions of shopping amenities are the store environment and the store location. In terms of positive amenities, foreign-owned supermarkets are typically more hygenic, offer greater security, more parking space, better accessibility by car, and display and organize their products more attractively. In addition, households may value American or European supermarket brands more than domestic ones for aspirational reasons. In terms of negative amenities, foreign-owned stores tend to be located farther away from the town center due to both their larger size and their later entry into the market. Given significant differences in car ownership rates across the Mexican income distribution, differential accessibility will play an important role when estimating the heterogeneity of the gains from foreign entry. In our theoretical framework that follows, our revealed preference approach flexibly captures these different amenities through income-and-product-group specific taste shifters that generate observable differences in foreign-store post-entry market shares across household types.

To summarize, foreign stores differ substantially on a number of key dimensions: they charge lower prices, offer higher quality products and larger pack sizes, sell a much larger variety of products, and offer a different set of amenities. The size of these differences are substantial, certainly compared with the differences between big box stores and pre-existing retailers in the US (e.g. Hausman and Leibtag, 2007). These foreign retailers bring to Mexico innovations such as more modern store formats, extensive use of distribution centers, cutting edge logistics such as cold-chains for fresh products, and more intensive use of global supply chains (Biles, 2008). Essentially, our empirical setting captures the entry of global retail chains at the world technological frontier in retailing into local retail markets that are largely dominated by traditional store formats, street markets, and small regional supermarket chains.

3 Theoretical Framework

In this section we derive a general expression for assessing the impact of foreign supermarket entry on local household welfare as a function of various observable moments in our rich collection of microdata. In order to calculate the change in welfare due to the entry of a foreign supermarket we consider the compensating variation for household h,[9] the change in exogenous income required to maintain utility when a foreign retailer arrives between period 1 and period 0, with periods denoted by superscripts:

$$CV_h = \underbrace{\left[e(\mathbf{P}^1, u_h^0) - e(\mathbf{P}^0, u_h^0)\right]}_{\text{Cost of living effect } (CLE)} - \underbrace{\left[y_h^1 - y_h^0\right]}_{\text{Nominal income effect } (IE)} \quad (1)$$

where $\mathbf{P}^t$ is the vector of prices faced by the household in period t, u_h^t is the household's utility and y_h^t is its nominal income.

[9] This approach follows earlier work by Hausman (1996) and Hausman and Leonard (2002).

The first term is the cost of living effect, the welfare change due to the price changes induced by the arrival of the foreign retailer. The second term is the nominal income effect, the welfare change due to any changes in household income that result from the arrival of the foreign retailer. In the next two subsections we decompose the cost of living effect and nominal income effect into six distinct channels and express these as functions of observable moments in our microdata.

3.1 Estimating the Cost of Living Effect

While, at least in principle, the nominal income effect can be empirically estimated without imposing additional structure, this is not the case for the cost of living effect. While we can observe the vector of price changes $\mathbf{P}_{dc}^1 - \mathbf{P}_{dc}^0$ for products sold in domestic continuing stores indexed by dc, i.e. those that are present in both periods, there are two sets of price changes that are inherently unobservable: the price changes $\mathbf{P}_f^1 - \mathbf{P}_f^0$ at entering foreign retailers indexed by f and the price changes $\mathbf{P}_{dx}^1 - \mathbf{P}_{dx}^0$ at domestic exiting retailers indexed by dx. In particular, foreign retailers' prices are not observed prior to their entry, and exiting domestic retailers prices are not observed post exit. As first noted by Hicks (1940), we can replace these two unobserved price vectors with 'virtual' price vectors, the price vectors that would set demand for these stores equal to zero given the vector of consumer prices for other goods and services.

To see this more clearly, note that the cost of living effect can be divided into three quite distinct sub-components, one for each of the three sets of price changes above: a direct price index effect due to the implicit price changes at foreign stores (i.e. the gains enjoyed by consumers shopping at the new foreign store); a pro-competitive price effect due to continuing domestic retailers changing prices as a result of foreign retail entry; and a pro-competitive exit effect due to the implicit price changes at exiting domestic stores (i.e. the losses suffered by customers of closing stores):

$$
\begin{aligned}
CLE \;=\; & \underbrace{\left[e(\mathbf{P}_f^1, \mathbf{P}_{dc}^1, \mathbf{P}_{dx}^{1*}, u_h^0) - e(\mathbf{P}_f^{1*}, \mathbf{P}_{dc}^1, \mathbf{P}_{dx}^{1*}, u_h^0)\right]}_{\text{(1) Direct price-index effect } (DE)} + \\
& \underbrace{\left[e(\mathbf{P}_f^{1*}, \mathbf{P}_{dc}^1, \mathbf{P}_{dx}^{1*}, u_h^0) - e(\mathbf{P}_f^{0*}, \mathbf{P}_{dc}^0, \mathbf{P}_{dx}^{0*}, u_h^0)\right]}_{\text{(2) Pro-competitive price effect } (PP)} + \underbrace{\left[e(\mathbf{P}_f^{0*}, \mathbf{P}_{dc}^0, \mathbf{P}_{dx}^{0*}, u_h^0) - e(\mathbf{P}_f^{0*}, \mathbf{P}_{dc}^0, \mathbf{P}_{dx}^0, u_h^0)\right]}_{\text{(3) Pro-competitive exit effect } (PX)}
\end{aligned} \tag{2}
$$

where asterisks denote virtual prices. Since virtual prices are inherently unobservable they must be estimated, which requires a demand function or at least an approximation to one. Below we propose two approaches: an exact estimation under CES demand and a first order approximation.

Exact Estimation under CES Demand We propose a three-tier demand system. In the upper tier there are Cobb-Douglas preferences over product groups $g \in G$ (e.g. beverages), in the middle tier there are asymmetric CES preferences over local retailers selling that product group $s \in S$ (e.g. Walmex, a foreign retailer; Soriana, a domestic retailer in modern retail; or a mom-and-pop store in the traditional retail sector), and in the final tier there are preferences over the individual products within the product groups $b \in B_g$ (e.g. a product such as a 330 ml Coca Cola can) that

we can leave unspecified for now:

$$U_h = \prod_{g \in G} [Q_{gh}]^{\alpha_{gh}} \tag{3}$$

$$Q_{gh} = \left(\sum_{s \in S_g} \beta_{gsh} q_{gsh}^{\frac{\eta_{gh}-1}{\eta_{gh}}} \right)^{\frac{\eta_{gh}}{\eta_{gh}-1}} \tag{4}$$

where α_{gh} and β_{gsh} are (potentially household- or income-group-specific) preference parameters that are fixed across periods. Q_{gh} and q_{gsh} are product-group and store-product-group consumption aggregates with associated price indices P_{gh} and r_{gsh} respectively, and η_{gh} is the elasticity of substitution across local retail outlets. For each broad product group, consumers choose how much they are going to spend at different retail outlets based on the store-level price index r_{gsh} (which itself depends on the products they anticipate buying in each store given the stores product mix and its product-level prices).

This structure seems reasonable given that stores often specialize in certain product groups and, at least within a quarter, consumers often shop at several stores and choose different sets of products in each store. While the demand system is homothetic, we capture potential heterogeneity across the income distribution by allowing households of different incomes to differ in their expenditure shares across product groups (α_{gh}), their preferences for consumption bundles at different stores within those product groups (β_{gsh} and the preference parameters that generate q_{gsh}), as well as their elasticity of substitution across local stores (η_{gh}).[10]

This approach has several advantages. First, as shown by Anderson et al. (1992), these preferences generate the same demands as would be obtained from aggregating many consumers who make discrete choices over which store to shop in. This mapping is appealing, particularly since in estimating price elasticities our unit of observation will be household income groups (observed separately for each location, period and product group).

Second, it has the appeal of being widely used in the trade literature starting with Feenstra (1994), in part because it yields a very parsimonious expression for the welfare gains from new products (or stores in our case). Building on Feenstra (1994), the following expression provides the exact proportional cost of living effect under this demand system:

$$\frac{CLE}{e(\mathbf{P}_f^{0*}, \mathbf{P}_{dc}^0, \mathbf{P}_{dx}^0, u_h^0)} = \frac{e(\mathbf{P}_f^1, \mathbf{P}_{dc}^1, \mathbf{P}_{dx}^{1*}, u_h^0)}{e(\mathbf{P}_f^{0*}, \mathbf{P}_{dc}^0, \mathbf{P}_{dx}^0, u_h^0)} - 1 = \prod_{g \in G} \left(\left(\frac{\sum_{s \in S_g^{dc}} \phi_{gsh}^1}{\sum_{s \in S_g^{dc}} \phi_{gsh}^0} \right)^{\frac{1}{\eta_{gh}-1}} \prod_{s \in S_g^{dc}} \left(\frac{r_{gsh}^1}{r_{gsh}^0} \right)^{\omega_{gsh}} \right)^{\alpha_{gh}} - 1 \tag{5}$$

where S_g^{dc} denotes the set of continuing domestic retailers within product group g, $\phi_{gsh}^t = r_{gsh}^t q_{gsh}^t / \sum_{s \in S_g} r_{gsh}^t q_{gsh}^t$ is the expenditure share for a particular retailer of product group g, and the ω_{gsh}s are ideal log-change weights.[11]

[10] While convenient for empirical tractability, this ad hoc treatment of non-homotheticity shuts down a second-order price index effect. Large first-order effects of foreign entry on incomes may push some households across income groups and thereby change their preference parameters as defined above. Since we will allow preferences to differ across seven broad income groups, it is reasonable to think that few households are shifted in this manner.

[11] In particular, $\omega_{gsh} = \left(\frac{\bar{\phi}_{gsh}^1 - \bar{\phi}_{gsh}^0}{\ln \bar{\phi}_{gsh}^1 - \ln \bar{\phi}_{gsh}^0} \right) / \sum_{s^{dc} \in S_g^{dc}} \left(\frac{\bar{\phi}_{gsh}^1 - \bar{\phi}_{gsh}^0}{\ln \bar{\phi}_{gsh}^1 - \ln \bar{\phi}_{gsh}^0} \right)$, which in turn contain expenditure shares

For each product group g, the expression has two components. The $\prod_{s\in S_g^{dc}}(\frac{r^1_{gsh}}{r^0_{gsh}})^{\omega_{gsh}}$ term is a Sato-Vartia (i.e. CES) price-index for price changes in continuing domestic stores that forms the *pro-competitive price effect*.[12] The price terms r^t_{gsh} are themselves price indices of product-specific prices p^t_{gsb} within domestic continuing stores which, in principle, could also account for new product varieties using the same methodology. Empirically, we find no evidence of such effects in response to foreign retail arrival, and so abstract from this possibility in the exposition.[13] While we name these price changes pro-competitive, they may derive from either reductions in markups or increases in productivity at domestic stores (distinctions that do not matter on the cost-of-living side but would generate different magnitudes of profit and income effects that we capture on the nominal income side).

The $(\frac{\sum_{s\in S_g^{dc}}\phi^1_{gsh}}{\sum_{s\in S_g^{dc}}\phi^0_{gsh}})^{\frac{1}{\eta_{gh}-1}}$ term captures the gains to customers of the foreign store in the numerator, the *direct price index effect*, and domestic store exit in the denominator, the *pro-competitive exit effect*. For expositional purposes, consider the simple case where there are no pro-competitive effects (such as when firms are monopolistically competitive as in Krugman 1980):

$$\frac{CLE}{e(\mathbf{P}^{0*}_f, \mathbf{P}^0_{dc}, \mathbf{P}^0_{dx}, u^0_h)} = \prod_{g\in G}\left((\sum_{s\in S_g^{dc}}\phi^1_{gsh})^{\frac{1}{\eta_{gh}-1}}\right)^{\alpha_{gh}} - 1. \tag{6}$$

The welfare gain from a new store is a function of the market share of that store post entry and the elasticity of substitution across stores. The revealed preference nature of this approach is clear. If consumers greatly value the arrival of the new store—be it because the store offers low prices p^1_{gsb}, more product variety that reduces r^1_{gsh} or better amenities β_{gsh}—the market share is higher and the welfare gain greater. Hence, these market share changes capture all the potential benefits of shopping in foreign stores outlined in the motivating evidence of Section 2. How much greater depends on the elasticity of substitution. Large foreign market shares will imply small welfare changes if consumers substitute between local stores very elastically, and large welfare changes if they are inelastic. (A similar logic applies to the exit of domestic stores where a large period 0 market share means large welfare losses, again tempered by the elasticity of substitution.)

Equation 6 also makes clear a third benefit of this approach. The CES assumption allows us to relate our estimation results to the recent quantitative literature on the gains from trade and FDI since the expression of the cost of living effect in the absence of pro-competitive effects is identical to the well known import share sufficient statistic of Arkolakis et al. (2012). Thus, our welfare expression allows us to shed light on the importance of pro-competitive effects, to separately estimate effects on nominal incomes and household cost of living, and to quantify the distribution of the gains from FDI through the household-level heterogeneity we incorporate.

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of different retailers within product groups where the shares consider only expenditure at continuing retailers $\tilde{\phi}^t_{gsh} = r^t_{gsh}q^t_{gsh} / \sum_{s\in S_g^{dc}} r^t_{gsh}q^t_{gsh}$.

[12] Notice that the assumption of CES preferences does not imply the absence of pro-competitive effects as we do not impose additional assumptions about market structure (e.g. monopolistic competition).

[13] In particular, we find no evidence in the CPI microdata that foreign retail entry increases the propensity for product additions or replacements among domestic retailers. We report these regressions in Online Appendix Table A.2.

In our quantification, we decompose the welfare gains into their constituent parts. Accordingly, we add and subtract terms to equation 5 to separate the cost of living effect into the direct price index effect and the two pro-competitive effects described in the preceding paragraphs:

$$\frac{CLE}{e(\mathbf{P}_f^{0*}, \mathbf{P}_{dc}^0, \mathbf{P}_{dx}^0, u_h^0)} = \underbrace{\left[\prod_{g\in G}\left(\left(\frac{\sum_{s\in S_g^{dc}}\phi_{gsh}^1}{\sum_{s\in S_g^{dc}}\phi_{gsh}^0}\right)^{\frac{1}{\eta_{gh}-1}}\prod_{s\in S_g^{dc}}\left(\frac{r_{gsh}^1}{r_{gsh}^0}\right)^{\omega_{gsh}}\right)^{\alpha_{gh}} - \prod_{g\in G}\left(\left(\frac{1}{\sum_{s\in S_g^{dc}}\phi_{gsh}^0}\right)^{\frac{1}{\eta_{gh}-1}}\prod_{s\in S_g^{dc}}\left(\frac{r_{gsh}^1}{r_{gsh}^0}\right)^{\omega_{gsh}}\right)^{\alpha_{gh}}\right]}_{\text{(1) Direct price-index effect } (DE)}$$

$$+ \underbrace{\left[\prod_{g\in G}\left(\prod_{s\in S_g^{dc}}\left(\frac{r_{gsh}^1}{r_{gsh}^0}\right)^{\omega_{gsh}}\right)^{\alpha_{gh}} - 1\right]}_{\text{(2) Pro-competitive price effect } (PP)} + \underbrace{\left[\prod_{g\in G}\left(\left(\frac{1}{\sum_{s\in S_g^{dc}}\phi_{gsh}^0}\right)^{\frac{1}{\eta_{gh}-1}}\prod_{s\in S_g^{dc}}\left(\frac{r_{gsh}^1}{r_{gsh}^0}\right)^{\omega_{gsh}}\right)^{\alpha_{gh}} - \prod_{g\in G}\left(\prod_{s\in S_g^{dc}}\left(\frac{r_{gsh}^1}{r_{gsh}^0}\right)^{\omega_{gsh}}\right)^{\alpha_{gh}}\right]}_{\text{(3) Pro-competitive exit effect } (PX)} \tag{7}$$

First Order Approach Using Observed Price Differences While the assumption of CES preferences has its virtues, it also imposes a particular structure on household demands. As an alternative approach, we exploit the richness of the store price data in order to estimate a first order approximation of the cost of living effect that is solely based on observable price changes due to foreign entry.

We take a first-order Taylor expansion of the expenditure function around period 1 prices and apply Shepherd's lemma. Focusing on the sales and price changes in the set of domestic stores continuously selling product b across both periods (for which we can observe price changes) provides us with the pro-competitive price effect :

$$PP' \approx \sum_b \sum_{s\in S_b^{dc}} \left(q_{bsh}^1(p_{bs}^1 - p_{bs}^0)\right), \tag{8}$$

where q_{bsh}^t is the quantity consumed of product b in store s by household h in period t and S_b^{dc} is the set of domestic stores continuously selling product b across both periods. Rewriting the PP' in proportional terms:

$$\frac{PP'}{e(\mathbf{P}_{f'}^1, \mathbf{P}_{dc'}^1, \mathbf{P}_{dx'}^{1*}, u_h^0)} \approx \sum_b \sum_{s\in S_b^{dc}} \left(\phi_{bsh}^1\left(\frac{p_{bs}^1 - p_{bs}^0}{p_{bs}^1}\right)\right), \tag{9}$$

where ϕ_{bsh}^1 is the household expenditure share spent on the product in period 1. To a first order approximation, the pro-competitive effect is simply a Paasche price index of the product-level price changes at continuing domestic stores due to foreign entry multiplied by the period 1 share of total expenditure captured by that store-product pair. Since the first order approach explicitly assumes no stores exited between periods 0 and 1, there are no separate exit and price effects.

For the direct price index effect, we focus on the sales and price changes at foreign stores in the

Taylor expansion around period 1 prices:

$$\frac{DE'}{e(\mathbf{P}_f^1, \mathbf{P}_{dc}^1, \mathbf{P}_{dx}^{1*}, u_h^0)} \approx \sum_b \sum_{s \in S_b^f} \left(\phi_{bsh}^1 \left(\frac{p_{bf}^1 - p_{bds}^0}{p_{bf}^1} \right) \right). \tag{10}$$

where S_b^f is the set of foreign stores selling product b in period 1. Hence, the direct price index effect corresponds to a Paasche price index of the product-level price differences between foreign stores in period 1, p_{bf}^1, and domestic stores in period 0, p_{bds}^0, multiplied by the period 1 share of total expenditure captured by foreign stores for that particular product. Essentially, this approach is equivalent to assuming the foreign stores were always present and always selling the same set of products and providing the same amenities, but in period 0 they charged the pre-entry prices charged by domestic stores for those products. In this sense, we abstract from unobserved gains to variety and amenity and solely focus on observable price changes.[14]

The benefits of this approach are clear. It yields a transparent Paasche price index that approximates the consumer gains from foreign entry purely based on observable moments in the price microdata and without the need to impose a particular functional form on consumer preferences. Essentially, we are multiplying the post-entry foreign market share by the observed price differences between foreign and domestic stores for the direct price index effect, and the post-entry domestic market share by the price changes at domestic stores for the pro-competitive effect. The disadvantages are equally clear. Since we implicitly assume the foreign stores were always present, we miss any gains that arise from the greater product variety or the amenities provided by foreign stores. Given that these variety and amenity differences are substantial, a fact we highlighted in Section 2, we prefer the exact approach under CES for our baseline estimates. Finally, reporting both approaches provides an additional benefit. For the reasons discussed above, the difference between the direct price index effect under CES and the first order approach provides us with approximate estimate of the proportion of the gains that come from new variety and store amenities as opposed to lower prices on pre-existing products.[15]

3.2 Estimating the Nominal Income Effect

The nominal income effect in equation 1 can also be separated into distinct sub-components. We divide the household's income sources into three groups: Households obtain labor income from working in retail, business income from owning and operating their own retail outlet, and both labor and business income from other sectors (i.e. non-retail) indexed by o. For labor and business incomes in retail we additionally distinguish between the traditional retail segment (independent stores and street markets) indexed by τ and modern store formats (supermarkets and

[14] Note that the choice of the Paasche weights is driven by the fact that our first order approach is designed to avoid making assumptions on the demand system and focus on observable price moments instead. Hence, we use post-entry shares as we do not observe the counterfactual market shares of foreign stores if they charged the same prices as domestic stores pre-entry (and estimating these necessitates evaluating unobserved differences in variety and amenities).

