Retail Globalization and Household Welfare: Evidence from Mexico

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PRELIMINARY AND INCOMPLETE

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 and unique collection of Mexican microdata to estimate the effect of foreign supermarket entry on household welfare and its underlying channels. The richness of the data allows us to estimate a general expression for the welfare gains from retail FDI, and to decompose the total effect into several distinct components. To base our estimates on plausibly exogenous variation in foreign retail entry we propose an event study design that exploits data on the universe of foreign store locations and opening dates in combination with high frequency data on barcode-level store prices, consumption quantities, and household incomes in those same locations over the period 2002-2014. 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. A substantial share of this price index effect is due to pro-competitive effects on consumer prices charged by domestic stores. We find little evidence of significant changes in average municipality level incomes, wages or employment. We do, however, find evidence of store exit and adverse effects on domestic store profits and the incomes of traditional retail sector workers. Finally, we present evidence that the gains from retail FDI are on average positive for all income groups but strongly regressive, and quantify the opposing forces that underlie this finding.

Keywords: Supermarket revolution; foreign direct investment; gains from trade

JEL Classification: 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 Perhaps unsurprisingly in this context, 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 the policy approaches to retail FDI across 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: Retail on average accounts 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 brings to bear 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, providing an ideal empirical setting to study the process of retail globalization.

The number of foreign supermarkets close to quadrupled from 365 stores at the end of 2001 to 1,335 stores at the end of our estimation period in March 2014.

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 distribution of household incomes?

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 im-

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1In 2012, the 250 largest retailers reported 4.3 trillion USD in revenues, of which 25 percent were due to foreign affiliate sales. This represents an increase of more than 400 percent relative to foreign affiliate sales of these firms in the year 2000, and a doubling of the foreign sales share in total revenues. Over the same period, the share of the world stock of inward retail FDI accounted for by developing countries also more than doubled to 25 percent (UNCTAD, 2014).

2For example, it took India’s Congress Party several years and many failed attempts to finally approve foreign entry into multi-brand retail in 2012. This process was accompanied by street protests, and several Indian states, such as Delhi, subsequently voted to block foreign entry. Most recently, the BJP government has announced its intention to move back to an outright nationwide ban of foreign retailers.

3These figures are based on reporting developing countries in post-2000 ILO data (employment), UN National Accounts statistics (GDP), and household consumption surveys (retail expenditures).
posing structure ex ante to limit the data requirements to a set of readily available cross-country
moments, we instead exploit newly available and uniquely rich microdata that allow us to esti-
mate a very general expression for the welfare gains from retail FDI. In particular, microdata
on barcode level consumer prices, 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 the gains from variety or pro-competitive effects on consumer 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 ensure that the moments we feed into the welfare expression are causally identified.

At the center of the analysis lies the construction of an extremely rich collection of microdata.
We combine data on all foreign supermarket locations and opening dates over the period 2002-
2014, with monthly store-level consumer prices at the barcode-equivalent level (e.g. a 330ml can
of Coca-Cola) from the confidential microdata of the Mexican CPI; daily household-by-store level
data on consumption quantities and prices at the barcode-equivalent level from the the Mexican
operation of a large international market research company; store-level revenues, costs and prof-
its for the universe of urban retail establishments from the confidential microdata of the Mexican
retail census; quarterly worker-level incomes, occupations and employment from Mexico’s ur-
ban income and employment surveys; and household-level income shares by activity matched
to consumption shares across products and store formats from Mexico’s household income and
expenditure surveys.

The analysis proceeds in four steps. In Step 1, we write down a general expression for the
effect of retail FDI on household welfare. We decompose the total effect into three distinct effects
on household cost of living (the price index) and three effects on household nominal incomes.
The cost of living effect comprises a direct price index effect and two pro-competitive price index
effects. The direct price index effect captures changes in household cost of living due to the new
foreign store offering pre-existing products at cheaper prices, new product varieties, as well as
different store amenities. The pro-competitive effects comprise an intensive margin, the effect
of foreign entry on consumer prices in continuing domestic stores, and an extensive margin, the
implicit price index changes due to domestic store exit. The nominal income effect comprises a
retail labor income effect (both from employment in traditional retail and modern retail), a retail
business income effect (for domestic store owners) and an indirect income effect on household
incomes in other sectors of the local economy.

In Steps 2 and 3 we estimate the empirical moments required to quantify the six effects that
underlie the total household gains from retail FDI. We tackle the pro-competitive effect among
continuing domestic stores first. The first empirical challenge in identifying this effect is that the
composition of goods and stores within consumer product groups changes over time. This implies
that changes in unit values reported in household consumption surveys yield imperfect measures
of local consumer price changes. We address this challenge by exploiting nationally representative
store price surveys at the barcode-equivalent product by store level that are administered by Mex-
ico’s statistical agency INEGI to calculate the CPI. These data allow us to construct monthly time series of prices for individual products sold in a particular retail outlet in a particular municipality over the period 2002-2014.

The second empirical challenge is non-random entry of foreign retailers across municipalities and over time. To ensure that we are identifying the causal effect on consumer prices in domestic stores, we propose an event study design. The store-opening data suggest that, over our period of study, foreign retailers operated under the objective of establishing a store presence across all of urban Mexico. If so, the precise timing of opening within these locations will be determined by the speed of obtaining zoning permits and the completion of construction, and so the month of opening will be uncorrelated with location specific changes in prices or incomes that may confound estimates of the price and income effects of foreign retail before and after entry. We test this identifying assumption by estimating a full set of 48 monthly treatment effects starting one year prior to the opening event and continuing for three years after opening. 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 this identifying assumption.

While our data allow us to observe the price changes of continuing store-by-product varieties in order to estimate the intensive margin pro-competitive effect, the consumer price changes that result from either the arrival of new store-by-product varieties in foreign stores (the direct price index effect) or the exit of domestic stores (the extensive margin of the pro-competitive effect) are inherently unobservable because neither first period prices of new varieties nor second period prices of exiting varieties can be recorded. To quantify the cost of living implications of these changes in the available set of consumer choices, we require functional form assumptions about consumer demand in order to estimate a virtual price—the price at which demand would be zero.

To this end, we use two different approaches. The first approach is an exact estimation of the cost of living effect under a multi-tier CES preference structure. 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 approach has the appeal of being widely used in the trade literature that evaluates the gains from new imported products 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). This expression 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 outlets. To obtain these estimates, we exploit the uncensored microdata of the Mexican operation of a large international market research company which contain prices and household consumption quantities at the barcode-equivalent level matched to individual retailer identities.

A second benefit of the CES structure is that it allows us to relate our results to the recent quantitative literature on the gains from trade: We show that under CES preferences, the expression for the direct price index effect of foreign entry is identical to the well known import share sufficient statistic for the gains from trade of Arkolakis et al. (2012) and extended to the case of horizon-
tal 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, and to separately estimate price index and nominal income effects, both at the aggregate and across different households.

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 barcode-level store price data in order to estimate a first order approximation of the direct price index effect of foreign store entry 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 functional form assumptions on consumer preferences. The disadvantage is that it can only quantify the direct gains from foreign store entry that arise due to the price differences between foreign and domestic stores for pre-existing products, abstracting from the gains from new product and store variety as well as from the potential amenity differences across stores. The combination of these two approaches provides an additional benefit. The difference between the direct price index effect under CES and the first order approach provides an approximate estimate of the proportion of the welfare gains that come from additional consumption variety and store amenities provided by foreign retailers.

To estimate the effects on nominal household incomes, we construct a quarterly time series of individual incomes, wages, occupation, and employment status that allows us to track individual workers over time in a given municipality. The identification issues are very similar to those we address in the price regressions. Accordingly, we follow a similar event study approach and examine how incomes, wages and employment status change in quarters before and after the month of entry of a foreign retailer. Similar to the consumer price regressions, this quarterly event study design allows us to test for pre-existing differences in the growth rates of local household economic outcomes without imposing parametric structure. To capture the effects of foreign retail entry on household income derived from domestic store profits, as well as to capture the effects on store exit, we complement these data with profit and store count data from the Mexican retail census.

In Step 4, we combine the estimates from Steps 2 and 3 to quantify the welfare expression from Step 1. The analysis provides several new findings. We find that foreign supermarket entry causes large and significant welfare gains for the average household that are in the order of 7.5 percent of initial household income. The majority of this effect is driven by a significant reduction in the cost of living. Interestingly, slightly more than 20 percent of the price index effect appears to be driven by pro-competitive effects on consumer prices charged by pre-existing domestic stores. The remaining 80 percent is driven by the direct price index effect that is due to foreign supermarkets offering cheaper prices, new varieties and different shopping amenities to consumers. This finding is consistent with raw moments in the data that we present as motivating evidence: foreign retailers charge on average 12 percent lower prices for the identical barcode within the same month and municipality, offer five times the barcode variety compared to modern domes-
tic stores, and constitute on average more than one third of total household retail spending after foreign entry. The estimation results using our first order approximation of the direct price index effect suggest that about one third of this direct effect is driven by observed ex-post store price differences alone, while the remaining two thirds derive from the substantial differences in product variety and store amenities. Turning to nominal incomes, we find no evidence of an 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 and the wage incomes of workers in the traditional retail sector.

Finally, we quantify the distribution of the gains from retail FDI. We find that while all household income groups on average experience significant gains from retail FDI, this effect is about twice as large for the richest income group compared to the poorest. We explore the role of several salient differences in household consumption and income patterns across the income distribution, and find that the key driver is the fact that households evaluate the consumption gains from the new foreign store very differently. While the wealthiest households benefit greatly from both the product mix (e.g. Western brands, higher quality varieties, larger pack sizes) and the new store amenities (e.g. parking, security, hygiene), this is the case to a much lesser extent for poorer income households. The key empirical moments underlying these results are that the richest household group substitute on average more than 50 percent of their retail consumption to the foreign store, whereas the poorest income group substitutes less than 15 percent of their retail consumption.

The paper is 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, 2012; Faber, 2014; Faigelbaum and Khandelwaih, 2014). Relative to the existing literature on trade and development, we focus on the consequences of retail globalization, a channel of integration that has received relatively little attention. Methodologically, this paper differs in its careful empirical evaluation of all major components of household welfare and, in particular, the cost of living implications of the policy in question. Rather than relying on state level price deflators as in Topalova (2010) or earlier work by Deaton and Tarozzi (2000), or on household consumption surveys in combination with simulated price changes at the level of aggregate product groups as in Porto (2006) and earlier work by Deaton (1989), or relying on cross-country trade flows as in Caron et al. (2012) and Faigelbaum and Khandelwal (2014), this paper draws on price and consumption data at the level of individual households, barcode-equivalent products, and stores to provide the first empirical estimate of the effect of foreign retail entry on household price indexes.