[15] Note that it is not possible to carry out this decomposition using the CES framework alone. A Sato-Vartia (CES) price index that uses the observed price differences between domestic and foreign stores is not defined since the market share of foreign retailers is zero in period 0.

big box stores) indexed by μ:

$$y_h = \sum_{i \in \{\tau,\mu\}} l_{ih} + \sum_{i \in \{\tau,\mu\}} \pi_{ih} + \sum_{i \in \{o\}} (l_{ih} + \pi_{ih}) \tag{11}$$

where l_{ih} and π_{hi} denote labor income and business income from sector i, respectively. Taking a first difference and dividing through by initial income, we obtain three nominal income effects:[16]

$$\begin{aligned} \frac{IE}{e(\mathbf{P}_f^{0*}, \mathbf{P}_{dc}^0, \mathbf{P}_{dx}^0, u_h^0)} \approx & \underbrace{- \sum_{i \in \{\tau,\mu\}} \left[\theta_{ilh}^0 \left(\frac{l_{ih}^1 - l_{ih}^0}{l_{ih}^0} \right) \right]}_{\text{(4) Retail labor income effect}} \\ & \underbrace{- \sum_{i \in \{\tau,\mu\}} \left[\theta_{i\pi h}^0 \left(\frac{\pi_{ih}^1 - \pi_{ih}^{i0}}{\pi_{ih}^0} \right) \right]}_{\text{(5) Retail profit effect}} \underbrace{- \sum_{i \in \{o\}} \left[\theta_{ilh}^0 \left(\frac{l_{ih}^1 - l_{ih}^0}{l_{ih}^0} \right) + \theta_{i\pi h}^0 \left(\frac{\pi_{ih}^1 - \pi_{ih}^{i0}}{\pi_{ih}^0} \right) \right]}_{\text{(6) Other income effect}} \end{aligned} \tag{12}$$

where θ_{ilh}^0 and $\theta_{i\pi h}^0$ are the period 0 share of total income that come from sector i labor and business income, respectively.

Foreign retail entry may change labor incomes in both the traditional and modern retail sector, the retail labor income effect. Foreign entry may also affect the profits of domestic store owners, the retail profit effect. Finally, foreign entry may give rise to general equilibrium effects on labor and business incomes in other sectors of the local economy or affect incomes for households producing goods sold at local retailers, the other income effect. Each of these nominal income effects can occur both at the intensive and extensive margin. At the intensive margin, foreign entry can affect earnings of individuals who remain active in a given sector and occupation. At the extensive margin, foreign entry may lead households to reallocate across sectors and occupations.[17]

4 Data

The theoretical framework outlined in the previous section allows us to express the gains from foreign retail entry in equations 7 and 12 as a function of: i) causal effects on consumer prices, consumption quantities and household nominal incomes, ii) household demand parameters that govern the elasticity of substitution across retail outlets, and iii) household expenditure shares across product groups and store types within product groups, and income shares across sectors and occupations. This section describes the data sources we draw on to obtain these estimates. Appendix Table A.1 contains descriptive statistics for the key variables in each dataset.

Store Opening Dates and Locations Our main regressor of interest is the first entry of a foreign-owned supermarket in a municipality. To generate this variable, we obtain data on store locations and dates of opening from Mexico's national association of retail businesses ANTAD (Asociación

[16] Note that we do not attempt to value changes in household leisure time, which we implicitly assume to be fixed.

[17] To see this more clearly, we can decompose each of the three terms in expression 12 into three mutually exclusive margins; an intensive margin (e.g. in the case of labor income, $\theta_{ilh}^0 \left(\frac{l_{ih}^1 - l_{ih}^0}{l_{ih}^0} \right)$ if $l_{ih}^0 > 0$ and $l_{ih}^1 > 0$), a job loss margin (e.g. $\theta_{ilh}^0 (-1)$ if $l_{ih}^0 > 0$ and $l_{ih}^1 = 0$), and a new jobs margin (e.g. $\left(\frac{l_{ih}^1}{y_h^0} \right)$ if $l_{ih}^0 = 0$ and $l_{ih}^1 > 0$).

Nacional de Tiendas de Autoservicio y Departamentales). All major national and regional retailers in Mexico are part of ANTAD comprising more than 34,000 retail units with close to 25 million square meters of retail space. Between 2002 and 2007, ANTAD collected detailed data from its members about the location and date of opening of every establishment. For subsequent periods we obtained foreign owned supermarket openings directly from retailers' annual reports, and in the case the smaller foreign retail chains for which we could not find annual reports we obtained their store locations as of March 2014 from the stores' websites and then obtained exact opening dates from local newspaper coverage of store openings or by calling them.[18]

In our empirical work it will be important to control for trends in other municipalities. Since foreign retail stores rarely open in rural areas or very small towns,[19] we exclude these municipalities from our analysis by restricting attention to the 608 municipalities that had at least one chain store (i.e. ANTAD member) in at least one year between 2002-2014. Unsurprisingly, these municipalities are larger (a median population of 63,000 compared to a median of 8,000 for the remaining 1,848 municipalities) and are exclusively urban municipalities. By the end of our sample in 2014, 76 percent of these sample municipalities contain a foreign retailer whereas only 16 percent did at the start of our sample in 2002.

CPI Microdata To estimate the pro-competitive price effect, we rely on the monthly microdata that are used to construct the Mexican CPI. These data consist of retail price quotes collected by Mexico's national statistics agency INEGI.[20] Every month INEGI enumerators obtain price quotes (inclusive of any promotions and value added tax) for over 85,000 items covering 315 product categories in 141 urban municipalities.[21] These individual price quotes are made publicly available on a monthly basis in the official government gazette (Diario Oficial de la Federación).[22] Because computing the CPI requires prices of identical products in the same retail outlet over time, these data are ideally suited to estimate price changes at surviving domestic retail establishments.

In addition to the public access data of the Mexican CPI, we also obtain access to the confidential data columns. These crucially allow us to observe the municipality in which the price quote was taken, as well as store format type and the retailer name. The latter information allows us to explore heterogeneity across traditional and modern stores as well as to remove foreign stores from the estimation of the pro-competitive price effect.

As the sample of prices is designed to be representative of Mexican household consumption, these data have a number of useful features. First, the price quotes are collected from not only supermarkets, convenience stores, and department stores but also traditional stores, street vendors and market stalls. Second, the quotes cover not just retail product groups but also services such as health, education, housing and transport. Third, within a given product group, the products and stores sampled are chosen to match the consumption patterns of urban households observed

[18] We also thank Mauricio Varela for data on Walmart store openings between 2002 and 2007.
[19] The smallest municipality with foreign presence has 10,000 inhabitants.
[20] Prior to July 2011, this collection was carried out by Mexico's Central Bank.
[21] For comparison, the U.S. CPI collects prices on 80,000 items in 211 product categories.
[22] We thank Etienne Gagnon for access to the data he assembled directly from the Gazette.

in the ENIGH consumption surveys discussed below (Salas, 2006).

When comparing prices of the same product over time, we will focus on the subset of goods which are identified by their brand, pack-size and variety (i.e. fresh whole milk Alpura brand 1 liter carton). These barcode-equivalent products comprise more than one third of all reported price quotes in the Mexican CPI microdata, and account for more than 40 percent of household retail expenditure. Focusing on these products allows us to ensure there are no changes in product characteristics over time that may confound estimates of the pro-competitive price effect. In our main analysis, we assume that the estimated price changes due to foreign entry are representative for both types of products within any given product group. However, we also report robustness results where we make various alternative assumptions about price changes for non barcode-equivalent items (which for the reasons outlined above are not part of our estimation sample for the pro-competitive price effect). The final estimation sample consists of roughly 3.3 million monthly store price observations over the period 2002-2014 comprising 120 product categories[23] across 76 urban municipalities.

Retail Census Microdata For the purpose of estimating the effect of foreign entry on retail profits and domestic store exit we use the confidential version of the Economic Census microdata for the years 2003 and 2008 (Censos Económicos 2004 and 2009) from INEGI. The Economic Census records establishment level information for the universe of urban retail establishments. The restricted access version of the data we use allows us to separately observe the number of traditional retail stores (below supermarket) and modern retail stores (supermarkets and bigger), as well as store-level revenues and costs from which we compute profits. The resulting dataset contains 1.3 million retail establishments in 2003 and 1.5 million in 2008 across our 608 sample municipalities.

Employment and Occupation Survey Microdata To estimate the effect of foreign entry on nominal incomes and employment, we require high frequency survey data. To this end, we use the National Employment and Occupation Surveys (ENOE) from INEGI.[24] The ENOE has a similar design to the U.S. Consumer Expenditure Survey in that it is a quarterly survey with a rotating panel of households in which a given household is followed over 5 quarters. The survey tracks sector, occupation and income in a manner equivalent to the ENIGH data set described below but has the advantage of a much larger sample size: Every quarter more than 100,000 individual residences are surveyed with the details of each working-age household member recorded. The resulting sample comprises roughly 5 million person observations across 273 urban municipalities.

Consumer Panel Microdata The direct price index effect requires data on the post-entry retail market shares of foreign supermarkets across product groups and across different levels of household income, as well as estimates of the elasticity of substitution across local stores. For this purpose, we use the consumer panel microdata of a large international market research company.[25] Their Mexican consumer panel covers the years 2011-2014 and are similar in nature to

[23] Referred to as *genéricos* in the Mexican CPI.

[24] ENOE replaced the national urban employment survey ENEU (1987-2004) which we use for pre-2005 years.

[25] These data were made available to us through an academic collaboration with their Mexico City office under the condition that the firm's name remained anonymous.

the home scanner data that market research companies collect in the US. The panel consists of approximately 6,000 urban households classified by seven income groups and distributed across 156 municipalities. Households are visited biweekly to obtain complete consumption diary information about all products purchased by the household. As with the CPI data, these data are at the barcode-equivalent level with enumerators carefully noting the brand, variety and pack size. The household sample is updated annually to be representative of all cities over 50,000 once the provided survey weights are taken into account. These microdata comprise roughly 24 million transaction-level observations between January 2011 and June 2014. Importantly, unlike the academic-use versions of similar US datasets, we have retailer identities for every transaction in a household's consumption basket. Thus, these data are ideally suited to observe retailer market shares by household, as well as to estimate elasticities of substitution across stores.

Household Income and Expenditure Survey Microdata In our quantification exercise, in order to calculate welfare effects across the income distribution we need to know the expenditure shares of households across various product groups matched to income shares from various occupations and sectors. For this purpose, we use the Mexican National Income and Expenditure Surveys (ENIGH), which are administered biannually by INEGI between 2006 and 2012.[26] These data allow us to observe the incomes and sources of income for each household as well as their expenditure shares across all retail and non-retail product groups and even the proportion within each product group sold at different types of stores (supermarket, street market, convenience store, etc.). Given the welfare expression derived in the previous section, we require pre-entry income and expenditure shares and so we restrict attention to the 12,293 households residing in 240 urban municipalities that had not yet experienced foreign retail entry by the time the ENIGH survey was conducted. We match the product modules covered by the consumer panel data above to the household income and expenditure surveys at the level of 12 broad product groups.[27]

5 Estimating the Effects of Foreign Retail Entry

This section draws on the microdata described in the previous section to empirically estimate the effect of foreign retail entry on local consumer prices, retail market shares, store exit, household labor and business incomes, and employment. We focus on the effect of the first foreign store entry as we wish to capture any subsequent foreign entry induced by this event. In practice, this choice makes little difference as the vast majority of urban municipalities receive just one foreign store during our estimation period. As well as being of interest in their own right, these empirical estimates enter into our cost of living and nominal income welfare expressions, equations 7 and 12, and hence form the basis of the quantification exercise in Section 6.

[26] Starting in 2006, the ENIGH surveys provide a detailed break up of expenditure within each product group into different store formats, which is why we do not make use of earlier years.

[27] As discussed above, the CPI data makes use of the ENIGH expenditure shares and so the two surveys use the same product-groups.

5.1 Effect on Consumer Prices

5.1.1 Effect on Consumer Prices in Domestic Retail Stores

Empirical Strategy To estimate the effect of foreign supermarket entry on consumer prices in domestic retail stores, we combine information on the universe of foreign store locations and opening dates with monthly panel data on local barcode level prices from the 2002-2014 CPI microdata. Since foreign stores are not randomly allocated, the obvious identification concern is that store openings are correlated with pre-existing price trends. There are several possible scenarios. First, it could be the case that foreign retailers target municipalities with higher pre-existing price growth or time their opening in a way that is correlated with positive local retail price shocks. Both of these scenarios would lead to an upward biased estimate of the treatment effect of foreign entry on domestic store prices. Alternatively, foreign stores may target faster growing municipalities whose retail environments are also becoming more competitive so that store prices could be on a pre-existing downward trajectory. Finally, rather than targeting a particular set of municipalities at particular points in time, between 2002 and 2014 foreign retailers may have expanded rapidly with the aim of establishing store presence across the whole of urban Mexico as quickly as possible. In this final scenario, we would not expect substantial bias as, at least over this period, neither the selection of municipalities in our urban estimation sample nor the timing of opening would be strongly correlated with pre-existing price trends.

We use the microdata to explore which of these scenarios is relevant by estimating the following baseline event study specification:

$$\ln p_{gsbmt} = \sum_{j=-13}^{36} \beta_j \, I\left(MonthsSinceEntry_{mt} = j\right) + \delta_{gsbm} + \eta_t + \epsilon_{gsbmt}\,, \tag{13}$$

where $\ln p_{gsbmt}$ is the log price of a barcode-product b in product group g, individual store s, in municipality m and month t. $I\left(\cdot\right)$ is an indicator function, and $MonthsSinceEntry_{mt}$ counts the months since the first foreign entry for each municipality m at time t (with negative values counting months before entry, positive values counting the months after entry and zero being the month that the first foreign store enters a municipality).[28] Since the pro-competitive price effect in equation 7 relates only to price changes at domestic stores, we remove foreign stores from the sample. The β_j parameters capture the effect of foreign store entry on domestic-store prices for each of j months before and after the opening event. δ_{gsbm} is a barcode-by-store fixed effect, and η_t is a month fixed effect.[29]

By estimating the treatment effect in the 12 months leading up to the opening event, this approach allows us to test for the presence and slope of potential trends in the run-up to the foreign store opening event in a transparent way without imposing parametric structure. The absence of

[28] We take $j = -6$ as the (omitted) reference category and define the indicator variable $I\left(MonthsSinceEntry_{mt} = 36\right)$ to take the value 1 for all $j \geq 36$, and similarly $I\left(MonthsSinceEntry_{mt} = -13\right)$ to take the value 1 for all $j \leq -13$. As discussed below, unlike the points in between, these two periods pre and post the event study cannot be estimated using a balanced municipality sample.

[29] Note that we do not include barcode-by-month fixed effects since the product descriptions we use to define barcodes are recorded consistently within stores over time, but not necessarily across stores or municipalities.

pre-existing trends would suggest that the two troubling scenarios outlined above are not an issue, while if there are trends, the event study design allows us to sign and quantify potential bias.

To estimate the event study on a fully balanced sample of municipalities both before and after the store opening, we exclude municipalities where the first foreign store opened in the first 12 months of our data set (July 2002-June 2003), and municipalities where the first foreign store opened in the last 36 months our data set (April 2011-March 2014) or later. Balancing the panel is important to alleviate selection concerns when exploring the time path of treatment effects. There is a clear tradeoff between a longer event study and a smaller, less representative, sample. Our choice of window is guided by the fact that we lose only six percent of our store price observations through this restriction (although, along with other robustness checks, we will also show results with an extended window below).

Estimation Results Panel A of Figure 2 presents the event study graph. Prices are flat (and not significantly different from zero) in the lead up to the store entry event, start falling as soon as entry occurs, and level off approximately 24 months after entry at a negative and significant 3 percentage points. As evidenced by the treatment effect estimated for post 36 months (labeled "$\geq$36" in the figure), this pro-competitive effect appears to be permanent. When we parametrically test for trend breaks, we find a precisely estimated flat price trend before foreign entry, a significant negative trend break at the time of foreign entry, and a return to a flat price trend about two years after foreign entry.[30] Note that since the CPI samples products and stores in proportion to their weight in the consumption basket of a representative household, these point estimates indicate that foreign retail entry significantly lowers the average household retail price index when using a first order Laspeyres approximation.

In addition to the baseline event study specification, we present two additional event studies that serve as robustness checks. First, in case our results are driven by more granular trends not captured by the month fixed effects, we replace the 141 month fixed effects with 33,516 store-type-by-product-group-by-month fixed effects, 705 region-by-month fixed effects and 705 municipality-size-by-month fixed effects (Panel B of Figure 2).[31] Second, to address any concerns that longer pre-existing trends may not be detected in our 12 pre-months event study, we also extend the event study to include treatment effects for the 24 months before the opening event (Panel C of Figure 2). The coefficient patterns across the three panels are remarkably similar, and the point estimate increases from a 3 percentage point reduction to 4 percentage points after including the additional controls. Columns 1-3 of Table 2 present the coefficients in table form (in quarterly rather than monthly bins for compactness).

The absence of pre-existing differential trends in price growth and the subsequent leveling off

[30] We regress log barcode prices on a post-entry dummy, a dummy for 24 months or more post entry and their interactions with $MonthsSinceEntry_{mt}$ in addition to δ_{gsbm} and η_t. The point estimates on $MonthsSinceEntry_{mt}$ are -.00011 (se=.00036) before entry, -.00116 (se=.00046) for the interaction of $MonthsSinceEntry_{mt}$ with a post-entry dummy, and -.00010 (se=.00043) for the interaction of $MonthsSinceEntry_{mt}$ with the dummy for 24 months or more post entry.

[31] Store types refer to either modern store formats (supermarkets and big box stores) or traditional retail outlets (mom and pop stores, street markets, etc.). Mexican regions are defined by five contiguous geographical zones according to the Instituto Federal Electoral . Similarly, we assign each municipality in our sample to one of five population quintiles that we define over the population in the year 2000 for the size-by-month fixed effects.

two years after entry provides no evidence in support of the hypothesis that, during our sample period, foreign retailers targeted urban municipalities based on pre-existing price trends or entered in response to changing economic conditions pre-entry. Instead, the results appear to be consistent with a scenario in which foreign retailers rapidly expanded their store networks to establish presence in a wide range of urban locations subject to a longer term planning horizon (and hence variation in opening times is driven by local planning approvals and building delays). The finding that the coefficients fall gradually in the first two years after opening rather than immediately is interesting. It suggests that local consumers adjust their shopping behavior gradually, as recently found to be the case for US retailers (Einav et al., 2015).

The remaining endogeneity concern is that foreign retailers anticipate breaks in local economic trends. For example, foreign retailers may anticipate local road or other infrastructure investments and target entry to coincide with these investments. We should be clear what would constitute a concern in this context: The local infrastructure investment must be placed at random, in the sense that it is uncorrelated with pre or post trends in prices; it must induce a trend break in prices that lasts only two years since prices return to trend after that; and it must be both anticipated by the foreign retailer, yet the foreign retailer must always precisely preempt its arrival since we see no drop in prices pre-entry. Taken individually, each of these three conditions appear unlikely, particularly the last one given the stochastic nature of delays in both opening a new store and in infrastructure investments. And of course, even if all three conditions are satisfied, it would not appear to be obvious why foreign retailers explicitly target places with anticipated negative price shocks.