The paper closely relates to a small body of work that explores the economic consequences of foreign supermarkets in developing and emerging countries (Neven and Reardon, 2004; Iacovone et al., 2014; Javorcik and Li, 2013). Relative to these papers that have focused on the spillover effects on domestic suppliers in both agriculture and manufacturing, this paper instead focuses on

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4Varela (2013) uses Walmart’s entry decisions into local markets in Mexico to estimate a structural model of diseconomies of scale in outlet expansion.
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, and so is silent on potentially interesting national level effects such as changes in manufacturing productivity that are absorbed by time fixed effects in our empirical setting.\footnote{5}

Insofar as we are estimating the welfare effects of new foreign retail choices, the work is also related to the trade literature that estimates the gains from new product variety (Feenstra, 1994; Broda and Weinstein, 2006; Feenstra and Weinstein, 2013; Handbury and Weinstein, 2011). In addition to studying foreign retailer entry at the level of a municipality as opposed to extensive margin changes in country level import flows, the richness of the collected 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 that an empirical analysis exploits information on import shares in consumption directly (in our setting expenditure shares on foreign-owned stores) at the household-by-product level in order to quantify the gains from integration.

Finally, since Walmart de México is by far the biggest foreign retailer in Mexico (and in fact is more dominant in Mexico than it has ever been in the United States), the paper relates to an extensive literature on the effects of Walmart in the United States. Basker (2005) analyzes effects on retail employment. Jia (2008) focuses on entry and exit decisions between Walmart and competing retailers. Hausman and Leibtag (2007) estimate the consumer benefits of Walmart entry. And Holmes (2011) infers economies of store density for Walmart from the centrifugal but dense expansion of Walmart. This paper offers two main innovations relative to the existing literature. First, developing countries offer a very different pre-existing retail environment to study the effect of modern big box store entry. That is, rather than analyzing the effect of modern store entry in the context of an already modernized retail sector, this paper sheds light on the effect of exposing a largely traditional retail environment to what is arguably the world’s technological frontier in retailing. Second, to the best of our knowledge this paper is the first to provide a comprehensive measurement of the total welfare effect of retail formats such as Walmart for local households. Somewhat surprisingly, the estimation of the effect of retail modernization on both nominal incomes and household cost of living in a unified empirical framework has not been attempted in the existing literature to date.

The remainder of the paper is structured as follows. Section 2 describes the background and policy context of retail globalization in Mexico and provides motivating evidence. Section 3 presents the theoretical framework. Section 4 describes the data sets used to estimate each component of the welfare expression. Section 5 present the empirical strategy and estimation results. Section 6 draws on these estimation results in combination with estimates of household demand
parameters to quantify the average household welfare gain from retail FDI, its underlying channels, and the distribution of the gains from retail FDI. Section 7 concludes.

2 Background and Motivating Evidence

2.1 Background

Foreign investments in retail and other sectors were originally governed by the 1973 Foreign Investment Law which required FDI to be approved on a case by case basis, and generally required a minimum 51% Mexican ownership. Over the 1980’s restrictions were relaxed allowing FDI up to 49% without explicit authorization. The major final step in Mexico’s opening to FDI was brought about by NAFTA which allowed full foreign ownership in all (including retail) but a few reserved sectors such as energy. Of particular importance was the fact that NAFTA guaranteed full freedom to import most North American products duty free, repatriate profits and had a third-party dispute resolution mechanism.

The first significant foreign investment in retail we are aware of is the purchase of 49% of Casa Ley (a regional retailer in Northern Mexico) by Safeway of the U.S. in 1981 under pre-NAFTA regulations. However, the truly transformative event has proven to be Walmart’s decision to enter the Mexican market in the early 1990’s around the time of NAFTA’s negotiation. Walmart initially arrived under a joint venture partnership with Mexican retailer Cifra, a successful local retailer focused on the Mexico City region with around 100 supermarket units. By 1997 Cifra was bought out by Walmart, and in 2000 the name of the company was changed to Walmart de México (WALMEX). In the ensuing years, Walmart de México became the largest retail chain and the largest employer in the country with 210,000 employees in January 2014.

The entry of global retail chains and their modern store formats into Mexico created a setting in which the domestic retail market, which was dominated by street markets, traditional store formats and independent shop owners, was exposed to what is arguably the world technological frontier in retailing. Major operational and technological differences included the introduction of distribution centers, modern logistics such as cold-chain for fresh products, and sourcing from global supply chains (Biles, 2008).

The expansion of Walmart and other foreign supermarket chains, such as Casa Ley-Safeway, Costco, HEB, Smart and Waldos, proceeded relatively slowly during the second half of the 1990s, serving predominantly metropolitan and relatively high income neighborhoods in the major cities. 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 central locations in the major metropolitan centers of Mexico. Between 2002 and 2014, the estimation period of our empirical analysis, foreign retailers expanded close to fourfold from 365 supermarkets to 1335 at the beginning of 2014. As is apparent in Figure 1, this period saw the expansion of foreign supermarkets beyond the large metropolitan city centers, towards establishing presence among the wide range of second and third tier urban
areas as small as 15,000 inhabitants.

2.2 Motivating Evidence

Once they have opened, how do these foreign-owned supermarkets differ from the domestic stores they compete with? In this subsection, we use the microdata of the Mexican subsidiary of a large international market research company and the administrative records of the Mexican National Retail Association (ANTAD) to document a set of stylized facts about the differences between foreign-owned and domestic retailers in periods after foreign entry.

Table 2 shows that foreign-owned retailers differ substantially along several key dimensions. Column 1 shows that, on average, foreign stores charge approximately 12 percent lower prices for identical barcode products compared to domestic retailers in the same municipality during the same month. Interestingly, the sign of this difference is reversed when we replace barcode-by-month fixed effects by product group-by-month fixed effects (column 2). Thus, foreign stores appear to offer higher quality varieties (where quality is proxied by price) and/or larger pack sizes within a product group whilst charging lower prices for varieties of equal quality and pack size.

These large differences in prices and product variety are combined with a substantially larger set of available varieties. When compared to modern domestic retail chains in the same municipality in column 3, a foreign-owned supermarket offers approximately five times as many barcode products. This difference in consumer choice is also apparent when comparing the floor space records using the ANTAD data. Column 4 of Table 2 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, in addition to differences in consumer prices and product variety 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 amenity are the store environment and the store location. In terms of positive amenities, foreign-owned supermarkets are typically cleaner, offer greater security, more parking space and display and organize their products more attractively. In addition, households may attach a higher brand value when going shopping at a modern Western retailer compared to domestic stores. 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 could play an important role when estimating the heterogeneity of the gains from foreign entry. In our framework, we empirically estimate consumer evaluations of differences in store amenities using observable moments on individual household expenditure shares across stores.

\footnote{Notice that columns 3 and 4 are based on the comparison to modern domestic retail chains and exclude the traditional independent domestic retail segment. These comparisons likely provide lower bounds of the differences in product variety between foreign stores and the domestic retail environment including the traditional sector.}
3 Theoretical Framework

In this section we derive a general expression for assessing the impact of foreign supermarket entry on local household welfare. We allow foreign supermarket entry to affect welfare through a variety of channels that affect both the cost of living (i.e. the price index) as well as household nominal incomes. We express the total cost of living effect as the sum of a direct price index effect and two pro-competitive price index effects. The direct price index effect captures changes in household cost of living due to the new foreign store offering pre-existing products at cheaper prices, new product varieties, as well as different store amenities. The pro-competitive effects comprise an intensive margin—the effect of foreign entry on consumer prices in continuing domestic stores—and an extensive margin—the implicit price index change due to domestic store exit. We express the total effect on nominal incomes as the sum of a retail labor income effect (both from employment in traditional and modern retail), a retail business income effect (for domestic store owners) and indirect income effects on household incomes in other sectors of the local economy.

3.1 A General Estimation Framework

Consumers purchase goods from a set of “items” indexed by a product \( b \)-by-store \( s \) pair. Each particular product is sold by potentially many stores. These stores may belong to either the modern retail sector \( i_m \) (e.g. supermarkets and big box stores) or to the traditional retail sector \( i_t \) (e.g. market stalls or mom-and-pop stores) with the two retail sectors indexed by \( i \in \{i_m, i_t\} \), respectively. For notational convenience, we distinguish prices at foreign retailers in the modern sector (indexed by \( f \) with product-by-store prices stacked in a vector \( P_f \)) from domestic retailers (indexed by \( d \) with product-store prices stacked in a vector \( P_d \)), with the latter category including both modern and traditional retailers.

A household \( h \)'s nominal expenditure on all goods and services, \( e(P_d, P_f, u_h) \), is equal to household nominal income:

\[
e(P_d, P_f, u_h) = y_h = \sum_{i \in \{i_m, i_t\}} w_i l_{ih} + \sum_{i \in \{i_m, i_t\}} \pi_{ih}(P_{ih}; w) + x_h. \tag{1}
\]

where nominal income \( y_h \) is the sum of three terms: wage earnings \( w_i \) from household labor \( l_{ih} \) (with \( \sum l_{ih} \leq n_h \) where \( n_h \) is household labor supply) across both retail sectors; profits \( \pi_{ih} \) from domestic modern or traditional retail enterprises owned by the household that depend on the vector of output prices \( P_{ih} \) and the vector of input prices \( w \) including potentially household labor; and income from other sources \( x_h \).

In order to calculate the welfare effects we consider the compensating variation,\(^7\) the change in exogenous income required to maintain utility when foreign retail arrives between period 1 and

\(^7\)This approach follows earlier work by Hausman (1981) and Hausman and Leonard (2002).
period 0, with periods denoted by superscripts:

\[
CV = \left[ e(P_{1d}^1, P_{f}^1, u_0^h) - e(P_{d}^0, P_{f}^{0s}, u_0^h) \right] - \left[ \sum_i w_i^1 t_{ih} - \sum_i u_i^0 t_{ih} + \sum_i \pi_{ih}^1(P_{ih}; w^1) - \sum_i \pi_{ih}^0(P_{ih}; w^0) + x_1^h - x_0^h \right].
\]

Cost of living effect (CLE)

\[
\text{Income effect (IE)}
\]

Or in proportional terms (relative to period 0 expenditure):

\[
\frac{CV}{e(P_{d}^0, P_{f}^{0s}, u_0^h)} = \left[ e(P_{1d}^1, P_{f}^1, u_0^h) \right] - \left[ \sum_i w_i^1 t_{ih} + \sum_i \pi_{ih}^1(P_{ih}; w^1) + x_1^h - \sum_i u_i^0 t_{ih} + \sum_i \pi_{ih}^0(P_{ih}; w^0) + x_0^h - 1 \right].
\]

Cost of living effect (CLE)

Income effect (IE)

The first term is the cost of living effect, whereby foreign retail entry may affect the purchasing power of households holding their nominal incomes constant. Of course foreign retailers’ prices are not observed prior to their entry and so the foreign retail prices in period 0 are replaced with virtual prices \(P_{f}^{0s}\), the foreign prices that would ensure that exactly zero quantity was consumed given the price vector of other goods. These virtual prices can be estimated with additional assumptions on consumer preferences. Similarly, prices are not always observed for domestic items that exit between periods 0 and 1 and these unobserved prices are also replaced with virtual prices; the vector \(P_{d}^{1s}\) contains actual prices for the observed domestic items in period 1 (continuously available items and new items) and virtual prices for item exits, while the vector \(P_{d}^0\) contains actual prices for domestic items in period 0.\(^8\) The second term is the income effect, whereby foreign retail entry may change labor incomes, particularly in the retail sector, and may alter domestic retail profits as well as household incomes in other sectors of the local economy.