Nevertheless, we present two additional robustness checks that serve to address these concerns directly. First, we add direct controls for local government expenditures reported by INEGI at the municipality-year level. As presented in Table 2, the event study coefficients are virtually unchanged after controlling for municipality-year variation in local public expenditure, providing some reassurance against this concern. Second, we also estimate the baseline event study specification, equation 13, on the non-retail CPI microdata. These data include price time series for consumer expenditures on, for example, the same local hair cut, taxi ride, domestic cleaning services, rents, education fees or medical procedures. This serves two purposes. If we do not expect non-retail prices to respond, it serves as a placebo falsification test as any omitted variables that change retail price trends would be expected to have similar effects on non-retail prices. Conversely, if we think non-retail prices may respond to foreign retail openings through indirect channels, the size of the response is needed for the quantification exercise. As shown in columns 4 and 5 of Table 2, the point estimates of the event study specifications run on non-retail prices are a time series of precisely estimated zeroes. Once again this provides some reassurance in favor of the validity of the event study design presented in Figure 2.

Heterogeneity In our theoretical welfare expression, we allow for heterogeneity in price changes across products and stores. To generate these moments, we explore the potentially heterogeneous effects of foreign entry on domestic retail prices across broad product groups as well as across store formats. This analysis is possible since the confidential version of the CPI microdata allows us to observe store formats and retailer names in addition to product groups. We estimate the

following specification:

$$\ln p_{gsbmt} = \sum_{gi} \beta_{gi} \left(ForeignEntry_{mt} \times Product_{gi} \right) + \delta_{gsbm} + \eta_{git} + \theta_{rt} + \phi_{pt} + \epsilon_{gsbmt} \,, \tag{14}$$

where $ForeignEntry_{mt}$ is an indicator that takes the value of 1 if there is a foreign store in municipality m in period t and $Product_{gi}$ is an indicator variable that takes the value of 1 if the retail price quote belongs to product group g and store type i (i.e. modern or traditional).[32] The β_{gi} estimates capture the effect of foreign entry on domestic retail prices across product-group g and store-type i categories. As we do not wish to estimate the very short run impacts of a foreign retail entry, we exclude price data for first 24 months after store opening to capture the medium-run price adjustment (recall that the price coefficients in the event study level off by that time). This specification is subject to similar identification concerns discussed above and we rely on the lack of pre-trends in the previously-reported event study.

Table 3 reports the results of the treatment effects for domestic supermarkets versus traditional stores, and for food items versus other consumer categories. The results suggest that foreign supermarket entry affects the prices of domestic stores similarly across both food and non-food products. In contrast, the pro-competitive price effect appears to be stronger for modern domestic store formats relative to traditional store formats.

5.1.2 Post-Entry Price Gaps between Foreign and Domestic Stores

Empirical Strategy As shown in equation 9, empirical estimates of the post-entry price differences between foreign and domestic stores can be used to estimate a simple and transparent approximation to the direct price index effect (in combination with the pre-post price changes in domestic stores calculated in the previous subsection).

To estimate these post-entry price differences, we compare prices of identical barcodes in the same municipality and month using the consumer panel and the following specification:[33]

$$\ln p_{gsbmt} = \beta_{gi} DomesticStore_{sgi} + \delta_{gbmt} + \epsilon_{gsbmt} \,, \tag{15}$$

where $DomesticStore_{sgi}$ is a dummy that takes the value of 1 if the retailer is not a foreign-owned store and δ_{gbmt} is a barcode-by-municipality-by-month fixed effect. As in the previous subsection, to account for potential heterogeneity we also allow the coefficient on $DomesticStore_{sgi}$ to vary by food and non food categories g, and by modern and traditional stores i.[34]

[32] The δ_{gsbm} are barcode-by-store fixed effects. As before, we also include product-group-by-store-type-by-month (η_{git}), region-by-month (θ_{rt}) and municipality-size-by-month(ϕ_{zt}) fixed effects to control for time-varying product-group by store-type specific shocks to prices and shocks that affect regions or municipality types differently, .

[33] These data span the period 2011-2014. As before, we focus only on barcode-identified products in order to control for differences in product characteristics across stores. We use these data rather than the CPI microdata because there are many more observations and barcode-equivalent products have unique numerical identifiers across stores in the consumer panel (the CPI data only uniquely identifies barcode-equivalent items within stores so any match across stores would have to be done on the brand and pack size descriptions).

[34] Here, and in all our household-level datasets, we weight our regressions using the household survey weights provided to ensure our results are representative.

Estimation Results Table 4 presents the estimation results. As reported in Section 2, foreign stores charge approximately 12 percent lower prices for identical barcode items compared to domestic stores in the same location during the same month. In terms of heterogeneity, the price advantage of foreign stores is most pronounced compared to traditional domestic retailers (a 17 percent price difference), but the difference remains both economically and statistically significant when comparing foreign stores to modern domestic supermarkets (a 4 percent price difference). In terms of heterogeneity across product groups, the price differences appear to be most pronounced for food relative to non-food product groups.

5.2 Effect on Consumption Quantities

5.2.1 Post-Entry Market Shares of Foreign Retailers

Empirical Strategy To calculate the direct price index effect in expression 7, we require estimates of the effect of foreign supermarket entry on the retail expenditure shares of foreign stores (broken down by both product group and household income group). To obtain these estimates we again turn to the consumer panel microdata and estimate the following specification:

$$\sum_{s \in S^f_{gmt}} \phi_{gshmt} = \beta_{gh} + \epsilon_{ghmt} \tag{16}$$

where $\sum_{s \in S^f_{gmt}} \phi_{gshmt}$ are retail expenditure shares spent at foreign foreign stores by individual household h in product group g. We estimate the average post-entry expenditure shares at foreign stores, β_{gh}, separately for each of 12 product groups and 7 household income groups as described in Section 4. As above, we restrict our sample to focus only on expenditure shares of foreign stores in locations where a foreign retailer had been open for 24 or more months (recall the price effects leveled off at 24 months suggesting consumer shopping habits are stable by that time). Thus, this specification estimates medium-run market shares of foreign stores.

Estimation Results Figure 3 presents the results. The average share of total household retail expenditure spent at foreign stores 24 months after the first foreign entry is more than 30 percent. Given that the median number of foreign stores across the sample municipalities is a single store, these results provide prima facie evidence via revealed preference of substantial consumer gains from retail FDI in a developing country context.

Including in our estimates data on foreign market shares from locations that received foreign stores many years prior to the start of our estimation sample raises the concern that these early receivers either may not be representative of the municipalities where foreign entry occurred over our sample period, or experienced subsequent shocks that altered their demand for foreign retailers. As a robustness exercise, we find similar results when we restrict the estimation of equation 16 to municipalities where foreign retail first arrived between 2 and 3 years ago where such concerns will be less pronounced (see Online Appendix Figure A.2).[35]

[35]Note that since the consumer panel microdata start in 2011 and cover large urban municipalities that had mostly experienced foreign entry by that time, we cannot carry out an event study looking at pre and post-entry market shares of foreign stores.

The post-entry expenditure shares on foreign stores differ significantly across the income distribution. The upper panel of Figure 3 shows that the wealthiest households spend more than 50 percent of their retail expenditure at foreign stores while the poorest just over 10 percent. These substantial differences in the extent to which local households substitute towards shopping at foreign stores suggest significant differences in how rich and poor households evaluate the amenities and product mix offered by foreign retailers (as captured by the taste shifters and store-income-group-specific price indices in our CES preference structure). Note, these differences across income groups come from variation across income groups within locations rather than simply variation across poor and rich locations: we find similar differences when we include municipality-by-quarter fixed effects in Figure A.1 of the Online Appendix.

The lower panel of Figure 3 reports foreign-store expenditure shares across 12 product groups. We find substantial differences across product groups; the foreign retail share in personal care products is above 40 percent but below 15 percent for beverages. For the quantification itself, we draw on the cross of these two dimensions and allow the foreign retail expenditure shares to vary by both income and product group.

5.2.2 Effect on Domestic Store Exit

Empirical Strategy To estimate the pro-competitive exit effect in expression 7, we require data on the market shares of exiting stores. Since the consumer panel only spans a short time window and the CPI price data do not contain quantities, we rely on store counts from the microdata of the Mexican retail censuses collected in 2003 and 2008 (and implicitly assume that closing stores had average market shares).[36] Hence, we estimate the following specification (separately for traditional and modern establishments):

$$d \ln N\_Establishments_m^{03-08} = \beta dForeignEntry_m^{03-08} + \gamma X_m + \epsilon_m \tag{17}$$

where the dependent variable is the change in the log number of retail units across the two census rounds and the key independent variable is $dForeignEntry_m^{03-08}$, the change in the foreign entry dummy between the two census rounds (i.e. whether the first foreign store opened between censuses). We also include a set of municipality controls X_m, the most important of which is a dummy for whether the municipality already had a foreign store at the time of the first census in 2003 (these municipalities are much larger, more likely to be located in the center of the country and presumably experienced different trends compared to municipalities that foreign stores entered in the major wave of expansions we study).[37] For β to yield an unbiased estimate of the effect of foreign entry on store counts, we require that foreign entry decisions between 2004 and 2008 are not correlated with other variables that drive changes in the number of local retail establishments.

While the event studies in other subsections provide some support for this assumption, the

[36] This assumption is likely conservative. If store closures were concentrated in stores with small market shares, then the welfare gains we report in our quantification would be even larger.

[37] Unlike in the household datasets, no survey weights are provided. We report the basic unweighted results, as well as results weighting by municipality employment counts from the 2003 Economic Census for consistency with other estimates in the paper.

lack of available high frequency data on local store counts precludes a similar strategy here. To partially address such concerns, we present a number of robustness checks. As in the price regressions, we report estimation results that include additional sets of municipality-level controls: region fixed effects, municipality size fixed effects, and contemporaneous changes in both log public expenditures and log GDP per capita.

Estimation Results Table 5 presents the estimation results. Foreign entry has a negative and statistically significant effect on the number of traditional retailers. The size of the preferred point estimate (weighted with controls) implies a 3.9 percent reduction. Reassuringly, this point estimates are similar across the various specifications. The coefficient estimate on store exit among modern domestic store formats is also negative and also equal to a 3.9 percent reduction, but is not statistically significant at conventional levels. Hence, we find negative but moderate effects on domestic store exit over our five year time horizon.

5.3 Effect on Nominal Labor Incomes, Business Incomes and Employment

Empirical Strategy To calculate the income effect in expression 12, we require estimates of the causal impact of foreign retail entry on nominal incomes and employment in the location where retail entry occurred. To do so, we start by running an event study specification similar to our price event study above, but here using quarterly income and employment data from the employment and occupation survey microdata:

$$\ln Income_{kmt} = \sum_{j=-5}^{12} \beta_j \, I\left(QuartersSinceEntry_{mt} = j\right) + \gamma X_{kmt} + \delta_m + \eta_t + \epsilon_{kmt}, \tag{18}$$

where $\ln Income_{kmt}$ is log monthly nominal income for individual k residing in municipality m in quarter t. X_{kmt} are person controls including a gender dummy, dummies for completed degrees (below primary, primary, secondary and higher) and third order polynomials for age and years of schooling.[38] We also run an identical specification for employment that replaces $\ln Income_{kmt}$ with $Employ_{kmt}$, an indicator variable that takes the value of one if the person is employed. Hence, the β_j coefficients uncover pre and post foreign entry movements in income and employment.

As discussed above, the event study design allows us to transparently and non-parametrically explore pre-existing trends in the run up to the store opening event. Again, there are several potential scenarios. Foreign retailers could target urban municipalities with higher pre-existing income growth rates, or decide on the timing of the opening in a way that is correlated with positive local economic shocks. Conversely, it could be the case that foreign retailers target urban municipalities with higher income levels that may happen to have lower income growth rates. Finally, it could be that, consistent with our price event study, foreign retailers expanded rapidly with the aim of establishing store presence across urban Mexico in a way that was uncorrelated with local shocks or pre-existing trends in incomes or employment (at least for our urban estimation sample).

[38] Note that we do not include individual worker fixed effects as the ENEU data is a rotating panel where individuals are followed for a maximum of 5 quarters. For completeness, Table A.3 of the Online Appendix reports similar results that include worker fixed effects.

As in the price event study, we balance the estimation sample between one year before and three years after the store entry event.[39] In addition to these baseline specifications, we also estimate a number of additional robustness checks. As before, we replace the quarter fixed effects with region-by-quarter as well as municipality-size-by-quarter fixed effects, and estimate specifications with both a one year pre-period as well as an extended event study with a two year pre period.

To estimate the effect of foreign retail entry on business incomes among local store owners, we return to the Mexican retail census microdata, and estimate specification 17 above after replacing the dependent variable $d \ln N\_Establishments_m^{03-08}$ by $dln\left(\overline{Profits_m}\right)^{03-08}$, the change in log mean municipality profits for traditional retail establishments.[40] For the quantification exercise, we require an estimate for the effect on total retail profits accruing to local households (inclusive of the lost profits of exiting traditional stores). This total effect is given by the sum of the profit effect and the store exit effect already calculated in Section 5.2.2.

Estimation Results Figures 4 and 5 and Table 6 present the estimation results for the income and employment event study described above. In contrast to the price event study, we find no evidence of either jumps in levels or breaks in trends around the period of foreign retail entry (or evidence of pre-existing trends). There appears to be no general equilibrium income or employment effects in the municipality, perhaps not surprisingly given that one store hires only a small number of employees. For completeness, Table A.3 in the Online Appendix also provides the regression table. Table A.3 also shows that we find no evidence of changes in population, at least over the time horizon we study: we aggregate the worker weights up to the municipality-level and regress log municipality population counts on quarters-since-entry dummies, municipality fixed effects and quarter fixed effects, and find statistically insignificant point estimates that are close to zero.

Table 7 presents the estimation results for domestic store profits using the retail census microdata. Foreign entry has a negative effect on retail profits for traditional store owners. The significance of the point estimate on profits depends on whether the specification is population weighted or not, but ranges between -4.4 and -5.1 percent. Reassuringly, this point estimate varies little when we include regional fixed effects, initial municipality size fixed effects, or control for contemporaneous changes in local government expenditures or GDP per capita.

Heterogeneity To quantify to what extent households may be affected differently depending on their primary source of income pre foreign entry, we require not just the general equilibrium income and employment effects, but also estimates broken down by sector. We now turn to exploring this heterogeneity. Since individuals may change sector or become unemployed over time, and the employment and occupation surveys only follow individuals over 5 consecutive quarters,

[39] This restriction excludes ten percent percent of our observations. The majority (6 percent) of these excluded observations are in urban municipalities that had not yet received a foreign store at the end of our sample in March 2014.

[40] We do not estimate the effect on modern retail profits for two reasons. The first reason is conceptual. Given that we are interested in the welfare effect of foreign entry on local households, the profits of retail chains that are repatriated to their headquarters in other locations should not enter the welfare expression in equation 12. The second reason is data constraints. While in the exit regressions we were able to observe the total number of modern stores and subtract off the number of foreign owned stores in the ANTAD data, we cannot do the same for profits since ANTAD do not report them and the census data do not allow us to distinguish between domestic and foreign stores in the modern retail sector.

we cannot directly asses longer-run outcomes for workers with different pre-foreign-entry occupations. Instead, we calculate both the average income and employment changes across various sectors and apply the decomposition outlined in equation 12 of the theory section.

To obtain average changes in nominal incomes across sectors, we regress individual log income on a foreign entry dummy that takes the value 1 when there is a foreign store in the municipality interacted with a sector dummy that takes the value 1 if a worker is employed in that sector:

$$\ln(Income)_{kimt} = \sum_i \beta_i \left(ForeignEntry_{mt} \times Sector_i\right) + \gamma X_{kimt} + \delta_{mt} + \eta_{im} + \theta_{it} + \epsilon_{kimt}\,, \tag{19}$$

where subscripts k, i, m and t index individuals, sectors, municipalities and quarters respectively. δ_{mt} is a municipality-by-quarter fixed effect, η_{im} is a sector-by-municipality fixed effect, and θ_{it} is a sector-by-quarter fixed effect. Our sectoral categories consist of two retail categories, retail workers in either modern or traditional store formats; as well as two non-retail categories, individuals whose main income source is either agriculture or manufacturing. The omitted category contains individuals whose main income source is in non-retail services (e.g. education, health care and financial services).[41] We assume this large omitted category experiences no income changes with foreign entry based on the flat event study plots for average incomes above.

The coefficients β_i capture the differential effect of foreign store entry on the incomes of various sectors (conditional on flexible trends at the municipality-quarter level, initial earnings differences across sectors within the municipality and national differences across sectors in that quarter). Finally, we remove observations covering the 24 months after the first foreign store entry to avoid capturing the short-run adjustment period we noted in the price regressions above.

Table 6 presents these results. In contrast to the average income regressions, we find a negative and significant effect on the incomes of traditional retail workers. This point estimate is robust to including income-group-by-quarter fixed effects as well as state-by-income-group specific time trends, implying that this effect is not driven by pre-existing trends that are specific to particular income groups. The point estimate corresponds to a reduction in the monthly incomes of traditional sector retail workers of 5.9 percent as a result of foreign retail entry. We find a smaller and insignificant 2.8 percent decline in the labor incomes of modern retail workers. In contrast, incomes in agriculture and manufacturing—individuals who may be supplying foreign retailers—rise but by small insignificant amounts.

Finally, we turn to employment changes across sectors. We regress the log number of employed workers in municipality m, sector i and quarter t on the exact same specification in 19, except removing the individual-level control variables. The final three columns of Table 6 report these coefficients to shed light on any extensive margin effects. We find a significant and substantial point estimate for traditional retial employment corresponding to an 11 percent employment reduction. This is partially compensated by an (insignificant) 3.92 percent increase in employment

[41] Although these data also report business incomes in retail, we exclude the small fraction of retail business owners. This is because we already have an estimate for the effect on retail profits using the retail census data where the profit data are more reliable for self employed business owners and the number of observations is far larger. (The employment and occupation surveys contain a median of only 9 store owners in each municipality-quarter cell.)

in the modern sector, potentially coming from employment at the foreign store itself. The employment changes in agriculture and manufacturing are small and insignificant (once again relative to the omitted category, non-retail services).

6 Quantifying the Welfare Effect of Foreign Retail

In order to quantify the effects of foreign retail on local household welfare using equations 7 and 12, we require two more inputs beyond the causal effects on prices, quantities and incomes we estimate above. First, we need an estimate of the elasticity of substitution across local retail outlets (the η_{gh} parameters in equation 7). Second, we require estimates of household budget shares across product groups (the α_{gh} parameters in equation 7) and pre-entry income shares across sectors and occupations (the θ_i^0 terms in equation 12). Armed with all three types of moments, we then proceed to the quantification.

6.1 Estimation of the CES Elasticity Parameter

To estimate the elasticity of substitution across local retail outlets we use the consumer panel microdata. The strength of these data is that we observe how much each household purchases of a particular barcode-equivalent product, at what price and at which specific store. Thus, we can observe how store-level market shares vary with store-level prices across various locations. We exploit this cross-location variation (rather than the time series) for two reasons: this variation is more likely to provide estimates of the long-run elasticity relevant for estimating the gains from new foreign retail store openings, and because the consumption data we use have a relatively short-term duration (10 quarters between 2011-14).[42]

To derive our estimating equation, note that in the CES case the log expenditure share of store brand s (e.g. Walmart) within product group g (e.g. beverages) can be written as

$$\ln \phi_{gshmt} = (1 - \eta_{gh}) \ln r_{gshmt} - (1 - \eta_{gh}) \ln c_{ghmt} + \eta_{gh} \ln \beta_{gshmt} \tag{20}$$

where $c_{ghmt} = \left(\sum_{s \in S_{gmt}} (\beta_{gshmt})^{\eta_{gh}} (r_{gshmt})^{1-\eta_{gh}}\right)^{\frac{1}{1-\eta_{gh}}}$ is the CES price index for the product group, r_{gshmt} is the store-product-group specific price index and β_{gshmt} is the store-product-group specific taste shifter for household h in municipality m in quarter t. Thus, if we regress log expenditure shares on local store-level price indices while using the fixed effects to sweep out the CES price index and deal with any endogeneity due to the taste shifter, we can recover the elasticity of substitution across stores, η_{gh}.