In the following sections we consider the various sub-components of the cost of living and income effects as well as the moments in the data that we will use to identify them.

### 3.2 Estimating the Cost of Living Effect

The cost of living effect can be divided into two quite distinct sub-components: a direct effect due to gains enjoyed by customers shopping at the new foreign store (either through lower prices on previously available varieties, new product and store variety or better store amenities); and a pro-competitive effect due to pre-existing domestic retailers exiting or changing prices as a result of the entry of foreign retailers. To see these distinct terms, note that:

\[
\text{CLE} = \left[ e(P_{1d}^1, P_{f}^1, u_0^h) - e(P_{d}^0, P_{f}^{0s}, u_0^h) \right] + \left[ e(P_{1d}^1, P_{f}^1, u_0^h) - e(P_{d}^0, P_{f}^{0s}, u_0^h) \right].
\]

(1) Direct effect (DE)

Pro-competitive effect (PE)

\(^8\)It is straightforward to also allow for product entry or exit in domestic stores through virtual prices \(P_{d}^{0s}\) and \(P_{d}^{1s}\). Empirically we find no evidence of such effects in response to foreign retail arrivals, and so abstract from this possibility in the theoretical exposition.
where using the virtual price notation defined above, \( P_{f} \) are the prices required to set demand for foreign products equal to zero given domestic prices in period 1. The first expression which we label the direct effect is the cost difference between obtaining \( u_{h}^{0} \) at period 1 prices with and without the presence of foreign retail. These are the gains from foreign retail arrival holding fixed competitors prices. The second expression which we label the pro-competitive effect is the cost difference between obtaining \( u_{h}^{0} \) at period 1 domestic prices and at period 0 domestic prices accounting for domestic product exit through the use of virtual prices (in the absence of foreign retail in either period). These are the gains from foreign retail working through changes in domestic competitors on the intensive and extensive margins.

The pro-competitive effect can itself be divided into two terms by separating the price effects on continuing domestic items with a price vector \( P_{dc} \) from domestic item exiters with prices \( P_{dx} \):

\[
PE = e\left(P_{dc}, P_{dx}, P_{f}, u_{h}^{0}\right) - e\left(P_{dc}, P_{dx}, P_{f}, u_{h}^{0}\right) + e\left(P_{dc}, P_{dx}, P_{f}, u_{h}^{0}\right) - e\left(P_{dc}, P_{dx}, P_{f}, u_{h}^{0}\right)
\]

(2) Pro-competitive intensive margin \((PEI)\)

(3) Pro-competitive exit margin \((PEX)\)

Estimating both the direct effect and the pro-competitive effect requires us to place additional structure on demand. Since virtual prices are not observed in the data they must be estimated, which requires a demand function for the good or at least an approximation to one. Below we propose two estimation approaches.

**Exact Estimation under CES demand** Our first approach provides an exact and complete estimate of the cost of living effect under a multi-tier CES demand structure that is common in the trade literature. This approach has several advantages. First, 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 gains from new products (or stores in our case). Second, 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 the estimation we will group households by income group (separately for each location, period and product group). Third, the assumption of CES preferences also allows us to relate the estimation results to the recent quantitative literature on the gains from trade and FDI: Under CES, we show that the expression for the direct price index effect is identical to the well known import share sufficient statistic of Arkolakis et al. (2012), extended to horizontal multinational production by Ramondo and Rodriguez-Clare (2013).

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 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 products within the product groups \( b \in B_{g} \) (e.g. a product such

---

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).
as a 330 ml Coca Cola can) that we can leave unspecified for now:

\[
U = \prod_{g \in G} \left[ Q_{gh} \right]^{a_{gh}}
\]

\[
Q_{gh} = \left( \sum_{s \in S_g} \beta_{gsh}^s q_{gsh}^s \right)^{\eta_{gh}^{-1}}
\]

where \( a_{gh}, \beta_{gsh} \) and \( \eta_{gh} \) are (potentially household- or income-group-specific) preference parameters that are fixed over periods. \( Q_{gh} \) and \( q_{gsh} \) are consumption aggregates with associated price indexes \( P_{gh} \) and \( r_{gsh} \) respectively, and \( \eta_{gh} \) is the elasticity of substitution between local retail outlets. Under this demand system, consumers choose separately for each broad product group how much they are going to buy in each store. Consumers then choose the particular products purchased within each store. This seems like a reasonable assumption given that certain stores specialize in certain product groups and, at least within a month, consumers visit multiple stores. While the demand system is homothetic, we capture potential heterogeneity across the income distribution by allowing for the preference parameters to differ across products and across household income levels.\(^\text{10}\)

Building on Feenstra (1994), the following expression provides the exact proportional cost of living effect:

\[
\frac{\text{CLE}}{e(P^1_d, P^1_f, u^1_h) - 1} = \prod_{g \in G} \left\{ \left( \sum_{s \in S^d_g} \phi_{gsh}^s \right)^{-\eta_{gh}^{-1}} \prod_{s \in S^d_g} \left( \frac{r_{gsh}^1}{r_{gsh}^0} \right)^{\omega_{gsh}} \right\}^{a_{gh}} - 1. (8)
\]

where \( S^d_g \) denotes the set of continuing domestic retailers within product group \( g \), \( \phi_{gsh}^t = \frac{r_{gsh}^t q_{gsh}^t}{\sum_{t \in S_g} r_{gsh}^t q_{gsh}^t} \) is the expenditure share for a particular retailer of product group \( g \), and the \( \omega_{gsh} \)'s are ideal log-change weights:

\[
\omega_{gsh} = \frac{\frac{\phi_{gsh}^1}{\ln \phi_{gsh}^1 - \ln \phi_{gsh}^0} - s_{c \in S^d_g} \left( \frac{\phi_{gsh}^1 - \phi_{gsh}^0}{\ln \phi_{gsh}^1 - \ln \phi_{gsh}^0} \right)}{
\]

which in turn contain expenditure shares of different retailers within product groups where the shares consider only expenditure at continuing retailers \( \tilde{\phi}_{gsh}^t = \frac{r_{gsh}^t q_{gsh}^t}{\sum_{t \in S_g} r_{gsh}^t q_{gsh}^t} \). The price terms \( r_{gsh}^t \) are themselves price indexes of product-specific prices \( p_{gsb}^t \) within stores which, in principle, could also account for new product varieties using the same methodology.

As above, the cost of living effect can be broken up into the direct effect and the two pro-

\(^\text{10}\)While necessary for empirical tractability, this somewhat ad hoc treatment of non-homotheticity shuts down a second-order price index effect: Large first-order effects of foreign entry on household incomes may push 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.
competitive effects as follows:

\[
CLE \left( P_d^0, P_f^0, u_h^0 \right) = \prod_{g \in G} \left\{ \sum_{s \in S^{dc}_g} \frac{1}{\phi_{gsh}^0} \prod_{s \in S^{dc}_g} \left( \frac{r_{gsh}^1}{r_{gsh}^0} \right)^{\alpha_{gh}} \right\}^{\eta_{gh}^{-1}} - \prod_{g \in G} \left\{ \frac{1}{\phi_{gsh}^0} \prod_{s \in S^{dc}_g} \left( \frac{r_{gsh}^1}{r_{gsh}^0} \right)^{\omega_{gsh}} \right\}^{\alpha_{gh}}
\]

\( \text{(1) Direct effect (DE)} \)

\[
+ \left[ \prod_{g \in G} \left\{ \sum_{s \in S^{dc}_g} \left( \frac{1}{\phi_{gsh}^0} \right)^{\alpha_{gh}} \prod_{s \in S^{dc}_g} \left( \frac{r_{gsh}^1}{r_{gsh}^0} \right)^{\omega_{gsh}} \right\}^{\alpha_{gh}} - 1 \right]
\]

\( \text{(2) Pro-competitive intensive margin (PEI)} \)

\[
+ \left[ \prod_{g \in G} \left\{ \sum_{s \in S^{dc}_g} \left( \frac{1}{\phi_{gsh}^0} \right)^{\alpha_{gh}} \prod_{s \in S^{dc}_g} \left( \frac{r_{gsh}^1}{r_{gsh}^0} \right)^{\omega_{gsh}} \right\}^{\alpha_{gh}} - \prod_{g \in G} \left\{ \sum_{s \in S^{dc}_g} \left( \frac{r_{gsh}^1}{r_{gsh}^0} \right)^{\omega_{gsh}} \right\}^{\alpha_{gh}} \right] . \quad (9)
\]

\( \text{(3) Pro-competitive exit margin (PEX)} \)

In the simple case where there are no pro-competitive effects (such as when firms are monoposophically competitive as in Krugman 1980):

\[
CLE \left( P_d^0, P_f^0, u_h^0 \right) = \prod_{g \in G} \left\{ \sum_{s \in S^{dc}_g} \phi_{gsh}^0 \prod_{s \in S^{dc}_g} \left( \frac{r_{gsh}^1}{r_{gsh}^0} \right)^{\omega_{gsh}} \right\}^{\alpha_{gh}} - 1
\]

\( \text{(10)} \)

which is precisely the welfare gain from trade highlighted in recent work by Arkolakis at al. (2012) and Ramondo and Rodríguez-Clare (2013), but here in a multi-sectoral environment.

**First Order Approach Using Observed Store 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 barcode-level store price data in order to estimate a first order approximation of the direct price index effect of foreign store entry that is solely based on observable price changes due to foreign entry. The advantage of this alternative approach is that it yields a a Paasche price index that approximates the consumer gains that arise from foreign store entry without imposing functional form assumptions on consumer preferences. The disadvantage is that it can only quantify the direct gains from foreign store entry that arise due to the price differences between foreign and domestic stores for pre-existing products. Reporting both approaches provides an additional benefit. The difference between the direct price index effect under CES and the first order approach provides an approximate estimate of the proportion of the welfare gains that come from the additional variety provided by foreign stores and the amenity differences between foreign and domestic stores.

For the pro-competitive effect, we start by taking a first-order Taylor expansion of the expenditure function around period 1 prices and apply Shepherd’s lemma. Focusing on price changes in the set of domestic stores continuously selling product b across both periods (for which we can
observe price changes) we obtain:

$$PE \approx \sum_b \sum_{s \in S_{dc}^b} \left[ q_{bsh}^1 \left( p_{bs}^1 - p_{bs}^0 \right) \right], \quad (11)$$

where $q_{bsh}^t$ is the quantity consumed of product $b$ in store $s$ by household $h$ in period $t$ and $S_{dc}^b$ is the set of domestic stores continuously selling product $b$ across both periods. Rewriting the $PE$ in proportional terms:

$$\frac{PE}{e(P_1^d, P_1^f, u^0_h)} \approx \sum_b \sum_{s \in S_{dc}^b} \left[ \phi_{bsh}^1 \left( \frac{p_{bs}^1 - p_{bs}^0}{p_{bs}^1} \right) \right], \quad (12)$$

where $\phi_{bsh}^1$ is the household expenditure share spent on the item in period 1. To a first order approximation, the pro-competitive effect is simply a Paasche price index of the price changes of pre-existing store-by-product varieties that occurred due to the entry of foreign retail.

For the direct price index effect, we again take a first-order Taylor expansion of the expenditure function around period 1 prices but now focus on the remaining term, the sales at foreign stores in period 1. We calculate the first-order welfare loss if these stores had the exact same number of varieties and amenities, but instead charged the pre-entry prices charged by domestic stores for those products:

$$DE \approx \sum_b \sum_{s \in S_f^b} \left[ \phi_{bsh}^1 \left( \frac{p_{bf}^1 - p_{bds}^0}{p_{bf}^1} \right) \right]. \quad (13)$$

where $S_f^b$ is the set of foreign stores present in period 1. Hence, the direct 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, $p_{bds}^0$ (instead of evaluating the virtual price changes at foreign stores that would set their demand equal to zero in period 1 that provides the exact welfare gain).

The benefits of this approach are clear. It yields a transparent first order approximation of the consumer gains that arise from foreign store entry purely based on moments we can obtain from the price microdata without the need to impose particular functional form assumptions on consumer preferences. The disadvantages are equally clear: Relative to the exact estimation approach outlined above, we miss any direct gains that arise due to differences in the number and type of product varieties on sale in foreign stores or the amenities provided by foreign stores, differences that are potentially substantial and that we highlighted in Section 2. We also miss any gains from the additional store-variety that new foreign-retail outlets provide since we do not evaluate the price changes that would set the demand for foreign stores equal to zero.
3.3 Estimating the Income Effect

The income effect in equation 2 can also be separated into distinct sub-components. Taking a second order Taylor approximation on the income effect in period 1 we obtain the following:

\[
IE_{\mathcal{C}\left(P^0_d, P^0_f, u^0_h\right)} \approx - \sum_i \left[ \theta_{w_0} \left( \frac{w^1_i - w^0_i}{w^0_i} + \frac{l^1_{ih} - l^0_{ih}}{l^0_{ih}} + \frac{w^0_i - w^0_i}{w^0_i} \right) \right]
\]

(4) Wage effects

\[
- \sum_i \left[ \theta_{\pi_0} \left( \frac{\pi_{ih}(P^1_{ih}; w)}{\pi_{ih}(P^0_{ih}; w^0)} \right) \right] - \left[ \theta_{o} \left( \frac{x^1_{ih} - x^0_{ih}}{x^0_{ih}} \right) \right]
\]

(5) Household business effects

(6) Other income effects

where \( \theta_{w_0} \) is the share of wages from industry \( i \) in household total income, \( \theta_{\pi_0} \) is the share of total income derived from a household retail enterprise in sector \( i \) and \( \theta_{o} \) is the share of other income in household total income.

Foreign retail entry may change wages generally, or specifically in certain industries such as formal retail or informal retail (the \( \theta_{w_0} \) term). There may also be changes along the employment margin with workers reducing their labor supply to these industries (the \( \theta_{w_0} \) terms). Households may also own businesses, for example traditional retail stores, and these may be hurt by foreign retail entry (the household business effects term). Finally, income from other sources may respond to foreign retail entry through general equilibrium wage effects or because households are producing goods that are sold through the retail sector.

In summary, our theoretical framework allows us to express the household gains from retail FDI as a function of three types of observable moments in our microdata: i) causal effects on retail prices, consumption quantities and household nominal incomes, ii) household demand parameters that govern the degree which households substitute between retail outlets as a function of price differences, and iii) pre-existing household expenditure shares across product groups and store types and income shares across wage labor and business occupations. The next section describes the data sources we draw on to obtain these estimates. The empirical analysis then proceeds in three steps. We first present the empirical strategy to estimate the causal effects of foreign entry on retail prices, consumption quantities and household incomes. We then estimate the demand parameters needed for the quantification. Finally, we combine the estimates obtained in the two previous steps with data on initial household expenditure shares and income sources to quantify the gains from retail FDI across the income distribution.

4 Data

This section provides an overview of the main data sets that we use in the analysis. A brief description of each dataset along with descriptive statistics for the key variables can be found in Table 1.
ANTAD 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 Nacional de Tiendas de Autoservicio y Departamentales). All major retailers in Mexico are part of ANTAD. The association represents more than 34,000 retail units with close to 25 million square meters of retail space. ANTAD collects unusually detailed data from all its members about the location and date of opening of every new unit in the country. The ANTAD information on store openings at the municipality level by retailer covers the period 2002-2007. We complement these data with information on all foreign owned supermarket openings after 2007 that we obtain directly from the retailers, and in some cases from newspaper coverage and phone calls to track down opening dates for foreign-owned supermarkets that are present in 2014 with missing information.11 Out of roughly 2,500 municipalities in Mexico, 608 have ANTAD presence. Municipios with ANTAD presence are urban areas with a median population of 63,000. In contrast, the 1,848 municipalities without ANTAD presence have a median population of 8,000, widely considered as rural areas using typical cutoffs of 20,000 to define an urban center. By the end of our sample in 2014, 76 percent of ANTAD municipalities have a foreign retailer.

Monthly Mexican CPI Microdata

To estimate the intensive margin pro-competitive effect, we use the monthly microdata of the Mexican CPI. These data consist of retail price quotes that are administered by Mexico’s national statistics agency INEGI every month to compute the Mexican CPI.12 Because the main objective of the CPI is to compute price inflation for identical product items in identical retail outlets over time, these data are ideally suited to estimate price effects among the pre-existing domestic retail environment faced by consumers that are unconfounded by unobserved changes in product quality or changes in the composition of stores over time.

These price data have a number of important features. First, the sample of prices is designed to be representative of Mexican household consumption and covers not only supermarkets, convenience, and department stores but also street vendors, traditional markets, and specialized stores. Second, the price quotes are designed to capture 100 percent of household expenditure, covering all of retail product groups in addition to services such as health, education, housing and transport. Third, within a given product group, the selection of individual product items and store types is designed to capture the consumption patterns obtained in the urban segment of the ENIGH household consumption surveys discussed below (Salas, 2006).

The data collection effort for the Mexican CPI is substantial. Every month INEGI enumerators obtain price quotes for over 85,000 items covering 315 product categories in 46 metropolitan areas

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11 We also thank Mauricio Varela for access to his data on Walmart store openings during years in which Walmart was not a member of ANTAD.

12 In July 2011 this operation was passed from Mexico’s Central Bank to INEGI.
covering 141 urban municipalities. These individual price quotes are made publicly available on a monthly basis in the country’s official government gazette (Diario Oficial de la Federación). Obviously the CPI includes many product groups which do not refer to physical goods sold by retailers, such as housing, education, health or public transport. We exclude all non-retail product groups from the main analysis of the effect of foreign entry on consumer prices in pre-existing retail establishments, but also use the non-retail price quotes for a set of placebo falsification tests. When comparing prices over time, we also exclude product groups whose price quotes are not based on barcode-equivalent information. CPI prices of fast changing product groups, such as clothing, or unprocessed product groups, such as fruit and vegetables or fresh meat, are based on store samples that do not credibly control for changes in product characteristics over time. The time series of prices for barcode-equivalent items (i.e. fresh whole milk Alpura brand 1 liter carton) that we use to estimate the pro-competitive effects of foreign retail entry comprise more than one third of all reported price quotes in the Mexican CPI microdata, and account for more than 40 percent of average household retail expenditure. Price quotes are inclusive of any promotions (sales) as well as value added tax.

In addition to the public access data of the Mexican CPI, we also obtain access to the confidential data columns. These allow us to observe the municipality in which the price quote was taken, as well as store format type and retailer names. The latter information allow us to explore the heterogeneity of the effect of foreign entry on consumer prices across different types of domestic competitors. The final estimation sample of the event study described in the following section consists of roughly 3.3 million store price observations over the period 2002-2014 comprising 120 product categories with barcode-equivalent products across 76 urban municipalities.

Mexican Retail Census Microdata

For the purpose of estimating the effect of foreign entry on retail business 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 in the country. The restricted access version of the data we use allows us to observe the number of stores with traditional retail formats (below supermarket) and modern retail formats (supermarkets and bigger), as well as store revenues and costs to compute profits. The final dataset comprises 608 urban ANTAD municipalities reporting outcomes for 1.3 million retail establishments in 2003 and 1.5 million retail establishments in 2008.

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13 For comparison, the U.S. CPI collects prices on 80,000 items in 211 product categories.
14 We thank Etienne Gagnon for access to the data he assembled directly from the Gazette.
15 Referred to as genéricos in the Mexican CPI.
16 Throughout the analysis, we define our urban estimation sample across datasets as urban classified municipalities that report at least one store presence in the ANTAD dataset over the years 2002-2014.
Quarterly Data on Household Incomes, Income Sources and Employment

To estimate the effect of foreign entry on nominal household incomes and employment, we require high frequency data to exploit the same event study design for incomes as we use for consumer prices. To this end, we make use of the National Employment and Occupation Surveys (ENOE) from INEGI. The ENOE has a similar design to the U.S. Current Population Survey in that it is a quarterly survey with a rotating panel of sampled households in which a given household is followed over 5 quarters. The survey tracks occupation and income in a manner equivalent to the ENIGH data set described below and has the advantage of being representative at the state level and for 32 large cities. Every quarter more than 100,000 individual residences are surveyed. The ENOE replaced the national urban employment survey ENEU (1987-2004) which we use for the pre-2005 years. The final estimation sample comprises roughly 5 million observations across 273 urban municipalities.

Microdata from the Mexican Operation of a Large International Market Research Company

The estimation of the effects of changes in product variety on household cost of living requires data on the ex post retail market shares of foreign supermarkets across product groups and households along the income distribution, as well as estimates of the elasticity of substitution of household consumption across local stores as a function of price differences. The data we exploit for this purpose are the microdata of a large international market research company, which was made available to us through an academic collaboration with their Mexico City office. Their Mexican consumption microdata data are available for the years 2011-2014. These data are similar to the home scanner data that market research companies collect on US consumers. The Mexican operation of the firm collects information from roughly 6,000 urban households classified by income group and distributed across 156 Mexican municipalities. Households are visited biweekly to obtain consumption diary information on 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 weights are taken into account. These microdata comprise roughly 24 million transaction-level observations over the period between January 2011 and June 2014. Importantly, we obtain access to the uncensored records including retailer identities that can be linked to 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 Data on Consumption and Income Shares

In the final quantification exercise in section 6, we make use of household microdata from the Mexican National Income and Expenditure Surveys (ENIGH), which are administered biannually by INEGI. The 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 store (e.g. supermarket or open market). These data allows us to calculate separate welfare effects of foreign entry for each household (depending on their incomes, income sources and consumption habits) in order to explore the heterogeneity in impacts. The final estimation sample for the welfare quantification contains 12,293 households residing in 240 urban municipalities between 2006-2012 that had not experienced foreign retail entry at the time of the ENIGH survey. ENIGH and the CPI data use a common set of 27 broad product groups (product classes) which we denote by $g$ in subsequent sections of the paper.

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, as well as household labor and business incomes and employment across Mexican municipalities over the period 2002-2014. As well as being of interest in their own right, these empirical estimates enter into the welfare expressions derived in the theoretical framework, and hence form the basis of the quantification of the household gains from retail FDI in Section 6.