To implement this procedure, we must place additional structure on the multi-tier preference structure we introduced in equation 3. First, since we will not be able to match individual households in the consumer panel to households in the income and expenditure surveys, we aggregate households into broad income groups (the 7 income groups in the consumer panel). Second, we must impose some discipline on the store-specific taste shifters for them not to soak up all the variation in expenditure shares. Our basic specification allows tastes to differ both across time

[42] In this context, it is important to note that the presumably larger long-run estimates of the elasticity of substitution generate more conservative estimates of the consumer gains from foreign retail entry than short-run estimates would.

for each retail-chain-product-group pair (for example due to a national advertising campaigns for a retail chain) and across municipality for each retail chain (for example because a retail chain is located on the outskirts of some municipalities and the center of others). We also report additional specifications that allow tastes to vary at the retail-chain-municipality-quarter level or retail-chain-municipality-product-group level.

Finally, in order to calculate the store-level price index we require a functional form for the lowest tier of consumer preferences—household preferences across products within a store-product-group—that we left unspecified up to now. In principle, we could use any demand system. For simplicity and transparency, we choose the widely-used Stone-price index, which is just a budget share weighted sum of log prices; $\ln r_{gshmt} = \sum_{b \in B_{gshmt}} \phi_{gsbhmt} \ln p_{gsbhmt}$. As products differ across stores, and some stores may sell higher-quality varieties, we use barcode fixed effects to ensure that we are only comparing identical products to extract these price index differences. To be precise, we recover $\ln r_{gshmt}$ from the store fixed effects in a regression of budget-share-weighted log prices at the barcode level on both store and barcode fixed effects, where this regression is run separately for every product-group income-group municipality time cell.[43] This procedure is similar to extracting firm fixed effects from matched employer-employee data, and we follow that literature by estimating the price indices off the largest 'mobility group' of connected stores and barcodes.

Given this additional structure, we can run the following regression:

$$\ln \phi_{gshmt} = b_{gh} \ln r_{gshmt} + \delta_{ghmt} + \gamma_{cgt} + \gamma_{cm} + u_{gshmt} \tag{21}$$

where u_{gshmt} is the error term, δ_{ghmt} are product-group-by-income-group-by-municipality-by-time fixed effects that sweep out the CES price index $\ln c_{ghmt}$, and the γ terms are retail chain c fixed effects to capture the unobserved taste shifters. The object of interest is $1 - b_{gh}$, an estimate of the elasticity η_{gh} that governs the degree of substitutability between local retail outlets as a function of store price differences.[44] To fix ideas via a simple example, we are essentially comparing one location where Soriana has relatively high prices for beverages compared to Walmart, with another location where the two stores have similar prices, and inferring the elasticity of substitution from the difference in relative market shares across the two locations. As in previous sections, we allow this elasticity parameter to differ across food and non-food retail product groups as well as across two broad income groups, "rich" and "poor" (defined as above and below median).[45]

As in any demand estimation, there are simultaneity concerns if demand shocks in the error term raise both store-level market shares and store-level price indices. To deal with this concern we follow Hausman (1996) and instrument the store-product-group price index with price indices

[43] Given the nature of the microdata, we first collapse the price data to average prices at the barcode-store-municipality-quarter level. Alternatively, we collapse them to median prices, and we will report both specifications. For comparability across locations, the resulting store fixed effects are then demeaned within each product-group income-group municipality time cell.

[44] The consumer panel data does not provide unique store identifiers for every purchase reported by the household. For this reason, we focus on substitution across the uniquely identified (primarily chain) stores in the consumer panel.

[45] Despite the richness of these data, the variation thins if we allowed for heterogeneity along more granular dimensions of h and g (we observe on average only 40 households in a given quarter-municipality cell).

in stores of the same retailer in other municipalities. In particular, we exploit the fact that supermarket chains often price their products nationally or regionally without taking into account idiosyncratic local demand shocks (e.g. Bejara et al., 2014; DellaVigna and Gentzkow, 2015).[46] This supply-side price variation allows us to identify the elasticity of substitution.[47] Thus, we instrument using product-group specific price indices constructed either from national leave-out means for that retailer or from regional leave-out means (using five Mexican administrative regions). As recently shown by Beraja et al. (2014), these two instruments are likely to identify potentially different local average treatment effects. The national leave-out means estimate the elasticity of substitution off national retail chains that price their products nationally, whereas the region-level leave-out means additionally extend the complier group of the IV to regional chains.

Table 8 presents the estimation results for both the average elasticity of substitution as well as allowing the elasticity to vary by income and product group. For both IV strategies, and all three different taste shifter fixed effect specifications, the elasticity estimates are consistently negative, significant and have substantial first-stage F-statistics. The average elasticities range between 2.28 and 4.36, well within the range of existing estimates that use scanner consumption microdata for the US (e.g. Hausman and Leibtag, 2007; Handbury, 2011). As is evident from the cost of living expression, equation 7, larger elasticity estimates result in smaller direct price index effects. Therefore, we base our welfare quantification on the specification that yields the most conservative (highest) average estimate of the elasticity of substitution across local retail outlets (those reported in columns 9 and 23 of Table 8). In addition to choosing the most conservative η_{gh} estimates, we also rerun our quantification both across a range of alternative average elasticities of substitution for which our preferred $\eta = 4.36$ forms the mid point, and using the first order approximation approach outlined in Section 3 that does not require estimates of this elasticity.

6.2 Combining the Estimated Moments for the Quantification

In order to calculate the welfare expressions derived in Section 3, we still require one final set of moments; estimates of pre-entry income and expenditure shares across the distribution of households. For these moments we draw on our sixth and final dataset, the Mexican household income and expenditure surveys. The household-level shares from these data, combined with the previous moments estimated at the income-group-by-product-group level, will allow us to estimate the welfare gains from foreign retail entry separately for each household in the survey.

As we require pre-entry income shares, we restrict attention to the 12,293 households surveyed over the period 2006-2012, who reside in the 240 urban municipalities without foreign stores at the time of the survey. The surveys record the share of income from each sector and occupation which provides the pre-entry income shares used to calculate the nominal income effects (the θ_h^0 parameters in equation 12). Alongside the causal income and employment changes presented in Section

[46] In support of this assumption, in the consumer panel data the variance of log prices within a retailer-barcode-quarter is .458 nationwide, .395 within a given region, and only marginally lower at .346 within a given state.

[47] The assumption underlying both of these IV strategies is that deviations in the taste shifters across locations are idiosyncratic after conditioning on our fixed effects. In this sense, the approach has similarities to the identification through heteroskedasticity approach in Feenstra (1994), Broda and Weinstein (2006) and Feenstra and Weinstein (2013) which also requires idiosyncratic taste shocks.

5.3, we have all the moments necessary for quantifying the nominal income effect.[48]

We now turn to the cost of living expression under the exact (CES) approach, expression 7. For each household, the income and expenditure surveys record household expenditures in each product group (the α_{gh} parameters). In Section 5.2 we obtained estimates of the share of retail expenditure at foreign stores post entry ($1 - \sum_{s \in S_g^{dc}} \phi_{gsh}^1$), and at exiting stores pre entry ($1 - \sum_{s \in S_g^{dc}} \phi_{gsh}^0$). Coupled with the elasticity of substitution across stores η_{gh} estimated in Section 6.1 above, we are in a position to calculate the key components of the direct price-index effect and the pro-competitive exit effect.

The remaining term is the pro-competitive price effect. This is a function of causal changes in store-price indices, $\frac{r_{gsh}^1}{r_{gsh}^0}$ and ideal log-change weights ω_{gsh}. Recall that in Section 5.1, we obtained estimates of causal price changes at domestic retail stores due to foreign entry for both food and non-food groups and for traditional and modern stores. Accordingly, we assume that all product-level price changes $\frac{p_{gsb}^1}{p_{gsb}^0}$ within these product-group-by-store-types are the same, $\frac{p_{gsb}^1}{p_{gsb}^0} \equiv p_{gs}$, where the store s now indexes two types, modern domestic μ and traditional domestic τ; and product group g now indexes two groups, food retail and non-food retail.[49] Given that we found a precisely estimated zero effect on non-retail consumer prices (e.g. health, housing, education and restaurants), we set the price changes equal to zero across all non-retail product groups.

The ideal log-change weights ω_{gsh} that weight these domestic store price changes in the CES price index can also be easily calculated. These are simple functions of pre- and post-entry expenditure shares for each store type within each product group. Fortunately, the design of the income and expenditure surveys are extremely helpful in this regard. As described in Section 4, the four survey rounds we use break down household expenditures in each product group into expenditures at different types of store. This break down allows us to directly observe these pre-entry store-type expenditure shares, $\tilde{\phi}_{gsh}^0$, for each household and product group. We then use the CES structure to calculate post-entry shares, $\tilde{\phi}_{gih}^1$, by combining these pre-entry shares with the causal price changes by store type discussed above and our elasticity of substitution estimates:

$$\tilde{\phi}_{gih}^1 = \tilde{\phi}_{gih}^0 \left(\frac{(p_{gi})^{1-\eta_{gh}}}{(p_{g\mu})^{1-\eta_{gh}} \tilde{\phi}_{g\mu h}^0 + (p_{g\tau})^{1-\eta_{gh}} \tilde{\phi}_{g\tau h}^0} \right) \tag{22}$$

where i takes the value μ or τ.

[48] To quantify the retail profit effect, we randomly assign a profit loss of 100 percent to 3.9 percent of traditional store owners in the income and expenditure surveys (based on the estimate of traditional store exit from Section 5.2.2). We assign the remaining 96.1 percent of traditional store owners a profit loss of 4.4 percent (based on the traditional store profit decline estimated in Section 5.3). To quantify the labor income effects, we use the estimates of the income and employment effects in Columns 3 and 6 of Table 6 to compute the expression in equation 12 and footnote 17. Households with members employed in a given sector (traditional retail, modern retail, agriculture or manufacturing) receive their initial income share in that sector multiplied by the average income effect estimated in Column 3. For sectors experiencing employment reductions of x percent in Column 6, we apply a 100 percent reduction in income to x percent of households working in that sector. For sectors experiencing gains of x percent, we increase income for $\frac{x\rho}{1-\rho}$ households not working in that sector by the average local earnings in that sector divided by total household income (where ρ is the proportion of local employment in that sector). We set the employment change to 0 in agriculture given the point estimate of 0.00811 and the large standard errors due to the small number of agricultural employees in our urban sample.

[49] We later relax this assumption and allow for different price changes across barcoded and non-barcoded products.

Finally, the cost of living expression under the first order approach is relatively straightforward to quantify. We require two sets of price changes: the pre-post price changes in domestic stores for the pro competitive effect (expression 9); and the sum of these pre-post price changes and the post-entry price gaps between domestic and foreign stores for the direct price index effect (expression 10). As above, we assume that these price changes and price gaps were common across all products within each product-group-by-store-type pair and draw on our estimates from Section 5.1. For the post-entry expenditure weights ϕ^1_{bsh} that weight these price changes and price gaps in the Paasche indices, we start with the product-group shares for each household from the income and expenditure surveys. These are then multiplied by the domestic (for the pro-competitive price effect) or foreign (for the direct price index effect) market shares within each product group, as well as the store-type shares within each product group, both obtained from households in the same income bin in the post-entry period consumer panel data.

Before performing the quantification, we need to confront the fact that the estimates of the causal effects of foreign retail entry on consumer prices, quantities and incomes that enter the quantification are estimated with error terms. Accordingly, to obtain the standard errors and confidence intervals we report below, we bootstrap the entire quantification exercise 1000 times. In each bootstrap, we both draw a random sample of households from our 12,293 households (sampling with replacement); and redraw each price, quantity and income parameter from a normal distribution with a mean equal to the point estimate and a standard deviation equal to the standard error of the estimate. As mentioned above, for robustness we also recompute the quantification for a range of elasticity estimates (recall we chose the most conservative specification in our baseline quantification), and for a range of assumptions on price changes for non-barcoded retail items (recall we assumed these changes to be equal to those of barcoded items in our baseline quantification).

6.3 Quantification Results

6.3.1 The Average Welfare Gains from Foreign Retail Entry

We first present the results of the quantification under the exact (CES) approach. As described above, the income and expenditure surveys allow us to calculate the welfare gains for each household in our sample based on the occupations and sectors they work in, the products they spend their income on and the types of stores they shop at. Column 1 of Table 9 presents the mean of the total welfare gain across all these urban households as well as the max, the min and the proportion negative.[50] The various sub components of the total welfare effect are reported in columns 2-7. On average, we find that foreign store entry leads to large and significant welfare gains for households in the municipality where the foreign-owned retailer enters. These gains are in the order of 6.2 percent of initial household income.

Turning to the sub components, our positive total welfare effect is driven by a significant reduction in the cost of living—a 6.4 percent welfare gain—that far outweighs the effects on the nominal income side. While the adverse effects on the incomes of traditional retail workers and local store owners are economically significant (recall their income losses were around 5 percent and em-

[50] When taking averages, we use the household weights in the income and expenditure surveys.

ployment losses were even larger), these effects are muted for the municipality as a whole since only a fraction of households derive substantial shares of their total income from these sources. In contrast, retail constitutes a large part of household total consumption for every household, generating substantial cost of living effects.

Honing in further, about one quarter of the cost of living effect, or 1.6 percent, comes from the pro-competitive price effect, the price reductions at domestic stores induced by the entry of foreign retailers. The pro-competitive exit effect, the welfare losses due to shop closures, is small at -0.7 percent since, at least over our 5 year window, the number of store closures was limited. The remainder of the cost of living effect, 5.5 percent, is due to the direct price index effect of foreign entry, the consumer gains from being able to shop at the foreign store itself. (A finding that was already foreshadowed in the raw data by the much lower prices charged by foreign stores and their large post-entry market shares.)

We report the results of the first order approach in columns 8-14 of Table 9. The total effect is smaller under this approach, with the average gains equal to 3.0 percent of initial household income. Recall that the first order approach uses a Paasche approximation of the direct price index effect—post-entry expenditure shares multiplied by observable price changes—that assumes foreign stores always existed but simply charged domestic prices in the pre-entry periods. Hence, it does not capture three potentially important welfare gains due to foreign store entry: new product variety on sale at foreign stores, different shopping amenities available at foreign stores, and the additional store variety that comes from having an extra shopping choice. In contrast, we prefer the exact (CES) approach above precisely because these three channels are captured in the CES direct price index effect alongside lower prices. Hence, in an approximate sense, the fact that the direct price index effect is 40 percent as large under the first order approach (2.0 percent as opposed to 5.5 percent) suggests that these variety and amenity gains account for a substantial proportion of the cost of living effect.[51] Given the large differences between foreign and domestic stores that we highlighted in Section 2, the sizable gains generated by variety and amenity seem plausible (a discussion we will return to when assessing the distribution of the welfare gains).

Finally, we explore the sensitivity of our average total effect to alternative values of two parameters that are key drivers of the quantification results: the elasticity of substitution across local stores and the price changes for non-barcoded products. Our baseline quantification above used the most conservative estimate of the elasticity of substitution, a specification that yielded a point estimate of 4.36 for the average elasticity across products and income groups (column 9 of Table 8). We take this estimate as a mid point and re-estimate the full quantification exercise using 10 alternative elasticities ranging from $\eta = 2$ to $\eta = 6.5$ in steps of 0.5. On the price side, our baseline quantification imposed the assumption that price changes were the same across barcoded and non-barcoded products within a product group and store type and then used the barcoded estimates from Section 5.1 where we could control for product characteristics. As with the elasticity,

[51] The pro-competitive price effect is also slightly smaller under the first order approach due to the fact that we use Paasche weights which will tend to underestimate the reductions in the price index at domestic stores since consumers can substitute away from them upon foreign entry.

we take this assumption as our mid point and re-estimate the quantification assuming there were no price changes for non-barcoded items, the price changes were 50 percent as large, 150 percent as large, or 200 percent as large. Table 10 reports the total welfare effect estimates for the 11 times 5 different combinations of elasticities and non-barcode price changes. Reassuringly, despite the wide parameter ranges, the total effects remain reasonable, varying between 3.4 and 16.1 percent.

Given that our counterfactual analysis is based on international integration (foreign entry) in just one sector of the economy, retail, the welfare effects reported in this section are large relative to existing estimates of the gains from trade (e.g. Arkolakis et al., 2012) that suggest similar magnitudes for a country going from autarky to current levels of trade. The implication is that retail FDI has been a major facet of globalization in developing countries in recent decades. In particular, while only a fraction of households derive income from the retail sector, over half of household consumption is purchased through the retail sector, and so shocks to retail can have substantial impacts on cost of living.

6.3.2 The Distribution of the Gains from Foreign Retail Entry

In the previous section we reported average household effects. Of course, since we have a separate estimate for each sample household in the income and expenditure surveys, it is straightforward to analyze the distribution of these gains. The left panel of Figure 6 plots the total welfare effect for each household against the initial position of the household in the income distribution using a non-parametric local polynomial regression. The right panel decomposes these gains. For both, we focus on our preferred exact (CES) approach. While all income groups benefit substantially from foreign retail entry, richer households gain substantially more than poorer households (about 7.5 percent compared to 5 percent).

Where does this regressiveness come from? We present a number of counterfactual exercises that allow us to analyze the interplay of forces underlying this result. We focus on the role of several key differences in shopping and income patterns across the income distribution: the share of retail expenditure spent at foreign stores post-entry; expenditure shares of retail relative to non-retail; of food relative to non-food product groups within retail; and retail income shares relative to other income sources. Each row of Figure 7 equalizes one of these differences across all households in the sample, setting it at its mean level (the left panel shows the distribution of the dimension pre-equalization). We then rerun the quantification and generate the counterfactual distribution of the welfare gains from foreign entry and compare it to the actual distribution we observe (with the distribution of both the actual and counterfactual gains shown in the right panel).

As shown in the first row of Figure 7, the richest households spend over 50 percent of their retail expenditure at foreign stores compared to just over 10 percent for the poorest households. These patterns suggest that household evaluations of store product variety and shopping amenities systematically differ across the income distribution (captured by the household-and-store-specific taste shifters β_{gsh} and price-indices r_{gsh} in the CES structure of Section 3.1). As is evident from the figure, equalizing this moment alone is sufficient to eradicate the regressiveness. In fact, if poor households valued the variety and amenity on offer at foreign stores as much as the rich did,

the gains would actually be progressive. This finding is intuitive. The higher quality and greater product variety on offer at foreign stores, as well as their better hygiene, easier car accessibility and parking amenities are all benefits that are likely to be valued more by wealthier households. The fact that it is these households gaining most from variety and amenity gives credence to the large contribution these forces played in generating the substantial average gains we documented in the previous section.

Turning to the second row of Figure 7, there is a countervailing force at play. Wealthier households spend a significantly smaller share of their total expenditure on retail consumption compared to poorer households (35 percent versus 70 percent). This force works in the opposite direction. In the absence of differences in retail expenditure shares, the gains from foreign retail entry would be vastly more regressive than we estimate.

The forces in the last two rows have much more muted effects on the distribution. The fact that poorer households spend more of their retail expenditure on food consumption contributes only very slightly to the regressiveness of the welfare gains. This is because both the pro-competitive price effect and the direct price index effect vary little across food and non-food product groups. Finally, somewhat surprisingly, differences in income sources across the income distribution do not significantly contribute to the regressiveness we find. While there are clear distributional patterns in the sectors that households obtain their income from (e.g. poorer households derive a larger proportion of their income from working in the traditional retail sector), these differences have little effect on the distribution of total gains since only a fraction of households within any given income group derive the majority of their income from the retail sector.