5.1 Effect on Consumer Prices

5.1.1 Effect on Consumer Prices in Domestic Retail Outlets

Empirical Strategy To estimate the effect of foreign supermarket entry on consumer prices in pre-existing domestic retail outlets in expression 11, we combine information on the universe of foreign store locations and opening dates with monthly panel data on local barcode level prices from the confidential microdata of the Mexican CPI over the period 2002-2014. 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 could target faster growing municipalities whose retail environments are also becoming more competitive, so that store prices could be on a pre-existing downward trajectory for reasons other than foreign entry. Finally, rather than targeting a particular subset of municipalities at particular points in time, foreign retailers may expand rapidly over the sample period with the long term aim of establishing store presence in most urban municipalities. In this final scenario, we would expect a limited potential for biased estimates as neither the selection of municipalities nor the timing of opening would likely be correlated with differential pre-existing price growth, at least among urban municipalities that form part or our CPI microdata sample.
We use the microdata to indicate which scenario we are facing, and estimate the following baseline event study specification:

$$\ln p_{gsbm} = \sum_{\tau = -12}^{36} \beta_\tau I(Months\text{SinceEntry}_{mt} = \tau) + \delta_{gsbm} + \eta_t + \epsilon_{gsbm},$$

where $\ln p_{gsbm}$ is the log price of a barcode-product $b$ in product-group $g$, individual store $s$, in municipality $m$ and month $t$. $I(Months\text{SinceEntry}_{mt} = \tau)$ is an indicator function, and $Months\text{SinceEntry}_{mt}$ counts the months since foreign entry for each municipality $m$ at a given point in time $t$ (with negative values counting months before entry, positive values counting the months after entry, so that $Months\text{SinceEntry}_{mt} = 0$ in the month that a foreign store enters a municipality for the first time).\(^{17}\) Since expression 11 concerns the intensive margin pro-competitive effect, we restrict attention to prices at domestic stores before and after the first foreign store opening. The parameter $\beta_\tau$ captures the effect of foreign store entry for each of $\tau$ months before and after the opening event. $\delta_{gsbm}$ is a barcode-by-store fixed effect, and $\eta_t$ is a month fixed effect.\(^{18}\)

By estimating the treatment effect in the 12 months leading up to the opening event as well as the 36 months after, this approach allows us to test for the presence and slope of potential trends or leads in the run-up to the foreign store opening event in a transparent way without imposing parametric structure. The absence of pre-existing trends or leads would suggest that the two troubling scenarios outlined above are not an issue, while if there are trends or leads, 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. There is a clear tradeoff between a longer event study and a smaller, less representative, sample. Our choice of window was 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).

**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 2 years after entry at a negative and significant 3 percentage points. As evidenced by the treatment effect estimated for post 36 months (labeled “>36” in the figure), this pro-competitive effect appears to be permanent. Note that since the

\(^{17}\)We also define the indicator variable $I(Months\text{SinceEntry}_{mt} = 36)$, that picks up the last treatment effect, to take the value 1 for all $Months\text{SinceEntry}_{mt} \geq 36$.

\(^{18}\)Note, we do not include barcode-by-month fixed effects for two reasons. First, the product descriptions which we use to define barcodes in the CPI microdata are recorded consistently within stores over time, but not necessarily across stores or municipalities. Second, even with harmonized barcode-level product descriptions across stores and regions, because the store price data doesn’t sample an exhaustive list of products, or the same products in every location, including such fixed effects would absorb much of the variation in the data set.
CPI sampling weights reflect the consumption basket of a representative household, these point estimates indicate that foreign retail entry significantly lowers the price index when using a first order Laspeyres approximation.

In addition to the baseline event study specification in 15, 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).\(^{19}\) Second, to address any concern that longer-run pre-existing trends may not be detected in our fully balanced event study with 12 pre-months, we also extend the event study to cover 24 months before the opening event (Panel C of Figure 2). The coefficient patterns across the three panels are remarkably similar. Table 3 columns 1-3 presents 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 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.,\textsc{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 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 con-

\(^{19}\)Store types refer to modern store formats (supermarkets and big box stores) and 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 (http://www.ife.org.mx/documentos/DERFE/Cartografia/Circunscripciones_Electorales.html). Similarly, we assign each municipality in our sample to one of five population quintiles that we define over pre-existing populations in the year 2000 to compute the size-by-month fixed effects.
cerns directly. First, we add direct controls for time-varying municipality log annual local government expenditure from the Mexican statistical institute INEGI. As presented in Table 3, the event study coefficients are virtually unchanged after controlling for contemporary changes in local public expenditure, providing some reassurance against this concern. Second, we also estimate the baseline event study specification in 15 on the non-retail CPI microdata. This serves two purposes. If we do not expect non-retail prices to respond, it serves as a placebo falsification test as we might expect any omitted variables that change retail price trends to have similar effects on non-retail prices. If we think they may respond to foreign retail openings through indirect channels, the size of the response is needed for the quantification exercise. The non-retail CPI microdata includes price time series for consumer expenditures on, for example, the same local haircut, taxi ride, public transport fares, domestic cleaning services, apartment rents, private education fees or medical procedures. As shown in Table 3 columns 4 and 5, when considering these non-retail prices, the point estimates of the event study specifications are essentially 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**  After reporting the event study on the average retail price effect of foreign store entry, we also explore the heterogeneous effects of foreign entry on domestic retail prices across broad product categories as well as domestic store formats. This analysis is possible since the confidential version of the Mexican CPI microdata allows us to observe store formats and retailer names in addition to product groups. We estimate the following specification:

\[
\ln p_{gstm} = \sum_{gs} \beta_{gs} \left( \text{ForeignEntry}_{mt} \times \text{Product}_{gs} \right) + \delta_{gsbm} + \eta_{gst} + \theta_{rt} + \phi_{pt} + \epsilon_{gstm},
\]

where \( \text{ForeignEntry}_{mt} \) is an indicator that takes the value of 1 if there is a foreign store in the municipality \( m \) in period \( t \) and \( \text{Product}_{gs} \) is an indicator variable that takes the value of 1 if the retail price quote belongs to product group \( g \) and store type \( s \), and \( \delta_{gsbm} \) are barcode-by-store fixed effects. As before, to control for time-varying product-group by store-type specific shocks to price growth as well as price changes that may affect regions or municipality types differently in a given period, we also include product-group by store-type by month fixed effects \( \eta_{gst} \), region-by-month fixed effects \( \theta_{rt} \) and municipality size-by-month fixed effects \( \phi_{pt} \). The \( \beta_{gs} \) estimates capture the differential effect of foreign entry on domestic retail prices across product-group by store-type categories relative to a reference category. This specification on the heterogeneous effects of foreign entry is subject to similar identification concerns as discussed for the simple pre versus post mean comparison of the average effect above. We follow a similar strategy and rely on the lack of pre trends in the event study reported above. We also exclude all price observations during a 24 month adjustment period immediately after the foreign opening event. We exclude the first 24 months after store opening because the price coefficients in the event study level off by that time so our single coefficient here will capture the long-run price adjustment.

Table 4 reports the results of the treatment interactions with respect to domestic supermarkets.
as opposed to traditional stores, and with respect to food items as opposed to 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 effect is stronger for modern domestic store formats relative to traditional store formats.

5.1.2 Ex-Post Price Gaps between Foreign and Domestic Stores for Identical Barcode Products

Empirical Strategy As discussed in Section 3, empirical estimates of the average ex-post price differences charged by foreign retailers relative to domestic retailers can be used to estimate a simple and transparent empirical approximation for the direct price index effect of foreign retail entry (in combination with the price changes in domestic stores calculated in the previous subsection). To estimate these ex-post price differences in the same municipality and month and for identical barcode items in expression 12, we use the microdata of the international market research company over the period 2011-2014 to estimate the following specification:

\[
\ln p_{gsbm} = \beta_{DomesticStore} + \delta_{gbmt} + \epsilon_{gsbm},
\]

where \(DomesticStore\) is a dummy that takes the value of 1 if the retailer is not a foreign-owned store and \(\delta_{gbmt}\) is a barcode-by-municipality-by-month fixed effect. This specification estimates the average price gap between foreign stores and domestic stores for identical barcode items observed in the same location and during the same month. Alternatively, as in the previous subsection, we also estimate the ex-post price gaps after further breaking up the domestic retail environment into modern and traditional stores as well as food as opposed to non-food product groups within each of these retailer categories.

Estimation Results Table 5 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 are most pronounced for food relative to non-food product groups.

5.2 Effect on Consumption Quantities

5.2.1 Foreign Retail Market Shares Post-Entry

Empirical Strategy To calculate the direct price index effect in expression 9, we require estimates of the effect of foreign supermarket entry on the retail expenditure shares of foreign stores (broken down by product group and by household income group). To obtain these estimates we turn to the
uncensored microdata of the international market research company and estimate the following specification:

$$\sum_{s \in S_{gmt}} \phi_{ghmt} = \beta_{gh} + \gamma_{mt} + \epsilon_{ghmt}$$  \hspace{1cm} (18)$$

where $\sum_{s \in S_{gmt}} \phi_{ghmt}$ are local retail market shares of all foreign retailers $s \in S_{gmt}$, and $\gamma_{mt}$ are municipality-by-quarter fixed effects. We allow for the expenditure share estimates $\beta_{gh}$ to differ across product-group $g$ and household-type $h$, where household type is one of seven income-groups as described in Section 4. As above, we focus on the time period 24 months after initial foreign entry which we interpret as the long run (recall the price effects leveled off around that point). Accordingly, we restrict our sample to municipalities and time periods where foreign retailer had been open for 24 or more months. Thus, this specification estimates the mean long-run foreign retailer shares across 7 household income groups and 13 product groups.\(^{20}\)

The choice to estimate average ex post foreign retailer shares after 24 months raises the potential concern that foreign entry could be correlated with other changes in the municipality that also affect foreign retail market shares. For example, income growth or changes in local transport infrastructure may differentially affect retail expenditures on foreign and domestic stores. To limit potential bias, as a robustness exercise we also restrict the estimation of 18 to municipalities where foreign retail first arrived between 2 and three years ago. The identifying assumption is that up to three years after the foreign entry event, the predominant factor that affects foreign retail shares is the fact that a foreign store opened in the municipality, rather than other time varying factors, such as income growth, that could affect the relative expenditure shares on domestic and foreign outlets independently of a foreign store opening.

**Estimation Results** Figure 3 presents the estimation results using the microdata of the international market research company. These data allow us to trace each retailer’s expenditure shares by product group across individual household consumption baskets. The average ex-post quarterly share of total household retail expenditure on foreign stores is more than 30 percent. Given that the median number of foreign stores across urban Mexican municipalities is one single store, these results provide prima facie evidence of a substantial and significant direct price index effect of retail FDI in a developing country context.

Importantly, the estimated ex post expenditure shares on foreign stores significantly differ across the distribution of household incomes. Figure 3 suggest that the poorest income group spend approximately 40 percent less of their retail expenditure in foreign supermarkets compared to the richest income group. The lower panel of the figure then breaks up the observed average ex post expenditure shares on foreign stores across product groups, rather than household income groups. The insight that arises is that non-food product groups appear to have slightly higher foreign expenditure shares compared to food products. However, this difference is not very pronounced. These findings are confirmed in size and significance in the robustness exercise reported

\(^{20}\)See discussion in data section.
in the Online Appendix where we restrict the estimation sample to municipalities where foreign retail first arrived between 2 and 3 years ago.

5.2.2 Effect on Domestic Store Exit

**Empirical Strategy** To estimate the effect of foreign store entry on domestic store exit in expression 9, we use the microdata of the Mexican retail census, which provide us with store counts by traditional and modern store formats across urban sample municipalities in 2003 and 2008. We estimate the following specification separately for establishments in the traditional and the modern retail sectors:

\[
\ln \left( N_{\text{Establishments}_{m}^{08-03}} \right) = \beta_1 F_{\text{ForeignEntry}_{m}^{08-04}} + \beta_2 F_{\text{ForeignEntry}_{m}^{08-04}} + \gamma X_m + \epsilon_m \tag{19}
\]

where the outcome of interest is the change in the log number of retail units. The identification strategy in 19 is to estimate differences in domestic retail exit over the five year period 2003-08 across urban municipalities that experienced foreign entry between 2004-2008 relative to urban municipalities that experienced foreign entry after 2008, while conditioning on the difference in exit among urban municipalities that had experienced foreign entry by the time of the retail census in 2003. For \( \beta_1 \) to yield an unbiased estimate of the effect of foreign entry, the assumption must hold that foreign entry among urban municipalities before or after 2008 is not correlated with confounding factors that also affect municipality level retail sector outcomes.

While the event studies presented in the preceding subsections provide some support for this assumption, we also present a number of robustness checks. We report estimation results both before and after including an additional set of obvious municipality level control variables in \( X_m \). We follow the previous specifications and report to what extent our estimate of \( \beta_1 \) is affected by the inclusion of region fixed effects, municipality size fixed effects and contemporaneous changes in log public expenditures and log GDP per capita over the period 2003-08.

**Estimation Results** Table 6 presents the estimation results on the effect of foreign entry on domestic store exit using the Mexican retail census microdata. Foreign entry has a negative and statistically significant effect on municipality growth in the number of domestic retail outlets among independent traditional stores. The size of the point estimate is a negative 5.1\% for domestic store exit. Reassuringly, this point estimates remains virtually unchanged after the inclusion of additional regional fixed effects, pre-existing municipality size fixed effects, as well as controlling for contemporaneous changes in local government expenditures or GDP per capita. The coefficient estimate on store exit among modern domestic store formats is a negative 3.5\% but not statistically significant at conventional levels.
5.3 Effect on Nominal Labor and Business Incomes and Employment

**Empirical Strategy** To calculate the income effect in expression 14 of Section 3, we require estimates of the causal impact of foreign retail entry on nominal incomes and employment in the location where retail entry occurred. We start by analyzing the effect on average nominal labor incomes by running the following event study specification using the microdata of the Mexican urban income and employment surveys (ENEU/ENOE):

\[
\ln Income_{jmt} = \sum_{\tau=-10}^{20} \beta_{\tau} I(QuartersSinceEntry_{mt} = \tau) + \gamma X_{jmt} + \delta_{m} + \eta_{t} + \epsilon_{jmt},
\]

(20)

where subscripts \(j\), \(m\) and \(t\) index individuals, municipalities and quarters respectively. \(X_{jmt}\) are person controls including a gender dummy, dummies for completed degrees (below primary, primary, secondary, higher) and third order polynomials for age and years of schooling. Alternatively, we replace log monthly incomes with an employment indicator that takes the value of one if the person is employed. Hence, we regress quarterly individual income or employment outcomes on foreign store opening events in addition to person controls, municipality fixed-effects and quarter fixed-effects.

As discussed for the price regressions 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 in turn could be characterized by lower income growth rates. Finally, it could be that, as found to be the case in the price regressions, foreign retailers expanded rapidly during the estimation period with a longer-term planning horizon to establish store presence in a wide range of urban municipalities, so that store openings are uncorrelated with local shocks or pre-existing trends in incomes or employment (at least for our urban estimation sample).

To empirically explore these possibilities, we proceed to implement the event study in the same way as described above for the price regressions. As above, we balance the estimation sample between one year before and three years after the store entry event. This restriction excludes approximately ten percent percent of our income and employment 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.\(^{21}\)

In addition to these baseline specifications, we follow the same methodology outlined in the previous section and estimate a number of additional robustness checks. As in the consumer price event study, we replace the quarter fixed effects with region-by-quarter as well as municipality

\(^{21}\)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, the Online Appendix also reports results after including worker fixed effects.
size-by-quarter fixed effects, and we estimate specifications with both a one year pre-period as well as an extended event study with two years in the run up to the foreign retail entry event.

Before turning to the results on differential income effects, we note that our empirical methodology is only able to estimate income gains or losses within the location where the foreign store opened. Any changes in national income due to foreign store entry are absorbed in the fixed effects. Undoubtedly such effects may be important. The owners, headquarter employees and shareholders of large domestic supermarket chains are likely to experience profit declines, and employees at foreign firms’ Mexican headquarters could experience gains. Such income effects are likely to be concentrated in Mexico City and other major cities where the headquarters are located and are excluded from our analysis. Accordingly, this paper provides estimates of the local welfare effects of foreign retail entry rather than the complete national welfare effects.

For our quantification we require estimates of the nominal income effects broken down by occupation/income sources. Any differences across occupations will lead to heterogeneous welfare impacts on households depending on their pre-existing occupation breakdown. Therefore, to estimate to what extent household incomes are affected differently depending on the primary source of income (indexed by $i$ below), we also run specifications that allow for heterogeneity.

Since individuals may work in several occupations or become unemployed over time, and we only follow individuals over 5 consecutive quarters, if we want to assess the impact on workers in different occupations prior to foreign entry we are necessarily restricted to shorter-run responses. In order to obtain longer run responses that match our price results, we therefore evaluate aggregate changes in incomes and employment across different occupations without including worker fixed effects. As with the price regressions, we remove observations from the first two years after foreign store entry to explore long run adjustments. We regress log income or employment on a foreign entry dummy that takes the value 1 when there is a foreign store in the municipality interacted with an occupation dummy that takes the value of 1 if a worker is employed in that occupation:

$$\ln(\text{Income})_{jimt} = \sum_i \beta_i (\text{ForeignEntry}_{mt} \times \text{Occupation}_i) + \gamma \chi_{jimt} + \delta_{mt} + \eta_{im} + \theta_{it} + \epsilon_{jimt},$$ (21)

where subscripts $j$, $i$, $m$ and $t$ index individuals, occupations, municipalities and quarters respectively. Subscript $i$ includes categories for retail workers in modern store formats, retail workers in traditional store formats, as well as residents with their main income sources in agriculture and manufacturing. $\delta_{mt}$ is a municipality-by-quarter fixed effect, $\eta_{im}$ is an occupation-by-municipality fixed effect, and $\theta_{it}$ is an occupation-by-quarter fixed effect. The coefficients $\beta_i$ capture the differential effect of foreign store entry on the incomes of retail workers in modern store formats, traditional store formats as well as in agricultural and manufacturing occupations (conditional on flexible trends at the municipality-quarter level and initial earnings differences across occupation groups within the municipality and the quarter). Alternatively, we estimate specification 21 with employment dummies on the left hand side to capture the differential effect on employment propensities.

The reference category in 21 are residents with a main income source in non-retail services,
such as education, health care or financial services. Notice that while the ENEU data report both labor and business incomes in any given sector, we exclude the small fraction of retail business owners from these regressions. The reason is that the ENEU quarterly surveys do not have sufficient sample sizes to zoom in on the business income effects of this group of residents.\textsuperscript{22}

Finally, to estimate the effect of foreign retail entry on the business incomes among independent local store owners, we complement the urban employment and income surveys with the confidential microdata of the Mexican retail census, and estimate specification \textsuperscript{19} above after replacing changes in mean log number of stores on the left hand side with changes in mean log municipality profits among traditional retail establishments.\textsuperscript{23} For the quantification exercise, this breakup into an effect on store exit and an effect on mean profits is convenient as it provides us with an estimate of the extensive margin pro-competitive effect (store exit) as well as an estimate for the effect on total municipality profits (inclusive of lost profits of exiting stores), which is given by the sum of the two effects ($\text{dln(Total Profits)} = \text{dln(Mean Profits)} + \text{dln(Number of Stores)}$).

**Estimation Results** Figures 4 and 5 and Table 7 present the estimation results on the income and employment effects of foreign supermarket entry. The estimation results on the average effects in Figures 4 and 5 suggest no significant effects on average municipality level log monthly incomes or employment propensities. For completeness, the Online Appendix reports the regression table and additional results that confirm the findings depicted in the Figures.

Table 7 presents the results that explore heterogeneity across retail workers in modern store formats, traditional formats, as well as labor income effects on agricultural and manufacturing workers. 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 differential 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 approximately 5.9 percent as a result of foreign retail entry. It is important to keep in mind that the ENEU allows us to estimate the effect on retail worker earnings conditional on employment in that sector during any given quarter. What the ENEU do not allow us to quantify is the extensive margin effect of workers or store owners that lose their job or business as a consequence of foreign retail entry because of the very short 5 quarter panel structure.

The final four columns of the table aim to shed light on such extensive margin effects using the ENEU employment data. We find insignificant estimates of the effect of retail entry on the employment propensities across the four occupational groups relative to average changes in employment

\textsuperscript{22}The median number of store owners in a given municipality-by-quarter in the ENEU is 9.

\textsuperscript{23}Notice that we do not estimate the effect on modern retail profits. The first reason is data constraints. While we are able to observe the total number of modern units and subtract the number of foreign owned units from our separate ANTAD data source, we cannot distinguish domestic and foreign owned store profits in the modern retail sector in the census microdata. The second reason is conceptual. Given that we are interested in the welfare effect of foreign store entry among local households, the profits of retail chains that are repatriated to their headquarters and share holders would not enter the welfare expression in 3.
in the municipality.

Finally, Table 8 presents the estimation results on the effect of foreign entry on domestic traditional store profits from the Mexican retail census microdata. Foreign entry has a negative and statistically significant effect on municipality growth in mean retail profits. The size of the point estimate on profits is a negative 5%. Reassuringly, this point estimates remain virtually unchanged after the inclusion of additional regional fixed effects, pre-existing municipality size fixed effects, as well as controlling for contemporaneous changes in local government expenditures or GDP per capita.

6 Quantifying the Welfare Effect of Foreign Retail

In order to quantify the effects of foreign retail on local household welfare, we proceed in two steps. First we exploit the consumer panel microdata to estimate the elasticity of substitution across local retail outlets as a function of their price differences. Second, we use the household microdata from the Mexican income and expenditure surveys (ENIGH) to estimate initial household-specific budget shares at the product group-by-store type level in addition to household income shares across different occupations and business income sources. Armed with all three types of observable moments (causal effects, demand parameters and initial budget and income shares), we then proceed to the quantification.

6.1 Estimation of the CES Elasticity Parameter

For the estimation of the preference parameters we use a market research company’s records on individual household shopping patterns across multiple stores. In the estimation procedure we will draw on the elasticity of household shopping responses with respect to variation in store-specific prices across locations to identify these parameters. These cross-location estimates form our baseline specification for two main reasons: these are 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 very short term duration (around 3 years).