7 Conclusion

The arrival of foreign retailers in developing countries is causing a radical transformation in the way that households source their consumption. This paper sets out to evaluate the welfare consequences of retail globalization in a developing country context. To do so, we bring to bear newly available and uniquely rich microdata that allow us to estimate a general expression of the local welfare effect of retail FDI.

We find that foreign supermarket entry leads to large and significant welfare gains for the average household. The majority of these gains come from a significant reduction in the cost of living. About a quarter of this reduction is driven by reductions in prices at domestic stores, with the remainder coming from the consumer gains due to the lower prices, new product variety and different shopping amenities offered by foreign retailers. On the nominal income side, we find no evidence of municipality-level income or employment effects. We do, however, find evidence of domestic store exit as well as employment, labor income, and profit declines in the traditional retail sector. Finally, we explore the distribution of the gains from retail FDI across the income distribution. We find that while all income groups experience significant gains from retail FDI on average, these gains are 50 percent larger for the richest income group compared to the poorest, primarily because of the greater valuation wealthy households place on the product variety and shopping amenities on offer at foreign stores.

Our analysis provides a number of insights that relate to ongoing debates about developing country policies towards retail FDI. Our findings suggest that these debates may focus too little on the potential for reductions in the cost of living that benefit the vast majority of households, both those who end up shopping at the foreign retailer and those who enjoy price reductions at domestic retailers. Instead they commonly focus on the potentially adverse effects for an important, but nevertheless select group of households working in the traditional retail sector. The empirical evidence suggests that while these adverse nominal income effects are present, they are swamped at the local level by reductions in the cost of living that give rise to real income gains across all household income groups.

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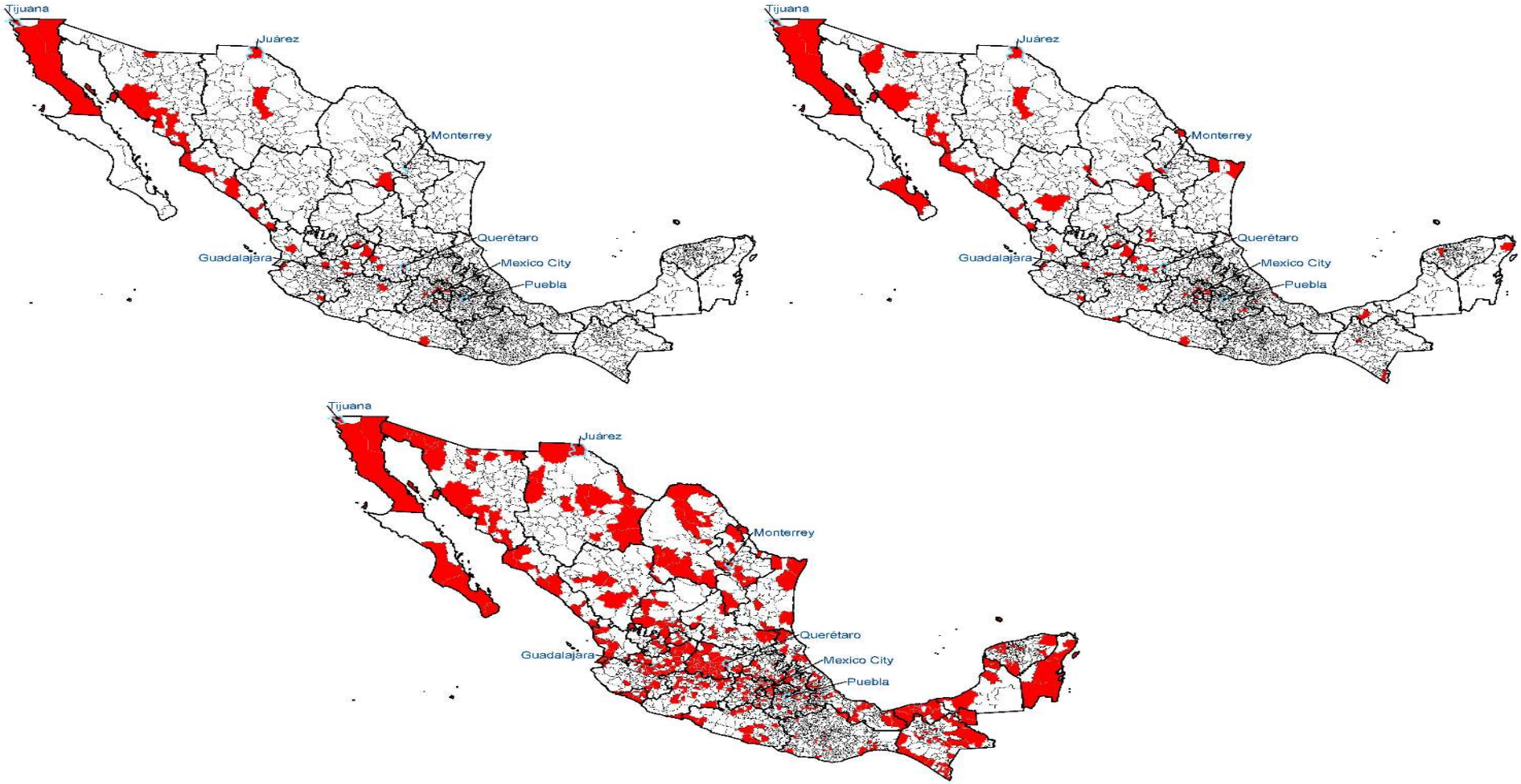
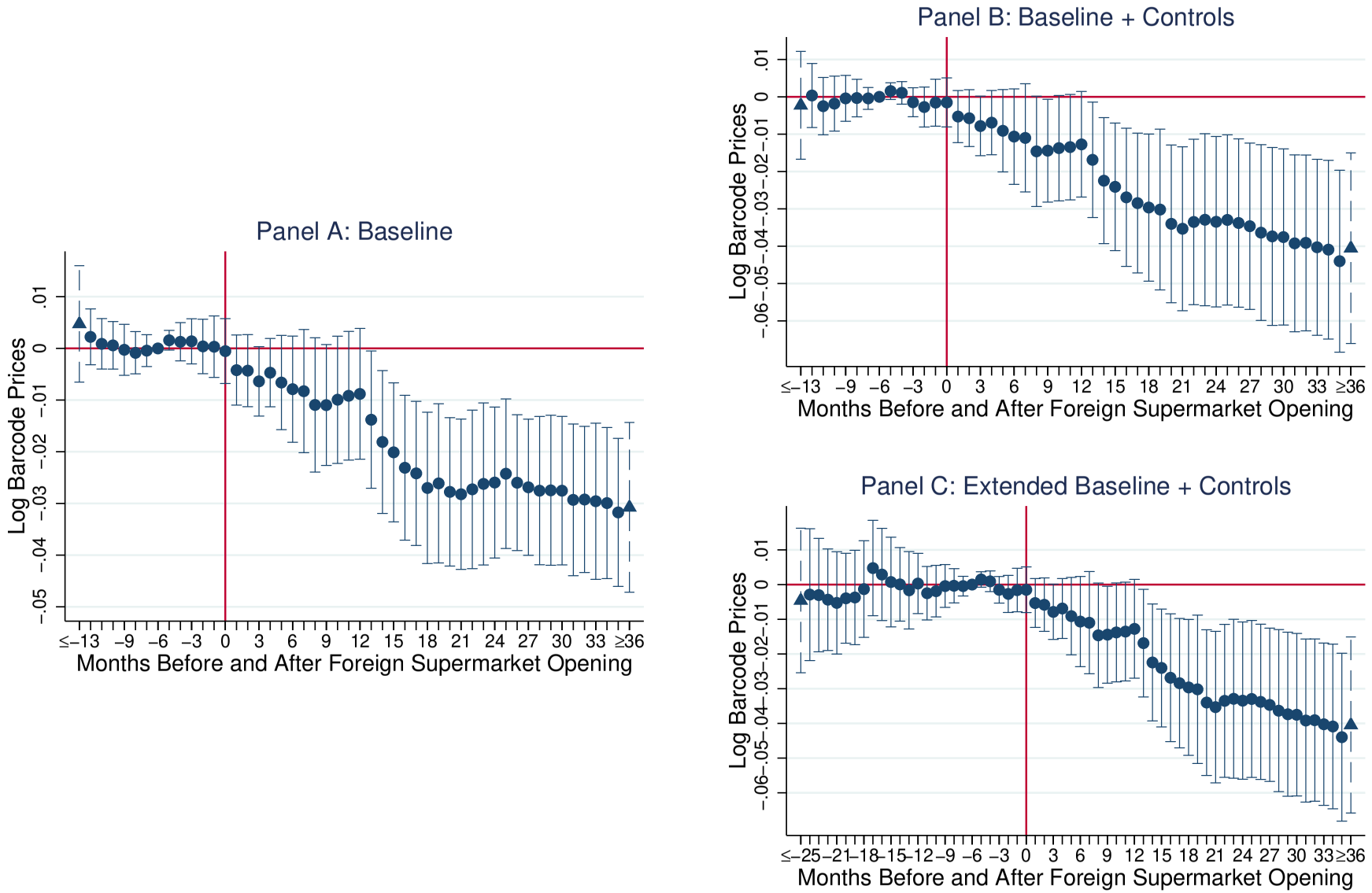
8 Figures and Tables

Figure 1: Retail Globalization in Mexico - Left to Right: Foreign Store Presence at the End of 1995, 2001, and 2013



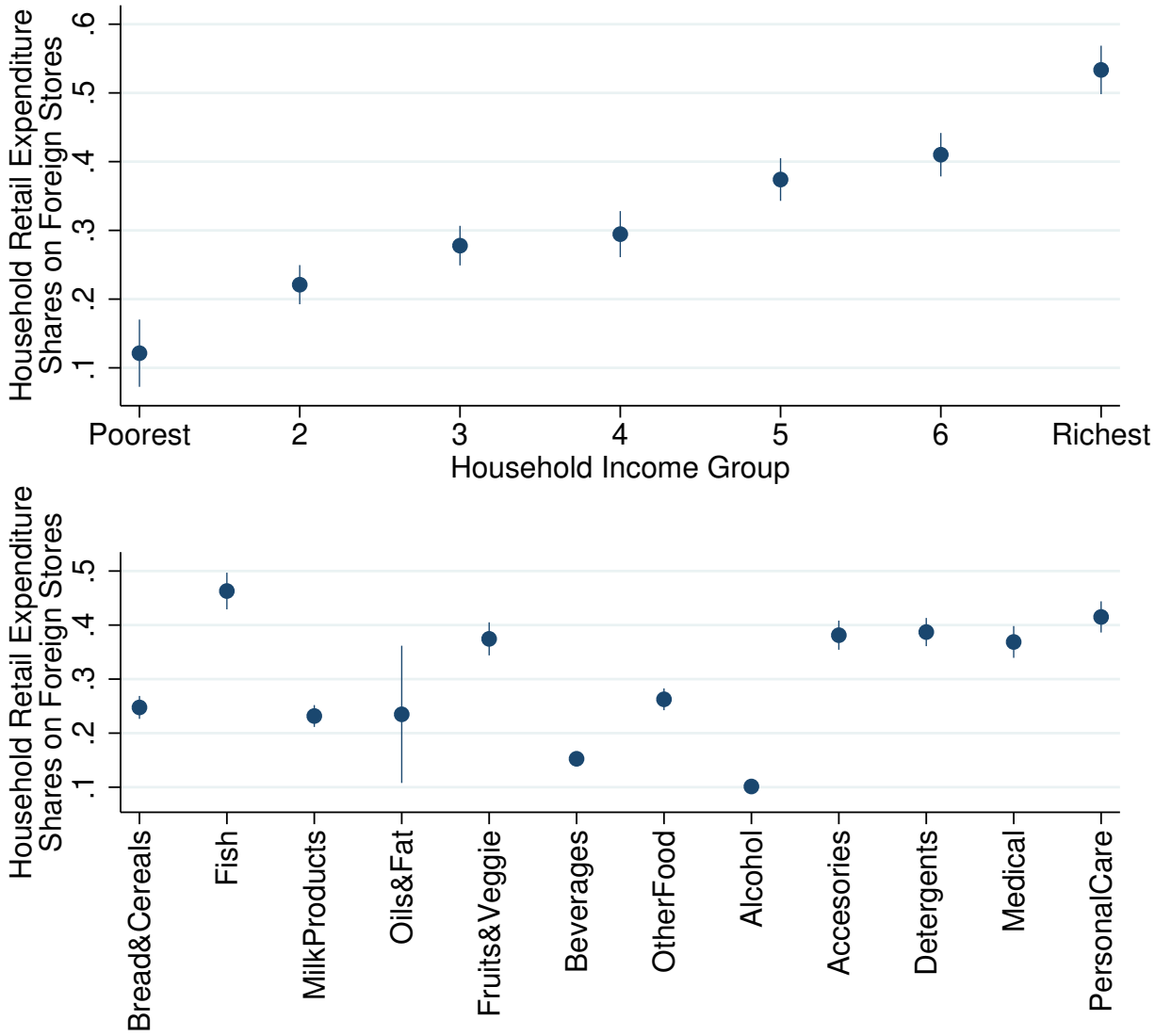
Notes: Municipalities in red indicate foreign store presence at the end of 1995 (upper left, 204 stores), 2001 (upper right, 365 stores), and 2013 (lower, 1335 stores). The data come from annual publications of the Mexican National Retail Association (ANTAD).

Figure 2: Effect on the Consumer Prices at Domestic Retailers: Monthly Event Study



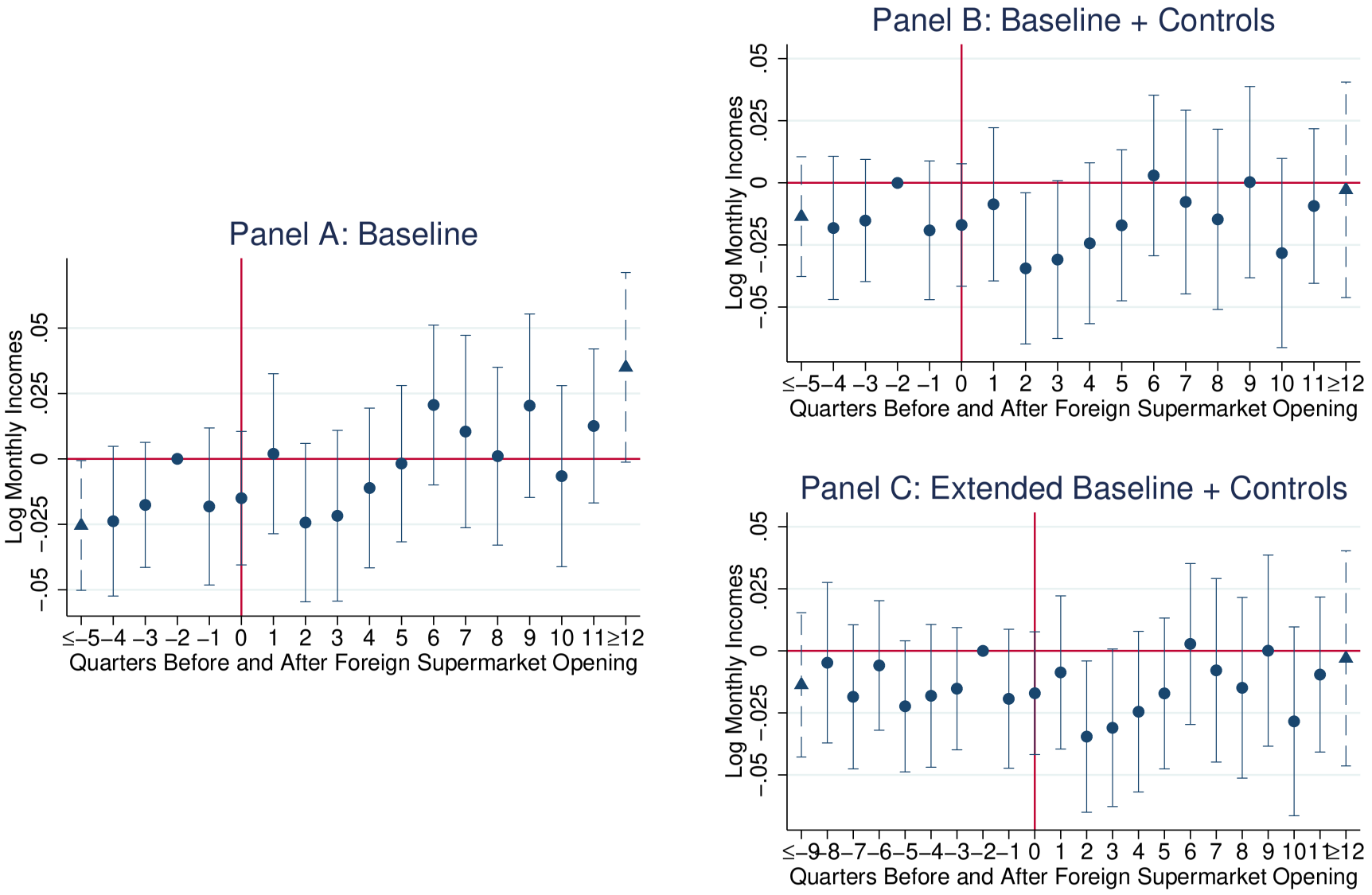
Notes: Each circle corresponds to a treatment coefficient from a regression of log prices on the 48 (or 60) monthly treatment effects in addition to barcode-by-store fixed effects and month fixed effects. The triangles denote the coefficients on the a dummy for the pre event study period ($\leq$13 or $\leq$25) and post event study period ($\geq$36) included in the same regression. The data come from the Mexican CPI price microdata over the period 2002-2014 covering 120 retail product groups in 76 urban municipalities, with a sampling probability designed to reflect nationally representative urban consumption weights. The reference category in each graph is barcode prices 6 months before foreign entry. Controls in panels B and C indicate the inclusion of additional store type-by-product-group-by-month as well as region-by-month and municipality-size-by-month fixed effects. The graphs depict 95% confidence intervals based on standard errors clustered at the municipality level.

Figure 3: Foreign Retail Market Shares Post Entry



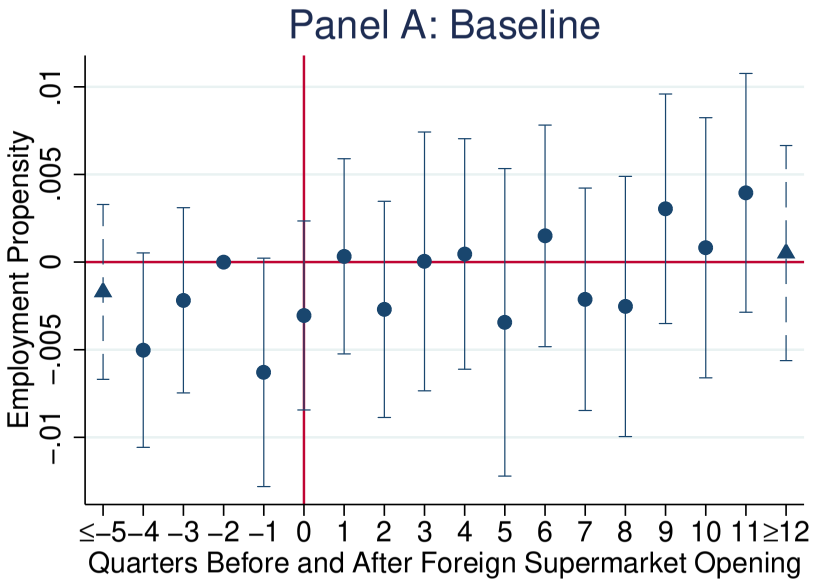
Notes: The graphs plot the share of household retail expenditure spent at foreign stores. The data come from the Mexican consumer panel microdata for the years 2011-14. We restrict attention to municipalities where the first foreign store entered more than two years previously. Expenditure shares are weighted by household survey weights. Both graphs depict 95% confidence intervals based on standard errors clustered at the municipality level.

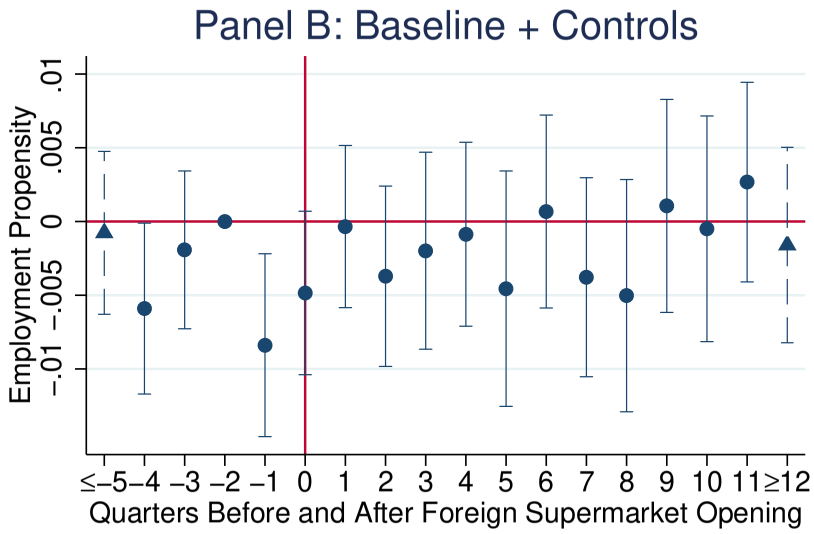
Figure 4: Effect on Average Municipality Monthly Incomes

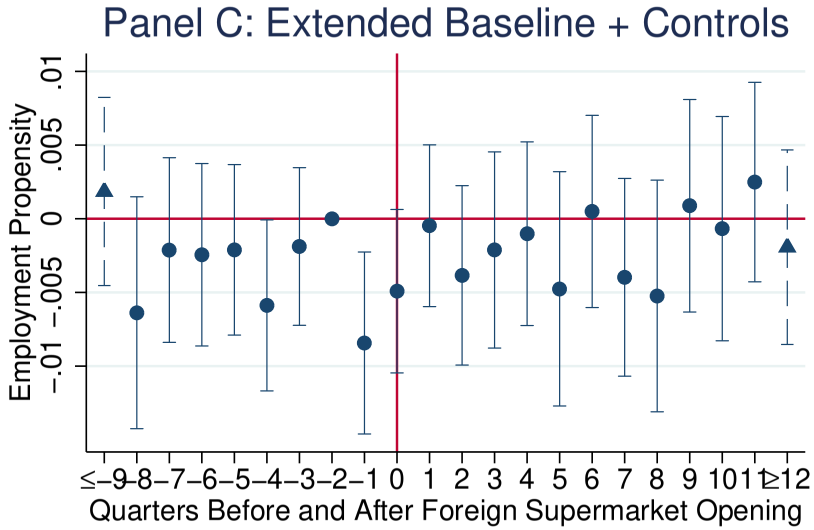


Notes: Each circle corresponds to a treatment coefficient from a regression of log monthly incomes on 16 (or 20) quarterly treatment effects in addition to municipality and quarter fixed effects, as well as person controls for sex, education and age. The triangles denote the coefficients on the a dummy for the pre event study period ($\leq$5 or $\leq$9) and post event study period ($\geq$12) included in the same regression. The data come from the 273 urban municipalities in employment and occupation surveys over the period 2002-2012. The reference category are incomes 2 quarters before foreign entry. Regressions are weighted by household survey weights. The graphs depict 95% confidence intervals based on standard errors clustered at the municipality level.

Figure 5: Effect on Average Municipality Employment

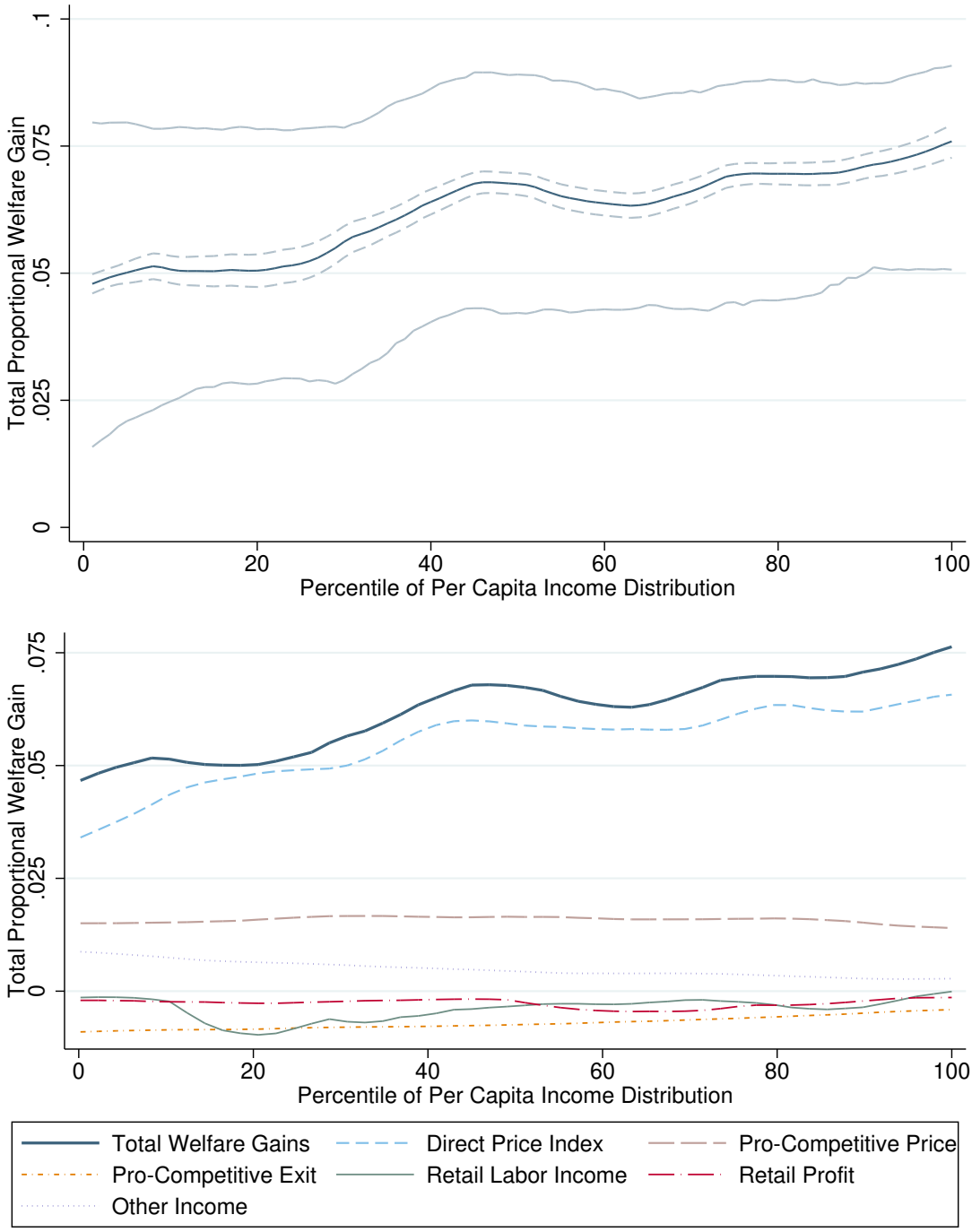






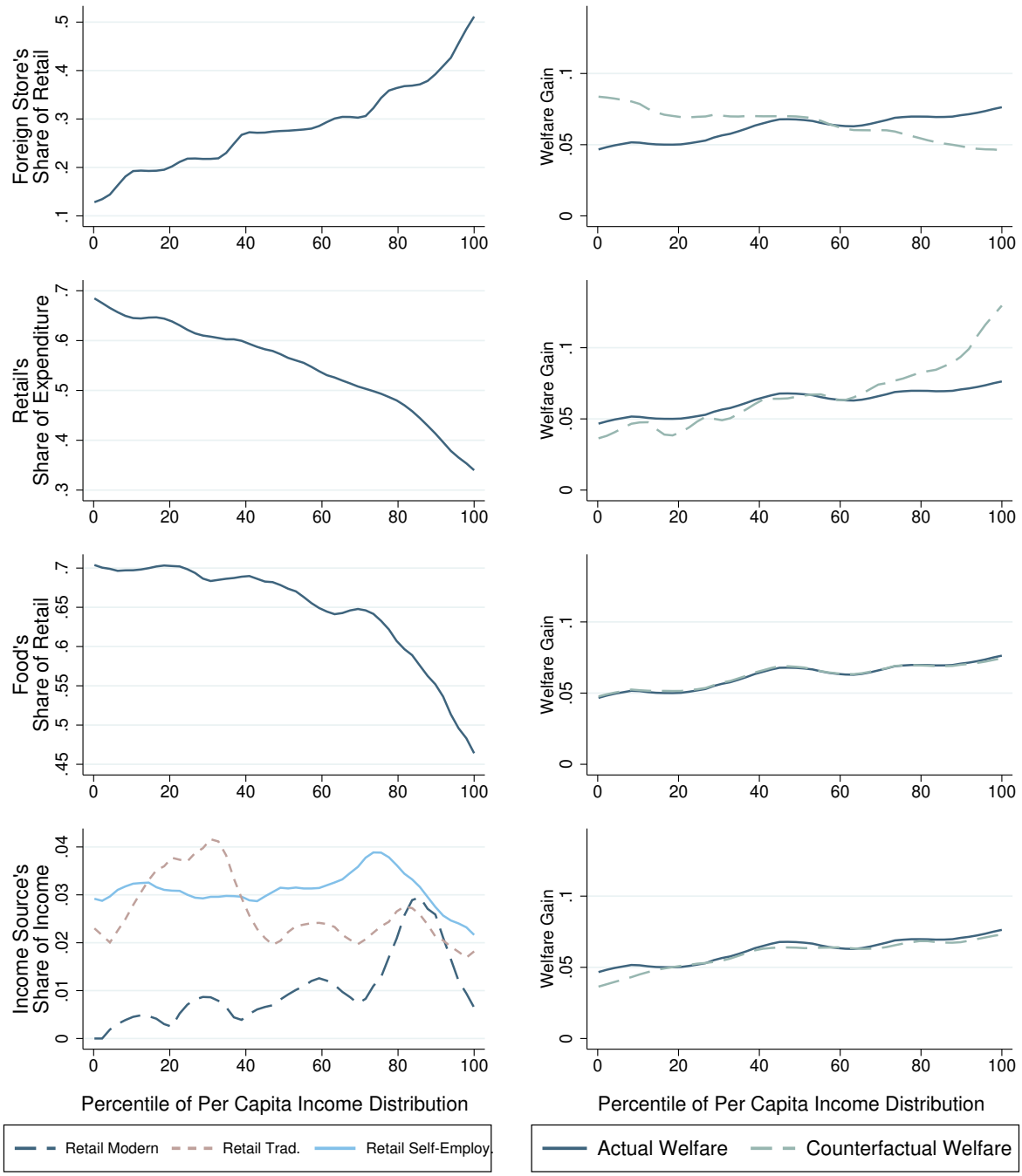
Notes: Each circle corresponds to a treatment coefficient from a regression of individual employment indicators on 16 (or 20) quarterly treatment effects in addition to municipality and quarter fixed effects, as well as person controls for sex, education and age. The triangles denote the coefficients on the a dummy for the pre event study period ($\leq$5 or $\leq$9) and post event study period ($\geq$12) included in the same regression. The data come from from the 273 urban municipalities in the employment and occupation surveys over the period 2002-2012. The reference category are employment propensities 2 quarters before foreign entry. Regressions are weighted by household survey weights. The graphs depict 95% confidence intervals based on standard errors clustered at the municipality level.

Figure 6: Gains from Foreign Retail Entry across the Household Income Distribution



Notes: The graphs are non-parametric plots of the household gains from foreign retail entry against the pre-entry location in the income distribution. Gains calculated from the quantification exercise described in Section 6. Pre-entry incomes as well as household-level income and expenditure shares come from the 12,293 households in the income and expenditure surveys that reside in the 240 urban municipalities that had not yet experienced foreign retail entry at the time of the survey. The upper panel depicts two sets of confidence intervals: The solid gray lines are the 95 percentile envelope of the non-parametric plots for each of the 1000 bootstraps described in Section 6. The tighter dashed lines are the 95 percentile confidence interval that just takes account of sampling variation across households in the income and expenditure survey. The lower panel decomposes the total gains into its constituent parts. Plots are weighted by household survey weights.

Figure 7: Counterfactual Distributions of the Gains



Notes: This figure explores the role of differences along several shopping and income dimensions in explaining the regressive total welfare effects we find. Each row explores a different dimension (foreign retail shares, retail's share of total expenditure, the food share of retail, and retail income shares). The left panels plot the distribution of this dimension in the data. The right panel plots with a dashed line the counterfactual distribution of gains if this dimension was equalized across households at its mean (alongside the actual distribution displayed with a solid line). Pre-entry incomes as well as household-level income and expenditure shares come from the 12,293 households in the income and expenditure surveys that reside in the 240 urban municipalities that had not yet experienced foreign retail entry at the time of the survey. Plots are weighted by household survey weights.

Tables

Table 1: How Do Foreign Owned Supermarkets Differ Ex Post?

Dependent Variable:	(1) Log Price	(2) Log Price	(3) Log Number of Barcodes	(4) Log Floor Space
Foreign Store Dummy	-0.118***	0.249***	1.612***	1.911***
	(0.00913)	(0.0160)	(0.0671)	(0.0416)
Municipality-By-Year FX	✓	✓	✓	✓
Municipality-By-Product-By-Month FX	✓	✓	×	×
Municipality-By-Barcode-By-Month FX	✓	×	×	×
Observations	18,659,777	18,659,777	10,393	11,113
R-squared	0.923	0.368	0.139	0.302
Number of Municipalities	151	151	151	499

Notes: Table reports the coefficient from regressing log prices, log number of barcodes or log floor space on a foreign store dummy. Columns 1-2 are based the Mexican consumer panel microdata for the years 2011-14, and compare foreign-owned supermarkets to all types of domestic retail establishments (traditional and modern) either with or without barcode-level fixed effects. Column 3 also uses the consumer panel to compare the number of barcode products sold in foreign stores to modern domestic retailers (domestic supermarkets or big box stores). Column 4 is based on ANTAD data on establishment floor space and again compares foreign-owned supermarkets to modern domestic retailers. Regressions using the consumer panel data are weighted by household survey weights. Standard errors are clustered at the municipality level and reported in parentheses. * 10%, ** 5%, *** 1% significance levels.

Table 2: Effect on the Prices of Domestic Retailers

	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	Log Price	Log Price	Log Price	Log Price (Non-Retail)	Log Price (Non-Retail)
Foreign Entry - More Than Four Quarters Before (Unbalanced)	0.00378	-0.00311	-0.00412	0.00254	0.00112
	(0.00612)	(0.00719)	(0.00716)	(0.00512)	(0.00689)
Foreign Entry - Four Quarters Before	0.000274	-0.00217	-0.00343	0.00403	0.00974
	(0.00231)	(0.00358)	(0.00325)	(0.00338)	(0.00640)
Foreign Entry - Three Quarters Before	-0.00146	-0.00119	-0.00208	0.00841**	0.00971*
	(0.00227)	(0.00217)	(0.00200)	(0.00408)	(0.00489)
Foreign Entry - Two Quarters Before (Omitted)	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)
Foreign Entry - One Quarter Before	-0.000276	-0.00271	-0.00257	-0.00108	0.00210
	(0.00199)	(0.00195)	(0.00192)	(0.00371)	(0.00493)
Foreign Entry - One Quarter After	-0.00396	-0.00504	-0.00495	0.00733	0.00971
	(0.00290)	(0.00308)	(0.00310)	(0.00509)	(0.00836)
Foreign Entry - Two Quarters After	-0.00684**	-0.00871**	-0.00877**	0.00975*	0.00882
	(0.00311)	(0.00402)	(0.00405)	(0.00533)	(0.00622)
Foreign Entry - Three Quarters After	-0.00999*	-0.0129*	-0.0133*	0.00266	0.00160
	(0.00566)	(0.00690)	(0.00696)	(0.00456)	(0.00326)
Foreign Entry - Four Quarters After	-0.0110*	-0.0147**	-0.0152**	-0.000294	0.00101
	(0.00589)	(0.00685)	(0.00689)	(0.00594)	(0.00668)
Foreign Entry - Five Quarters After	-0.0145**	-0.0181**	-0.0190**	0.00739	0.00717
	(0.00624)	(0.00743)	(0.00732)	(0.00634)	(0.00890)
Foreign Entry - Six Quarters After	-0.0234***	-0.0273***	-0.0283***	0.00636	0.00232
	(0.00654)	(0.00870)	(0.00844)	(0.00694)	(0.00812)
Foreign Entry - Seven Quarters After	-0.0278***	-0.0320***	-0.0330***	-0.00182	-0.00684
	(0.00708)	(0.0101)	(0.00986)	(0.00732)	(0.00747)
Foreign Entry - Eight Quarters After	-0.0281***	-0.0347***	-0.0354***	-0.00145	-0.00450
	(0.00738)	(0.0109)	(0.0107)	(0.00921)	(0.0107)
Foreign Entry - Nine Quarters After	-0.0263***	-0.0341***	-0.0341***	0.0103	0.00635
	(0.00687)	(0.0112)	(0.0110)	(0.0101)	(0.0124)
Foreign Entry - Ten Quarters After	-0.0282***	-0.0369***	-0.0362***	0.0144	0.00508
	(0.00694)	(0.0115)	(0.0112)	(0.0108)	(0.0114)
Foreign Entry - Eleven Quarters After	-0.0296***	-0.0393***	-0.0385***	0.00981	-0.00168
	(0.00704)	(0.0117)	(0.0113)	(0.0114)	(0.0111)
Foreign Entry - Twelve Quarters After	-0.0313***	-0.0425***	-0.0414***	0.0111	0.00117
	(0.00727)	(0.0119)	(0.0115)	(0.0133)	(0.0135)
Foreign Entry - More Than Twelve Quarters After (Unbalanced)	-0.0316***	-0.0412***	-0.0392***	0.0248	0.0121
	(0.00835)	(0.0127)	(0.0119)	(0.0162)	(0.0160)
P-Value (Post 3 Years = 12 Quarters After)	0.941	0.744	0.548	0.0077	0.057
Month FX	✓	✓	✓	✓	✓
Barcode-By-Store FX	✓	✓	✓	✓	✓
Product Group-By-Store Type-By-Month FX	×	✓	✓	×	✓
Region-By-Month FX	×	✓	✓	×	✓
Municipality Size-By-Month FX	×	✓	✓	×	✓
Control for Local Government Expenditure	×	×	✓	×	✓
Observations	3,228,544	2,850,238	2,560,558	1,581,115	1,321,733
R-squared	0.996	0.996	0.996	0.997	0.997
Barcode-By-Store Cells	149,273	124,466	114,207	42,715	34,877
Store Type-By-Product-By-Month Cells	33,516	33,516	32,790	8,186	8,027
Region-By-Month Cells	705	705	690	705	690
Municipality Size-By-Month Cells	705	705	690	705	690
Municipality Clusters	76	76	65	90	65

Notes: Table reports regressions of log prices at domestic stores on 16 quarters-since-foreign-entry treatment effects and 2 pre and post event study dummies. Data come from the CPI price microdata for the period 2002-14 covering 120 retail product groups and 76 urban municipalities, with a sampling probability designed to reflect nationally representative urban consumption weights. The dependent variable are log price quotes for unique barcode-by-store combinations. Foreign Entry indicates the first presence of a foreign supermarket in the municipality. Regressions include different sets of fixed effects and additional controls as indicated in the table. The final columns show results on non-retail CPI price quotes including transportation, housing, education, health and other services. Barcode-by-store fixed effects in that column refer to item-purevyor identifiers that enumerators track over time (e.g. a hair cut from the same hairdresser or the same taxi ride from the same taxi company). Standard errors are clustered at the municipality level and reported in parentheses. * 10%, ** 5%, *** 1% significance levels.