In the CES case, note that the logged share equation can be written as

\[
\ln \phi_{gshmt} = (1 - \eta_{gh}) \ln r_{gshmt} - (1 - \eta_{gh}) \ln c_{ghmt} + \eta_{gh} \ln \beta_{gshmt}
\]

(22)

where \( c_{ghmt} = \sum_{s \in S_{gmt}} (\beta_{gsh}) \eta_{gh} (r_{gshmt})^{1 - \eta_{gh}} \) is the CES price index, \( g \) indexes product groups, \( s \) indexes stores, \( h \) indexes household income groups, \( m \) indexes location, and \( t \) indexes time. If we had measures of \( r_{gshmt} \), the price index for product group \( g \) within store \( s \) for income group \( h \), we could simply run the following regression:

\[
\ln \phi_{gshmt} = b_{gh} \ln r_{gshmt} + \delta_{ghmt} + \gamma_{st} + u_{gshmt}
\]

(23)
where $u_{ghmt}$ is measurement error on log budget shares that needs to be uncorrelated with prices, $\delta_{ghmt}$ are product-group-by-income-group-by-municipality-by-time fixed effects, $\gamma_{st}$ is a store-time fixed effect that absorbs unobserved taste differences across stores and time which we discuss in more detail in the next paragraph. Finally, $1 - b_{gh}$ is the parameter of interest: the elasticity parameter $\eta_{gh}$ that governs the degree of substitutability between local retail outlets as a function of store price differences. When we carry out the estimation, we restrict this parameter to be identical across households and product groups as our baseline estimation approach. We later relax this assumption, and allow the parameter to potentially differ across income groups as well as product categories.\(^{24}\)

We allow the store-specific taste shifters to vary across time through the inclusion of store-by-time fixed effects. Essentially we are comparing store market shares across locations with different relative price indexes across stores (where prices indexes across stores are all demeaned by product group, income group, municipality and time through the $\delta_{ghmt}$ fixed effects). Exploiting the cross section in this manner provides estimates of long run elasticities since if price differences are persistent over time, when we look across municipalities we see consumers that have had time to adjust their shopping patterns in response to these price differences across stores.

Turning to our measures of the store price index, $r_{ghmt}$, recall we left the third tier of the demand system unspecified in Section 3. In principle we could use any demand system to calculate the price index. For simplicity and transparency, we use a Stone-price index, $\ln r_{ghmt} = \sum_{b \in B_{ghmt}} p_{gbhmt} \phi_{gsbhmt}$, or a budget share weighted sum of log prices. As barcodes differ across stores, and some stores may sell higher-quality varieties, we ensure that we are only comparing identical products to extract price differences by recovering $\ln r_{ghmt}$ from regressing budget-share-weighted log prices at the barcode level (where budget shares are income group-specific) on store-by-product-group-by-income-group-by-municipality-by-time fixed effects. The coefficient on the fixed effects provides an estimate of the store price index for a product and income group relative to other stores in that municipality and time period.

Given the nature of the consumption microdata, we collapse the price data to averages at the (retailer identity)-(barcode)-(income-group)-(quarter)-(municipality) level in order to estimate the specifications above.\(^{25}\)

We address the standard simultaneity concern that arises when estimating demand. For example, suppose that the taste parameters $\beta$ are not constant across locations within a store-time period as implicitly assumed when we include only a $\gamma_{st}$ fixed effect. Deviations in taste shifters would then enter the error term and potentially be correlated with $\Delta \ln p_{gsh}$ due to supply side considerations. To deal with this concern we follow Hausman (1996) and instrument price indexes with price indexes in stores of the same retailer in nearby municipalities. The assumption

\(^{24}\)Notice that despite the richness of these microdata, the variation starts to become thin once we allow for heterogeneity along the $h$ or $g$ dimension. To see this more clearly, notice that there are on average 40 households observed in a given quarter in a given municipality.

\(^{25}\)The retailer identity is one of the retailers we can identify from the microdata with all traditional stores (for which the research company does not brand-identify a retailer) grouped together. The market research company data divide consumers into six income groups.
here is that deviations in the taste shifters across locations are idiosyncratic, a similar assumption required for the identification through heteroskedasticity approach in Feenstra (1994), Broda and Weinstein (2006) and Feenstra and Weinstein (2013), and so these deviations do not confound prices in nearby locations which serve as valid instruments in the presence of common supply side price determinants.

Table 9 presents the estimation results for the average household elasticity of substitution under CES. The IV point estimate reported in Table 9 that we use for the welfare quantification is $\eta = 3.82$.

### 6.2 Calculating the Welfare Effect of Foreign Retail Entry

We now calculate the expressions derived in the theoretical framework of Section 3, using both the causal effects estimated in Section 5 and the demand parameters from this section to quantify the welfare effects of foreign retail entry across Mexican households. We first explain how to map the various casual estimates into the theoretical welfare expressions, then we proceed report the results of the quantification both for the average household and for the full distribution of households.

To be consistent with the empirical estimates of the previous sections, we restrict attention to ENIGH households surveyed over the period 2006-2012 (four cross-sections covering incomes and expenditure for the third quarters of 2006, 2008, 2010 and 2012) who reside in urban municipalities without foreign stores at the time of the survey. Unlike earlier ENIGH surveys, these four rounds break down the location of expenditure by product group into detailed store categories that allow us to code the expenditure as occurring in modern or traditional stores. The ex ante household income shares as well as ex ante household expenditure shares provide us with the remaining parameters needed to perform the full quantification outlined in Section 3.

To quantify the cost of living effect, ideally we would separately estimate the causal price changes and budget share changes for every barcode product in every domestic store. Given the available store price microdata that we use in the event study methodology presented in Section 5, estimating such a large number of causal price effects is not feasible. Instead, we make a simplifying assumption that still allows for substantial heterogeneity. We assume that causal price changes within a product-group-by-store-type are the same, where the two store types are domestic continuing modern, $M$, stores and domestic continuing traditional, $T$, stores and product groups refer to food and beverages and non-food consumption:

$$\frac{p_{sib}}{p_{gib}} = p_{sj} \forall s \in S_{dcj}.$$  

where $j$ takes two values, $M$ or $T$. Note that we allow these price changes to differ by broad product groups as well as store types, so for example food prices could fall more than the prices of non-food products, and relatively more so in domestic modern than traditional stores as suggested by the empirical estimates in Table 4.

With this assumption in hand, and the estimates of the causal effects on price changes and ex post foreign retail shares reported in Section 5, we have almost all we need to carry out the quantification exercise presented in Section 3. The only remaining inputs are empirical estimates
of post-foreign-entry market shares of continuing domestic varieties that enter into the ideal log change weights. In the CES case, these can be easily calculated since the estimated elasticities of substitution allow us to calculate ex post budget shares for continuing stores as a function of initial expenditure shares in the ENIGH surveys and the estimated prices effects:

$$\tilde{\phi}_{gsh}^1 = \phi_{gsh}^0 \left( \left( \frac{p_{gj}}{p_{gM}} \right)^{1-\eta_{gh}} \frac{\sum_{s \in S_{dcM}} \phi_{gsh}^0}{\sum_{s \in S_{dcT}} \phi_{gsh}^0} \right)$$

where \( j \) takes the value \( M \) if \( s \in S_{dcM} \) and the value \( T \) if \( s \in S_{dcT} \). Note that \( \sum_{s \in S_{dcM}} \phi_{gsh}^0 \) is the expenditure share of continuing domestic store purchases of product group \( g \) spent in modern retail.

### 6.3 Quantification Results

#### 6.3.1 Average Household Gains from Foreign Retail Entry

In this subsection, we present the quantification results and explore several counterfactuals that shed light on the interplay of forces that underlie the distribution of the welfare effects that we find.

We first present the results of the quantification under the exact (CES) approach. The ENIGH data combined with our empirical moments allow us to calculate welfare gains separately for each household in the sample based on their expenditure shares and income sources. Column 1 of Table 10 presents the mean of the total welfare gain across all households as well as the various sub components of the total welfare effect in columns 2-7. Foreign store entry leads to large and significant welfare gains for the average household in the municipality where the store opened. These gains are of the order of 7.5 percent of initial household welfare.

Given that the counterfactual analysis is based on international integration (foreign entry) in just one sector of the economy, these welfare effects are large relative to existing estimates of the gains from trade (Arkolakis et al., 2012). Two important insights arise from our analysis in this respect. First, retail is an important non-tradable sector that would frequently be omitted when quantifying the gains from international integration. In particular, while not a majority of households source nominal incomes from retail employment, all households are affected by retail sector shocks through changes in local cost of living. Second, the richness of the newly available micro-data that our analysis brings to bear allows us to evaluate the consequences of foreign supermarket entry on all major components of household welfare without shutting down potential channels, such as pro-competitive effects, ex ante.

The majority of the total welfare gain is driven by a significant reduction in the cost of living rather than income effects. While the adverse effects on the household incomes of traditional retail workers and local store owners are economically significant (estimated negative 5-6 percent changes), these effects are muted when analyzing the municipality as a whole. In contrast, retail constitutes a large share of household expenditures for all households which drives large cost of
living effects.

Focusing on the cost of living effect, about 20 percent of this effect comes from pro-competitive effects on the intensive margin, i.e. reductions in prices at domestic stores induced by the entry of foreign retailers. The remaining 80 percent of the cost of living effect is due to the direct price index effect of foreign entry, a finding already foreshadowed in the raw data by both the significantly lower prices charged by foreign stores and their large ex-post retail market shares reported in Section 5.

Turning to the first order approach in columns 8-14 of Table 10 we see that the Paasche approximation of the direct price index effect that is purely based on observable price changes can account for one third of the exactly estimated direct price index effect under CES (2.07 percent as opposed to 6.20 percent). This effect does not capture three potentially important welfare gains due to foreign store entry: gains from greater product variety or higher quality product varieties, potentially higher shopping amenity at foreign stores, and gains from the addition of an additional store variety. Hence, in an approximate sense, these additional sources of welfare gains account for around two thirds of the total welfare gain. Given the large differences in product variety and quality at these foreign stores and differences in amenity that we highlighted in Section 2, the share accounted for by these channels seems plausible (a discussion we will return to when assessing the distribution of the welfare gains). The pro-competitive price effect is also slightly smaller under the direct approach, which can be explained by the fact that we use a Paasche first-order approximation which will tend to underestimate the pro-competitive effects as it uses ex post weights on domestic stores.

6.3.2 The Distribution of the Gains from Foreign Retail Entry

Since we have estimates of the welfare gains for every household in the ENIGH sample, we can plot these estimated gains against initial household income to explore the distribution of the gains from foreign retail entry. Figure 6 presents non-parametric plots of the exact approach quantification, and Figure 7 breaks up this total welfare effect into the various components. We find that while all income groups benefit substantially from foreign retail entry, richer households gain more than poorer households. The regressiveness of the gains from retail FDI is sizable. The total welfare gain for the poorest household group is about 5 percent, doubling to 10 percent for the richest households.

Where do these regressive gains come from? Figure 8 presents a number of counterfactual exercises that allow us to analyze the interplay of forces underlying these results. Each of these graphs sets one component of the quantification equal to the mean of that component across all households in the sample and compares the resulting counterfactual distribution of the welfare gains from foreign entry to the one we actually observe. We explore the role of several salient differences in household shopping and income patterns across the household income distribution: expenditure shares on foreign retailers relative to domestic ones ex post, on retail relative to non-retail consumption, on food relative to non-food product groups within retail, and labor and
business income shares from retail relative to other income sources.