Table 3: Effect on the Prices of Domestic Retailers - Heterogeneity

Dependent Variable:	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log Price
Foreign Entry	-0.0373***			
	(0.0119)			
Foreign Entry X Food		-0.0395***		
		(0.0137)		
Foreign Entry X Non-Food		-0.0362**		
		(0.0154)		
Foreign Entry X Traditional Store			-0.0235	
			(0.0198)	
Foreign Entry X Modern Store			-0.0526***	
			(0.0169)	
Foreign Entry X Food X Traditional Store				-0.00425
				(0.0162)
Foreign Entry X Non-Food X Traditional Store				-0.0287
				(0.0231)
Foreign Entry X Food X Modern Store				-0.0559***
				(0.0169)
Foreign Entry X Non-Food X Modern Store				-0.0497*
				(0.0255)
Barcode-By-Store FX	✓	✓	✓	✓
Product-By-Store Type-By-Month FX	✓	✓	✓	✓
Region-By-Month FX	✓	✓	✓	✓
Municipality Size-By-Month FX	✓	✓	✓	✓
Observations	2,790,780	2,790,780	2,790,780	2,790,780
R-squared	0.996	0.996	0.996	0.996
Number of Barcode-By-Store Cells	123,937	123,937	123,937	123,937
Number of Product-By-Store Type-By-Month Cells	33,516	33,516	33,516	33,516
Number of Region-By-Month Cells	705	705	705	705
Number of Municipality Size-By-Month Cells	705	705	705	705
Number of Municipality Clusters	76	76	76	76

Notes: Table reports regressions of log prices at domestic stores on an indicator for foreign entry interacted with indicators for product groups and store types. The data come from the Mexican CPI price microdata over the period 2002-2014 covering 120 retail product groups and 76 urban municipalities, with a sampling probability designed to reflect nationally representative urban consumption weights. The basic specification is the same as that reported in column 2 of Table 2 except that the foreign entry effect is averaged across quarters and the estimation sample excludes an adjustment period of 24 months after entry. Columns 2-4 interact foreign entry with indicators for different groups of product and store types. Standard errors are clustered at the municipality level and reported in parentheses. * 10%, ** 5%, *** 1% significance levels.

Table 4: Post-Entry Price Differences for Identical Barcodes

Dependent Variable:	(1) Log Price	(2) Log Price	(3) Log Price	(4) Log Price
Domestic Store	0.118***			
	(0.00913)			
Domestic Store X Food		0.124***		
		(0.00979)		
Domestic Store X Non-Food		0.0744***		
		(0.00765)		
Domestic Store X Traditional			0.173***	
			(0.00874)	
Domestic Store X Modern			0.0397***	
			(0.0113)	
Domestic Store X Food X Traditional				0.174***
				(0.00942)
Domestic Store X Non-Food X Traditional				0.170***
				(0.0108)
Domestic Store X Food X Modern				0.0431***
				(0.0124)
Domestic Store X Non-Food X Modern				0.0189***
				(0.00713)
Municipality-By-Barcode-By-Month FX	✓	✓	✓	✓
Observations	18,659,777	18,659,777	18,659,777	18,659,777
R-squared	0.923	0.923	0.923	0.923
Number of Municipalities	151	151	151	151

Notes: Table reports regressions of log prices at both domestic and foreign stores on an indicator for whether the price is recorded at a foreign store. The data come from the Mexican consumer panel microdata over the period 2011-14. The dependent variable is log barcode prices, and the reference category in all columns are barcode prices in foreign owned retailers. Columns 2-4 report price differences across different product groups and store types as indicated. Regressions are weighed by household survey weights. Standard errors are clustered at the municipality level and reported in parentheses. * 10%, ** 5%, *** 1% significance levels.

Table 5: Store Exit

Panel A: Unweighted regressions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ΔLog(Number Stores) 2003-08 Traditional Store Formats				ΔLog(Number Stores) 2003-08 Modern Store Formats			
ΔForeign Entry 2003-2008	-0.019	-0.023	-0.025*	-0.024*	0.0088	-0.0065	-0.036	-0.035
	(0.014)	(0.014)	(0.014)	(0.014)	(0.067)	(0.068)	(0.069)	(0.069)
Foreign Entry Pre 2003	-0.055***	-0.057***	-0.035**	-0.032**	0.20***	0.16***	0.17***	0.17***
	(0.013)	(0.015)	(0.015)	(0.016)	(0.053)	(0.058)	(0.060)	(0.062)
Δlog(Public Expenditures)			0.12***	0.12***			0.37***	0.38***
			(0.028)	(0.028)			(0.12)	(0.12)
Δlog(GDP per Capita)				-0.020				-0.012
				(0.014)				(0.066)
Geographical Region FX	×	✓	✓	✓	×	✓	✓	✓
Municipality Size FX	×	✓	✓	✓	×	✓	✓	✓
Observations	608	608	564	564	608	608	564	564
R-squared	0.022	0.056	0.107	0.110	0.015	0.085	0.107	0.107
Median Stores/Municipality	2088	2088	2088	2088	33.5	33.5	33.5	33.5
Panel B: Pop. Weighted regressions	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	ΔLog(Number Stores) 2003-08 Traditional Store Formats				ΔLog(Number Stores) 2003-08 Modern Store Formats			
ΔForeign Entry 2003-2008	-0.025	-0.026	-0.039**	-0.039**	0.022	0.0039	-0.041	-0.039
	(0.022)	(0.022)	(0.018)	(0.018)	(0.074)	(0.076)	(0.074)	(0.075)
Foreign Entry Pre 2003	-0.091***	-0.086***	-0.050***	-0.051***	0.13**	0.11*	0.12*	0.12*
	(0.018)	(0.019)	(0.018)	(0.019)	(0.060)	(0.063)	(0.070)	(0.069)
Δlog(Public Expenditures)			0.14***	0.14***			0.17	0.17
			(0.035)	(0.035)			(0.14)	(0.14)
Δlog(GDP per Capita)				0.0083				-0.048
				(0.025)				(0.081)
Geographical Region FX	×	✓	✓	✓	×	✓	✓	✓
Municipality Size FX	×	✓	✓	✓	×	✓	✓	✓
Observations	608	608	564	564	608	608	564	564
R-squared	0.086	0.117	0.157	0.158	0.016	0.180	0.162	0.163
Median Stores/Municipality	2088	2088	2088	2088	33.5	33.5	33.5	33.5

Notes: Table reports regressions of changes in log store counts between 2003 and 2008 on whether a foreign store first entered over that time period. The data come from the microdata of the Mexican retail census for the years 2003 and 2008 covering 608 urban municipalities. The dependent variable is the change in log municipality-level retail establishments between 2003 and 2008. Columns 1-4 and 9-12 report results for the traditional domestic retail segment, and columns 5-8 and 13-16 report results for the modern domestic retail segment. The upper panel is unweighted and the lower panel weights using municipality employment counts from the 2003 Economic Census. Standard errors are clustered at the state level. * 10%, ** 5%, *** 1% significance levels.

Table 6: Effect on Incomes - Heterogeneity

Dependent Variable:	(1) Log (Monthly Income)	(2) Log (Monthly Income)	(3) Log (Monthly Income)	(4) Log (Employment)	(5) Log (Employment)	(6) Log (Employment)
Foreign Entry X Modern Retail Workers	-0.000278	-0.0348*	-0.0278	-0.00396	0.0369	0.0392
	(0.0192)	(0.0204)	(0.0212)	(0.0653)	(0.0714)	(0.0561)
Foreign Entry X Traditional Retail Workers	-0.0356*	-0.0571***	-0.0592**	-0.104*	-0.0942	-0.113**
	(0.0199)	(0.0216)	(0.0240)	(0.0531)	(0.0571)	(0.0552)
Foreign Entry X Agriculture	0.0265	0.0218	0.0202	-0.0597	-0.0285	-0.00811
	(0.0264)	(0.0311)	(0.0307)	(0.0809)	(0.101)	(0.106)
Foreign Entry X Manufacturing	-0.00513	-0.00612	0.0117	-0.166***	0.00572	-0.0166
	(0.0174)	(0.0186)	(0.0187)	(0.0379)	(0.0368)	(0.0380)
Person Controls	✓	✓	✓	×	×	×
Municipality-by-Quarter FX	✓	✓	✓	✓	✓	✓
Municipality-by-Group Fixed Effects	✓	✓	✓	✓	✓	✓
Group-by-Quarter FX	×	✓	✓	×	✓	✓
State-by-Group Time Trends	×	×	✓	×	×	✓
Observations	3,878,561	3,878,561	3,878,561	47,666	47,666	47,666
R-squared	0.340	0.340	0.341	0.963	0.965	0.967
Number of Individuals	1,455,911	1,455,911	1,455,911	1,455,911	1,455,911	1,455,911
Number of Municipality-by-Quarter Cells	8,574	8,574	8,574	8,574	8,574	8,574
Number of State-by-Group Time Trends	160	160	160	160	160	160
Number of Municipality Clusters	273	273	273	273	273	273

Notes: Table reports regressions of log incomes and log number of employees on an indicator for foreign entry interacted with sectoral dummies. Data come from the 273 urban municipalities in the employment and occupation surveys over the period 2002-2012. The dependent variable in Columns 1-3 is individual log monthly incomes. Dependent variable in columns 4-6 is the log number of employed individuals by sector. The regressions include different combinations of fixed effects and controls as indicated in the table. Columns 1-3 weight regressions by household survey weights, whereas Columns 4-6 use the survey weights to compute the sum of employment by sector and then weight the regressions by the sum of household survey weights at the municipality-level. Standard errors are clustered at the municipality level and reported in parentheses. * 10%, ** 5%, *** 1% significance levels.

Table 7: Effect on Store Profits

Dependent Variable:	ΔLog(Mean Profit) 2003-08							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Unweighted regressions				Population weighted regressions			
ΔForeign Entry 2003-2008	-0.049*	-0.047	-0.048	-0.051*	-0.039	-0.041	-0.043	-0.044
	(0.028)	(0.029)	(0.030)	(0.030)	(0.032)	(0.033)	(0.034)	(0.034)
Foreign Entry Pre 2003	-0.087***	-0.082***	-0.071***	-0.081***	-0.070**	-0.074**	-0.043	-0.047
	(0.024)	(0.024)	(0.026)	(0.027)	(0.031)	(0.032)	(0.032)	(0.034)
Δlog(Public Expenditures)			0.042	0.038			0.079*	0.075*
			(0.046)	(0.045)			(0.044)	(0.045)
Δlog(GDP per Capita)				0.061*				0.034
				(0.035)				(0.030)
Geographical Region FX	×	✓	✓	✓	×	✓	✓	✓
Municipality Size FX	×	✓	✓	✓	×	✓	✓	✓
Observations	608	608	564	564	608	608	564	564
R-squared	0.014	0.061	0.064	0.071	0.020	0.071	0.112	0.115
Median Number of Stores Per Municipality in 2003 and 2008	2088	2088	2088	2088	2088	2088	2088	2088

Notes: Table reports regressions of changes in log profits between 2003 and 2008 on whether a foreign store first entered over that time period. The data come from the microdata of the Mexican retail census for the years 2003 and 2008 covering 608 urban municipalities. The dependent variable is the change in log mean municipality profits between 2003 and 2008 among traditional retail establishments. Columns 1-4 are unweighted and columns 5-8 weight using municipality employment counts from the 2003 Economic Census. Standard errors are clustered at the state level. * 10%, ** 5%, *** 1% significance levels.

Table 8: Demand Parameter Estimates

Panel A: Average Coefficient Estimates	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Average Prices	Median Prices	Average Prices	Median Prices	Average Prices	Median Prices	Average Prices	Median Prices	Average Prices	Median Prices	Average Prices	Median Prices	Average Prices	Median Prices
Dependent Variable: Log Budget Shares (Phi)	OLS	OLS	National IV	National IV	Regional IV	Regional IV	National IV	National IV	Regional IV	Regional IV	National IV	National IV	Regional IV	Regional IV
Log(Store Price Index)	0.214***	0.205***	-1.341***	-1.281***	-1.856***	-1.578***	-2.648***	-2.421***	-3.362***	-2.736***	-1.913***	-1.821***	-2.367***	-2.052***
	(0.006)	(0.006)	(0.145)	(0.133)	(0.608)	(0.477)	(0.338)	(0.29)	(1.038)	(0.747)	(0.241)	(0.219)	(0.862)	(0.689)
Product Group-by-Income Group-by-Municipality-by-Quarter FX	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Retailer-by-Product Group-by-Quarter FX	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Retailer-by-Municipality FX	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Retailer-by-Municipality-by-Quarter FX	×	×	×	×	×	×	✓	✓	✓	✓	×	×	×	×
Retailer-by-Municipality-by-Product Group FX	×	×	×	×	×	×	×	×	×	×	✓	✓	✓	✓
Observations	304,885	304,885	304,885	304,885	297,624	297,624	304,885	304,885	297,624	297,624	304,885	304,885	297,624	297,624
First-Stage F-Statistic			184.884	201.035	14.833	18.868	87.951	103.207	15.52	22.113	106.577	117.084	10.394	12.882

Panel B: Heterogeneous Coefficient Estimates	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
	Average Prices	Median Prices	Average Prices	Median Prices	Average Prices	Median Prices	Average Prices	Median Prices	Average Prices	Median Prices	Average Prices	Median Prices	Average Prices	Median Prices
Dependent Variable: Log Budget Shares (Phi)	OLS	OLS	National IV	National IV	Regional IV	Regional IV	National IV	National IV	Regional IV	Regional IV	National IV	National IV	Regional IV	Regional IV
Log(Store Price Index) X Poor X Food	0.244***	0.232***	-1.235***	-1.186***	-1.567***	-1.344***	-3.352***	-3.063***	-2.867***	-2.349***	-1.842***	-1.776***	-3.034***	-2.436**
	(0.011)	(0.011)	(0.184)	(0.174)	(0.548)	(0.439)	(0.615)	(0.528)	(0.92)	(0.679)	(0.345)	(0.324)	(1.748)	(1.225)
Log(Store Price Index) X Poor X Non-Food	0.21***	0.206***	-0.65***	-0.597***	-1.602***	-1.352***	-1.688***	-1.496***	-2.854***	-2.317***	-0.577***	-0.511***	-0.801***	-0.784***
	(0.008)	(0.008)	(0.1)	(0.092)	(0.571)	(0.464)	(0.308)	(0.26)	(0.89)	(0.656)	(0.124)	(0.113)	(0.304)	(0.295)
Log(Store Price Index) X Rich X Food	0.21***	0.201***	-1.621***	-1.581***	-1.814***	-1.58***	-4.008***	-3.697***	-3.267***	-2.717***	-2.274***	-2.219***	-3.341***	-2.716***
	(0.009)	(0.008)	(0.205)	(0.193)	(0.573)	(0.457)	(0.692)	(0.595)	(0.988)	(0.727)	(0.384)	(0.36)	(1.834)	(1.284)
Log(Store Price Index) X Rich X Non-Food	0.154***	0.152***	-1.068***	-1.018***	-1.988***	-1.717***	-2.247***	-2.044***	-3.342***	-2.77***	-1.05***	-0.983***	-1.165***	-1.146***
	(0.008)	(0.008)	(0.11)	(0.102)	(0.623)	(0.507)	(0.344)	(0.29)	(0.968)	(0.715)	(0.141)	(0.129)	(0.337)	(0.327)
Product Group-by-Income Group-by-Municipality-by-Quarter FX	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Retailer-by-Product Group-by-Quarter FX	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Retailer-by-Municipality FX	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Retailer-by-Municipality-by-Quarter FX	×	×	×	×	×	×	✓	✓	✓	✓	×	×	×	×
Retailer-by-Municipality-by-Product Group FX	×	×	×	×	×	×	×	×	×	×	✓	✓	✓	✓
Observations	304,885	304,885	304,885	304,885	297,624	297,624	304,885	304,885	297,624	297,624	304,885	304,885	297,624	297,624
First-Stage F-Statistic			31.287	33.191	3.915	4.894	10.783	12.694	4.14	5.81	13.586	14.534	0.98	1.391

Notes: Table reports regressions of log budget shares on log store-specific price indices, with the coefficient corresponding to one minus the elasticity of substitution across stores. The data come from the Mexican consumer panel microdata over the period 2011-14. The dependent variable is log expenditure shares across stores within a municipality, quarter, product group and income group cell. The independent variable is log store-specific price indices for that municipality, quarter, product group and income group cell. The indices themselves are recovered from store fixed effects in a regression of budget share weighted log prices at the barcode level on both store and barcode fixed effects as described in Section 6.1. All stages use household survey weights. Panel B reports results where the coefficient on the price index is allowed to vary by income and product group. Standard errors are clustered at the municipality level. * 10%, ** 5%, *** 1% significance levels.

Table 9: Household Welfare Effect - Decomposition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Exact Under CES Approach						
Dependent Variable:	Total Effect	Direct Price Index Effect	Pro-Comp Price Effect	Pro-Comp Exit	Labor Income Effect	Profit Effect	Other Income Effect
Average Effect	0.0621***	0.0551***	0.0158***	-0.00705	-0.00397**	-0.00269**	0.0049
	(0.0104)	(0.0006)	(0.0050)	(0.0053)	(0.0020)	(0.0013)	(0.0078)
Max	0.730	0.177	0.055	0.000	0.692	0.000	0.020
Min	-0.986	0.000	0.000	-0.014	-1.000	-1.000	0.000
Proportion Negative	0.0203	0	0	0.999	0.0736	0.0581	0
Observations (Households)	12,293	12,293	12,293	12,293	12,293	12,293	12,293
Number of Municipality Clusters	240	240	240	240	240	240	240

	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	First Order Approach						
Dependent Variable:	Total Effect	Direct Price Index Effect	Pro-Comp Price Effect	Pro-Comp Exit	Labor Income Effect	Profit Effect	Other Income Effect
Average Effect	0.0295***	0.0204***	0.0109***	0	-0.00397**	-0.00269**	0.0049
	(0.0093)	(0.0014)	(0.0037)	(0.0000)	(0.0020)	(0.0013)	(0.0078)
Max	0.715	0.060	0.031	0.000	0.692	0.000	0.020
Min	-0.995	0.000	0.000	0.000	-1.000	-1.000	0.000
Proportion Negative	0.0527	0	0	0	0.0736	0.0581	0
Observations (Households)	12,293	12,293	12,293	12,293	12,293	12,293	12,293
Number of Municipality Clusters	240	240	240	240	240	240	240

Notes: Table reports the welfare effects of foreign retail entry from the quantification exercise described in Section 6. The average effect is the survey-weighted mean across all 12,293 households in the income and expenditure surveys that reside in the 240 urban municipalities that had not yet experienced foreign retail entry at the time of the survey. The top panel uses the exact and complete CES approach while the bottom panel uses the Paasche approximation that is purely based on observed price differences. Standard errors come from the bootstrap procedure described in Section 6. * 10%, ** 5%, *** 1% significance levels.

Table 10: Effect on Average Household Welfare - Robustness

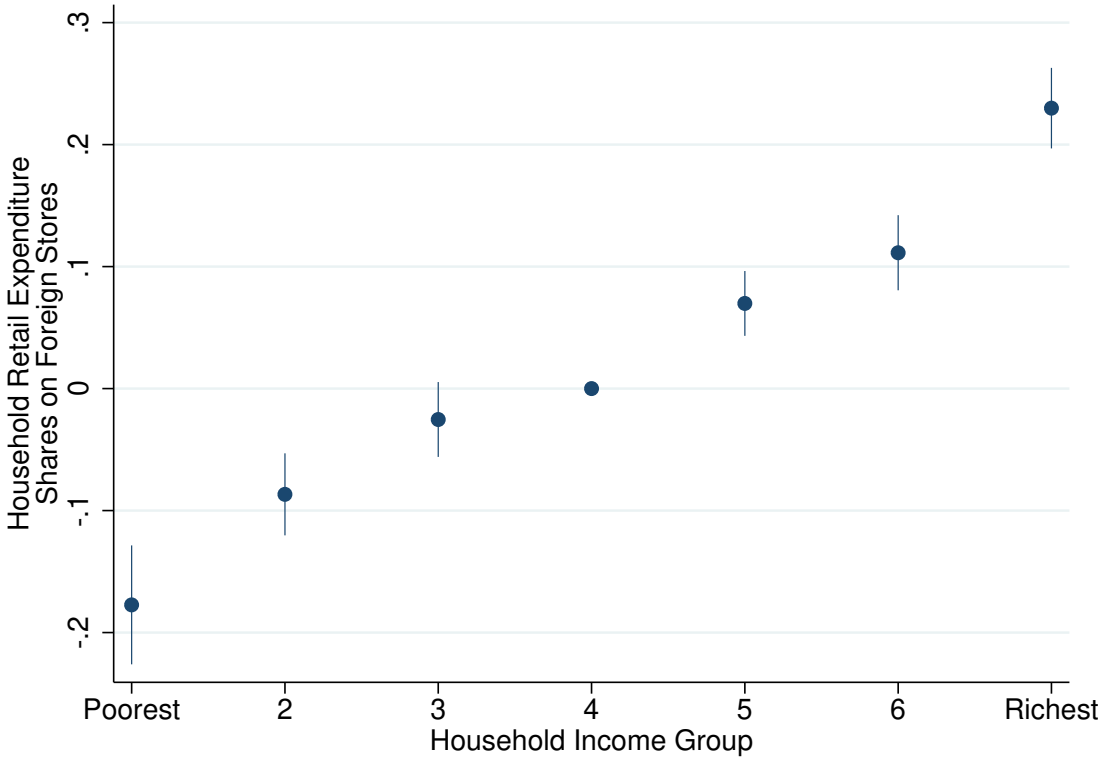
	$\eta = 2$	$\eta = 2.5$	$\eta = 3$	$\eta = 3.5$	$\eta = 4$	$\eta = 4.362$	$\eta = 4.5$	$\eta = 5$	$\eta = 5.5$	$\eta = 6$	$\eta = 6.5$
0 Percent of Pro-Competitive Effect for Non-Barcoded Products	0.1480	0.1037	0.0787	0.0658	0.0564	0.0517	0.0487	0.0433	0.0380	0.0357	0.0344
50 Percent of Pro-Competitive Effect for Non-Barcoded Products	0.1516	0.1066	0.0828	0.0696	0.0610	0.0551	0.0539	0.0477	0.0443	0.0414	0.0386
100 Percent of Pro-Competitive Effect for Non-Barcoded Products	0.1553	0.1099	0.0871	0.0730	0.0624	0.0588	0.0574	0.0521	0.0476	0.0444	0.0399
150 Percent of Pro-Competitive Effect for Non-Barcoded Products	0.1581	0.1143	0.0896	0.0770	0.0677	0.0630	0.0601	0.0548	0.0496	0.0473	0.0461
200 Percent of Pro-Competitive Effect for Non-Barcoded Products	0.1618	0.1174	0.0939	0.0809	0.0725	0.0667	0.0655	0.0593	0.0560	0.0532	0.0504

Notes: Table reports the welfare effects of foreign retail entry from the quantification exercise described in Section 6 but using alternative estimates and assumptions. Each cell is the survey-weighted mean effect across all 12,293 households in the income and expenditure surveys that reside in the 240 urban municipalities that had not yet experienced foreign retail entry at the time of the survey. The highlighted estimate corresponds to the average effect when we restricting our preferred η estimation specification to a single parameter across all households and product groups (column 9 of Table 8), and applying our baseline assumption that the pro-competitive effects on prices in domestic stores that we estimated using barcoded items are identical for non-barcoded items. Other columns vary the value of η while rows vary the relative strength of the pro-competitive effects on non-barcoded retail items.

Online Appendix

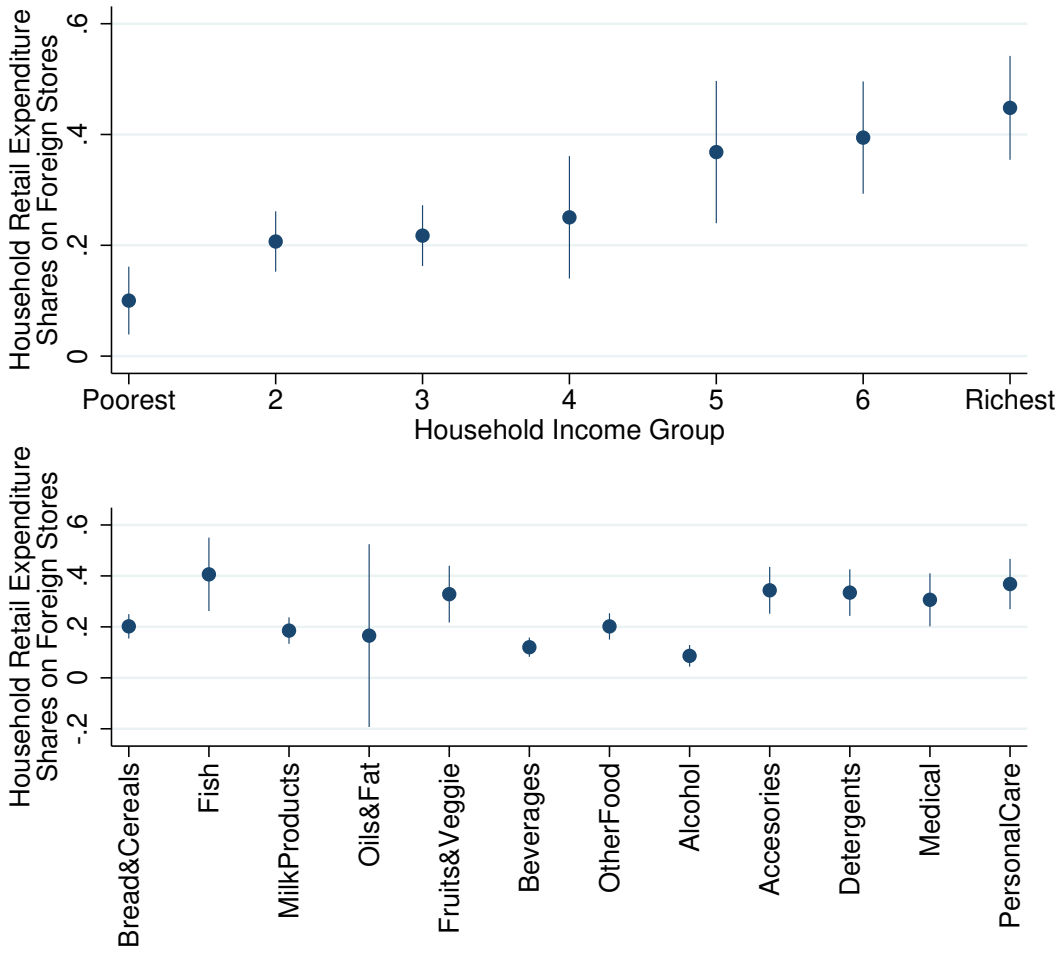
Additional Figures and Tables

Figure A.1: Foreign Retail Market Shares Post Entry: Municipality-by-Quarter Fixed Effects



Notes: The graphs plot the share of household retail expenditure spent at foreign stores. The data come from the Mexican consumer panel microdata for the years 2011-14. We restrict attention to municipalities where the first foreign store entered more than two years previously. Municipality-by-quarter fixed effects included in the estimation of these shares. The omitted income group is the median income group. Regressions are weighted by household survey weights. Expenditure shares are weighted by household survey weights. Both graphs depict 95% confidence intervals based on standard errors clustered at the municipality level.

Figure A.2: Foreign Retail Market Shares Post Entry: Restricted Estimation Sample



Notes: The graphs plot the share of household retail expenditure spent at foreign stores. The data come from the Mexican consumer panel microdata for the years 2011-14. We restrict attention to municipalities where the first foreign store entered between two and three years previously. Expenditure shares are weighted by household survey weights. Both graphs depict 95% confidence intervals based on standard errors clustered at the municipality level.

Table A.1: Descriptive Statistics of the Six Datasets

Dataset	Collection organization	Geographic coverage	Number of municipalities	Time period	Data collection frequency	Data collection strategy	Variable	Number of observations	Units of observation	Units of measurement	Mean	Median	Std. dev.	Min	Max
Store Opening Dates and Locations	ANTAD	National, municipalities with ANTAD presence	608	Jan 2002-Mar 2014	Monthly	Members' reports	Foreign store=1	89,376	Municipalities	Dummy	0.42	0	0.49	0	1
CPI microdata[1]	Banxico/INEGI	National (46 metro areas in 32 States)	141	Jul 2002-Mar 2014	Monthly	Panel. Monthly store visits	Prices	10,891,110	Store-by-Product	Mexican pesos (MXN)	1,766	74	16,176	0	1,083,000
Retail Census Microdata[2] (Censos Económicos)	INEGI	National urban municipalities	608	2003 and 2008	Quinquenial	Repeated cross section	Traditional store units in mun.	1,216	Municipalities	Units	2,240	899	4,029	12	37,028
							Modern retailer store units in mun.	1,216	Municipalities	Units	36	9	82	0	802
Employment and Occupation Survey Microdata (ENEU/ENOE)	INEGI	National urban mun. over 100,000	532	Q1 2002-Q4 2012	Quarterly	Rotating panel of ~250,000 individuals aged 15+. Each person followed 5 quarters	Monthly income	12,749,290	Individuals	MXN	1,933	0	4,234	0	9,000,000
							Employment=1	12,749,290	Individuals	Dummy	0.50	1	0.50	0	1
Consumer Panel Microdata	International market research company	National urban mun. over 50,000	156	Q1 2011-Q1 2014	Weekly	Panel. Bi-weekly household visits, 6,000 households	Prices	55,448,292	Household-by-Store-by-Product	MXN	28	10	104	0	41,789
							Quantities	55,448,292	Household-by-Store-by-Product	Units	1.52	1	2.8	1	499
Household Income and Expenditure Survey Microdata (ENIGH)	INEGI	National urban municipalities	971	2006, 2008, 2010, 2012	Biannual	Repeated cross section approx. 20,000 households per round	Monetary Income (quarter)	77,198	Households	MXN	31,718	20,963	45,179	0	4,870,915
							Expenditures (quarter)	77,198	Households	MXN	39,132	26,618	50,657	620	2,622,790
							Wage income share	77,177	Households	Share	0.72	0.84	0.31	0	1
							Business income share	77,177	Households	Share	0.10	0.00	0.23	0	1
							Other income share	77,177	Households	Share	0.18	0.07	0.25	0	1

Notes: [1] Our main CPI estimating sample consists of barcode-equivalent products (hence excludes non-barcode items such as unpackaged fresh fruits or vegetables, health, transportation, housing etc.). This leaves 120 genericos out of 315 for the price regressions.

[2] We obtain municipality-level aggregates from the universe of 1.3 and 1.8 million retail establishments in 2003 and 2008, respectively, in the 608 ANTAD municipalities.

Table A.2: Effect on Product Replacements and Basket Expansions Among Domestic Retailers

Dependent Variable:	(1) Product Replacement	(2) Product Replacement	(3) Product Replacement	(4) Basket Expansion	(5) Basket Expansion	(6) Basket Expansion
Foreign Entry Dummy	-0.000501	-0.000446	-5.47e-05	0.00110	0.00165	0.00214
	(0.00323)	(0.00451)	(0.00474)	(0.00155)	(0.00218)	(0.00228)
Month FX	✓	✓	✓	✓	✓	✓
Barcode-By-Store FX	✓	✓	✓	×	×	×
CPI Reporting Line FX	×	×	×	✓	✓	✓
Product Group-By-Store Type-By-Month FX	×	✓	✓	×	✓	✓
Region-By-Month FX	×	✓	✓	×	✓	✓
Municipality Size-By-Month FX	×	✓	✓	×	✓	✓
Control for Local Government Expenditure	×	×	✓	×	×	✓
Observations	3,228,544	2,850,238	2,560,558	3,553,689	3,230,077	2,900,305
R-squared	0.141	0.160	0.161	0.027	0.143	0.150

Notes: Table reports the regression of an indicator for product availability in the CPI surveys on a foreign entry dummy. The dependent variable in columns 1-3 is product replacement events (0,1) (i.e. when a product item is replaced within an existing reporting line in the CPI data), or basket expansion events (0,1) in columns 3-6 (i.e. when the enumerator adds an additional product reporting line in the data). The replacement variable has values of zero until the month when the product was replaced. The expansion variable takes values of 1 in the first period the reporting line was added and zeroes thereafter. The various fixed effects are as described in the main text, except for the basket expansion regressions, where we take reporting line fixed effects instead of barcode-by-store fixed effects. Standard errors are clustered at the municipality level and reported in parentheses. * 10%, ** 5%, *** 1% significance levels.

Table A.3: Effect on Municipality Average Incomes and Employment

Dependent Variable:	(1) Log Monthly Income	(2) Log Monthly Income	(3) Log Monthly Income	(4) Employed	(5) Employed	(6) Employed	(7) Log Municipality Population
Foreign Entry - More Than Four Quarters Before (Unbalanced)	-0.0254**	-0.0136	-0.0173	-0.00170	-0.000770	-0.00154	-0.00257
	(0.0126)	(0.0123)	(0.0161)	(0.00255)	(0.00282)	(0.00376)	(0.0359)
Foreign Entry - Four Quarters Before	-0.0238	-0.0182	-0.0160	-0.00502*	-0.00591**	-0.00334	-0.00445
	(0.0146)	(0.0147)	(0.0179)	(0.00283)	(0.00296)	(0.00392)	(0.0202)
Foreign Entry - Three Quarters Before	-0.0176	-0.0152	-0.00533	-0.00218	-0.00193	-0.000556	-0.00122
	(0.0122)	(0.0125)	(0.0120)	(0.00270)	(0.00273)	(0.00340)	(0.0144)
Foreign Entry - Two Quarters Before (Omitted)	0	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Foreign Entry - One Quarter Before	-0.0182	-0.0191	-0.0126	-0.00629*	-0.00839***	-0.00496	0.0209
	(0.0153)	(0.0142)	(0.0161)	(0.00333)	(0.00316)	(0.00355)	(0.0165)
Foreign Entry - One Quarter After	-0.0150	-0.0170	-0.0144	-0.00305	-0.00485*	-0.00283	0.0153
	(0.0130)	(0.0126)	(0.0154)	(0.00275)	(0.00283)	(0.00388)	(0.0155)
Foreign Entry - Two Quarters After	0.00197	-0.00866	0.0102	0.000328	-0.000343	0.00217	0.0234
	(0.0156)	(0.0157)	(0.0176)	(0.00284)	(0.00281)	(0.00397)	(0.0178)
Foreign Entry - Three Quarters After	-0.0243	-0.0344**	-0.0193	-0.00270	-0.00371	0.00110	0.00675
	(0.0154)	(0.0155)	(0.0198)	(0.00315)	(0.00312)	(0.00496)	(0.0188)
Foreign Entry - Four Quarters After	-0.0217	-0.0309*	-0.0128	3.82e-05	-0.00198	5.28e-05	0.0346
	(0.0166)	(0.0162)	(0.0230)	(0.00377)	(0.00341)	(0.00508)	(0.0233)
Foreign Entry - Five Quarters After	-0.0111	-0.0243	0.000488	0.000464	-0.000865	0.00429	0.0347
	(0.0156)	(0.0165)	(0.0226)	(0.00336)	(0.00318)	(0.00572)	(0.0293)
Foreign Entry - Six Quarters After	-0.00181	-0.0171	0.00173	-0.00344	-0.00456	0.000742	0.0255
	(0.0152)	(0.0155)	(0.0254)	(0.00448)	(0.00407)	(0.00671)	(0.0291)
Foreign Entry - Seven Quarters After	0.0206	0.00294	0.0151	0.00150	0.000674	0.00450	0.0123
	(0.0156)	(0.0165)	(0.0243)	(0.00323)	(0.00334)	(0.00799)	(0.0312)
Foreign Entry - Eight Quarters After	0.0105	-0.00773	0.00850	-0.00212	-0.00378	0.00143	0.0244
	(0.0188)	(0.0189)	(0.0231)	(0.00324)	(0.00344)	(0.00696)	(0.0349)
Foreign Entry - Nine Quarters After	0.00104	-0.0147	0.00362	-0.00253	-0.00503	0.00264	0.0345
	(0.0173)	(0.0185)	(0.0275)	(0.00379)	(0.00402)	(0.00893)	(0.0340)
Foreign Entry - Ten Quarters After	0.0203	0.000264	0.00489	0.00304	0.00106	0.00867	0.0132
	(0.0179)	(0.0196)	(0.0248)	(0.00334)	(0.00369)	(0.00889)	(0.0329)
Foreign Entry - Eleven Quarters After	-0.00659	-0.0283	-0.00870	0.000817	-0.000496	0.00934	0.00389
	(0.0177)	(0.0194)	(0.0249)	(0.00379)	(0.00390)	(0.00938)	(0.0335)
Foreign Entry - Twelve Quarters After	0.0126	-0.00936	0.0177	0.00395	0.00267	0.00899	-0.00810
	(0.0150)	(0.0159)	(0.0278)	(0.00348)	(0.00345)	(0.0102)	(0.0360)
Foreign Entry - More Than Twelve Quarters After (Unbalanced)	0.0350*	-0.00282	0.00683	0.000515	-0.00160	0.00368	-0.00663
	(0.0185)	(0.0221)	(0.0286)	(0.00313)	(0.00338)	(0.0101)	(0.0381)
Quarter FX	✓	✓	✓	✓	✓	✓	✓
Municipality FX	✓	✓	✓	✓	✓	✓	✓
Person Controls	✓	✓	✓	✓	✓	✓	×
Region-By-Quarter FX	×	✓	×	×	✓	×	✓
Municipality Size-By-Quarter FX	×	✓	×	×	✓	×	✓
Person FX	×	×	✓	×	×	✓	×
Observations	4,307,362	4,307,362	4,307,362	5,610,685	5,610,685	5,610,685	9,702
R-squared	0.300	0.301	0.809	0.020	0.021	0.561	0.982
Number of Individuals	1,579,372	1,579,372	1,579,372	1,796,587	1,796,587	1,796,587	1,796,587
Number of Municipality Clusters	273	273	273	273	273	273	273

Notes: Table reports regressions of log monthly income or individual employment indicators on 16 quarterly treatment effects and 2 pre and post event study dummies. The data come from the 273 urban municipalities in the quarterly microdata of the Mexican employment and occupation surveys over the period 2002-2012. The reference category are incomes or employment propensities two quarters before foreign entry. The dependent variable in columns 1-3 is individual log monthly income and individual employment dummies in columns 4-6. Column 7 calculates population at the municipality level by summing the survey weights and regresses log municipality population on quarterly treatment effects. To be consistent with previous columns, this regression is weighted by municipality population. The regressions include different combinations of fixed effects and controls as indicated in the table. All regressions are weighted by household survey weights. Standard errors are clustered at the municipality level and reported in parentheses. * 10%, ** 5%, *** 1% significance levels.

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