On one hand, post foreign entry the richest households spend over 50 percent of their total retail expenditure at foreign stores compared to merely 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, as captured by $\beta_{gsh}$ in expression 6. As shown in Figure 8, this moment in the data clearly works in favor of richer households experiencing much larger reductions in cost of living due to foreign entry: In the absence of differences in foreign shares across households, the gains would actually become progressive.

On the other hand, richer households spend a significantly smaller share of their total expenditure on retail consumption compared to poorer households. As shown in Figure 8, this moment in the data works in the opposite direction. In absence of differences in retail expenditure shares, the gains from retail globalization would be vastly more regressive than we estimate.

The two remaining sources of heterogeneity have much more moderate impacts on the distribution of gains across households. As shown in Figure 8, the fact that poorer households spend more of their retail expenditure on food consumption contributes positively but only slightly to the regressiveness of the welfare gains. The reason for this is that both the pro-competitive effect on domestic retail prices in Table 4 as well as the direct price index effect in Figure 3 are relatively evenly distributed across food and non-food product groups. Finally, differences in retail income shares across the income distribution do not appear to contribute significantly to the estimated regressiveness. 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 or being self-employed in the retail sector), these differences have little effect on the total welfare gains from foreign retail entry since the majority of households derive no 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 welfare effect of retail FDI. Empirically, we exploit information about the location and date of opening for the universe of foreign-owned supermarkets in Mexico to ensure that the moments we feed into the welfare expression are causally identified.

The paper presents several new findings. We find that foreign supermarket entry causes large and significant welfare gains for the average household. The majority of this effect is driven by a significant reduction in the cost of living. Interestingly, a significant fraction of this price index effect appears to be driven by pro-competitive effects on consumer prices charged in domestic stores. This effect arises in addition to the direct price index effect that is due to the new foreign
retail outlet offering cheaper prices, new varieties and different shopping amenities to local consumers. Turning to nominal incomes, we find no evidence of an 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 and the wage incomes of workers in the traditional retail sector. Finally, we exploit the richness of the household microdata to quantify the distribution of the gains from retail FDI. We find that while all household income groups on average experience significant gains from retail FDI, this effect is about twice as large for the richest income group compared to the poorest, and quantify the interplay of opposing forces that underlie this finding.

Our analysis provides a number of insights that relate to ongoing debates about developing country policies on retail FDI. Most importantly, our findings suggest that these debates may focus too little on potential real income gains for the vast majority of consumers due to improvements in local purchasing power. Instead they commonly focus on potentially adverse effects for an important, but nevertheless select, subgroup of households working in the traditional retail sector. The empirical evidence suggests that while the potential for adverse nominal income effects is borne out in the data, these effects appear to be trumped by significant reductions in local cost of living inflation that on average give rise to net welfare gains across all household income groups.

References


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 source are annual publications of the Mexican National Association of Supermarkets (ANTAD).
Figure 2: Effect on the Prices of Domestic Retailers: Monthly Event Study

Notes: Point estimates are based on monthly price time series of unique barcode-by-store combinations over the period 2002-2014. The dots correspond to coefficient estimates from a regression of log prices on the indicated monthly treatment effects in addition to barcode-by-store fixed effects and month fixed effects in the baseline specification. The reference category in all graphs are barcode prices 6 months before foreign entry. Controls indicates 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 that are clustered at the municipality level.
Notes: The graphs depict quarterly household retail expenditure shares on foreign stores among municipalities that have experienced foreign store entry more than two years ago. The point estimates are based on regressions of household expenditure shares on the indicated income group or product group dummy variables in addition to municipality-by-quarter fixed effects. The data source for this graph are the microdata of the Mexican operation of a large international market research company for the years 2011-14. Both graphs depict 95% confidence intervals based on standard errors that are clustered at the municipality level.
Figure 4: Effect on Average Municipality Monthly Incomes

Notes: Point estimates are based on the quarterly microdata of the Mexican urban income and employment surveys over the period 2002-2012. The dots correspond to coefficient estimates from a regression of log monthly incomes on the indicated quarterly treatment effects in addition to municipality fixed effects, quarter fixed effects, as well as person controls for sex, education and age. The reference category are incomes 2 quarters before foreign entry. The graphs depict 95% confidence intervals based on standard errors that are clustered at the municipality level.
Figure 5: Effect on Average Municipality Employment

Panel A: Baseline

Panel B: Baseline + Controls

Panel C: Extended Baseline + Controls

Notes: Point estimates are based on the quarterly microdata of the Mexican urban income and employment surveys over the period 2002-2012. The dots correspond to coefficient estimates from a regression of individual employment indicators on the indicated quarterly treatment effects in addition to municipality fixed effects, quarter fixed effects, as well as person controls for sex, education and age. The reference category are employment propensities 2 quarters before foreign entry. The graphs depict 95% confidence intervals based on standard errors that are clustered at the municipality level.
Figure 6: Gains from Foreign Retail Entry across the Household Income Distribution

Notes: The graph is based on 12,293 households residing in 240 urban municipalities between 2006-2012 that had not experienced foreign retail entry at the time of the ENIGH survey.
Figure 7: Gains from Foreign Retail Entry across the Household Income Distribution

Notes: The graph is based on 12,293 households residing in 240 urban municipalities between 2006-2012 that had not experienced foreign retail entry at the time of the ENIGH survey.
Figure 8: Counterfactual Distributions of the Gains

Notes: The graphs are based on 12,293 households residing in 240 urban municipalities between 2006-2012 that had not experienced foreign retail entry at the time of the ENIGH survey.
## Tables

### Table 1: Descriptive Statistics

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Geographic coverage</th>
<th>Num. municipalities</th>
<th>Time period</th>
<th>Data collection strategy</th>
<th>Variable</th>
<th>Num. obs.</th>
<th>Units of observation</th>
<th>Units of measurement</th>
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<th>Median</th>
<th>Std. dev.</th>
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<th>Max</th>
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<td>ANTAD - Store openings</td>
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<td>Jan 2002-Mar 2014</td>
<td>monthly</td>
<td>Members' reports</td>
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<td>Banxico/INEGI - CPI microdata</td>
<td>National (46 metro areas in 32 States)</td>
<td>141</td>
<td>Jul 2002-Mar 2014</td>
<td>monthly</td>
<td>Panel. Monthly store visits</td>
<td>Prices</td>
<td>10,891,110</td>
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<td>Market research company</td>
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<td>156</td>
<td>Q1 2011 - Q1 2014</td>
<td>weekly</td>
<td>Panel Bi-weekly household visits, 6,000 households</td>
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<td>CE- Retail establishment census</td>
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<td>608</td>
<td>2003 and 2008</td>
<td>quinquenial</td>
<td>Repeated cross section</td>
<td>Traditional store units in mun.</td>
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<td>Municipalities</td>
<td>Units</td>
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<td>National urban mun. over 100,000</td>
<td>532</td>
<td>Q1 2002 - Q4 2012</td>
<td>quarterly</td>
<td>Rotating panel of approx. 250,000 individuals aged 15+. Each person followed 5 quarters</td>
<td>Monthly income</td>
<td>12,749,290</td>
<td>Individuals</td>
<td>MXN</td>
<td>1,933</td>
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<td>ENIGH - Income-expenditure survey</td>
<td>National</td>
<td>971</td>
<td>2006, 2008, 2010, 2012</td>
<td>biannual</td>
<td>Repeated cross section approx. 20,000 households per round</td>
<td>Monetary Income (quarter)</td>
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<td>Expenditures (quarter)</td>
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<td>Wage income share</td>
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<td>households</td>
<td>Share</td>
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<td>Business income share</td>
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<td>Share</td>
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<td>Other income share</td>
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<td>Share</td>
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**Notes:**

1. Our main CPI estimating sample consists of barcode-equivalent products (hence excludes non-barcode items such as health, transportation, housing etc.) This leaves 120 genericos out of 315 for the price regressions.
2. We obtained municipal level aggregates from an underlying universe of 1.3 and 1.8 million retail establishments in 2003 and 2008 respectively in the 608 ANTAD municipalities.
Table 2: How Do Foreign Owned Stores Differ Ex Post?

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<th>Dependent Variable:</th>
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<td>1.612***</td>
<td>1.911***</td>
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<td></td>
<td>(0.00913)</td>
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<td>Municipality-By-Product-By-Month FX</td>
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<td>x</td>
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<td>Observations</td>
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<td>18,659,777</td>
<td>10,393</td>
<td>11,113</td>
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<td>R-squared</td>
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<td>Number of Municipalities</td>
<td>151</td>
<td>151</td>
<td>151</td>
<td>499</td>
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Notes: Columns 1-3 are based on the microdata of the Mexican operation of a large international market research company for the years 2011-14. Column 4 is based on the administrative records of the Mexican National Retail Association (ANTAD) over the period 2002-2007. Estimation samples in Columns 3 and 4 report mean differences among modern store formats (supermarkets) of domestic and foreign retailers. Regressions are weighted by household weights and expenditure weights across products. Standard errors are clustered at the municipality level and reported in parenthesis below the point estimates. * 10%, ** 5%, *** 1% significance levels.
### Table 3: Effect on the Prices of Domestic Retailers

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<th>Dependent Variable:</th>
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<td>Foreign Entry - Four Quarters Before</td>
<td>0.000227</td>
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<td>(0.00228)</td>
<td>(0.00367)</td>
<td>(0.00336)</td>
<td>(0.00336)</td>
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<td>-0.00115</td>
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<td>Foreign Entry - Two Quarters Before</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>Foreign Entry - One Quarter Before</td>
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<td>(0.00193)</td>
<td>(0.00370)</td>
<td>(0.00490)</td>
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<tr>
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<td>-0.00505</td>
<td>-0.00499</td>
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<td>-0.00875**</td>
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<td>Foreign Entry - Three Quarters After</td>
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<td>Foreign Entry - Four Quarters After</td>
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<td>-0.0283***</td>
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<td>Foreign Entry - Six Quarters After</td>
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<td>Foreign Entry - Seven Quarters After</td>
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<td>(0.00959)</td>
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<tr>
<td>Foreign Entry - Eight Quarters After</td>
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<td>-0.0341***</td>
<td>-0.0341***</td>
<td>0.0106</td>
<td>0.00693</td>
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<tr>
<td></td>
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<td>Foreign Entry - Nine Quarters After</td>
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<td>-0.0362***</td>
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<td>(0.01161)</td>
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#### P-Value (Post 3 Years = 12 Quarters After)

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<th>0.0075</th>
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**Notes:** The dependent variable is log barcode prices. Regressions are based on the monthly price time series of unique barcode-by-store combinations over the period 2002-2014 in 120 product groups and 76 municipalities. Foreign Entry indicates the first presence of a foreign supermarket in the municipality. The final columns show results on non-retail CPI price quotes including transportation, housing, education, health and other services. The equivalent to “barcode-by-store” fixed effects in that estimation are individual item codes followed each month (such as the same haircut or the same taxi ride). Standard errors are clustered at the municipality level and reported in parenthesis below the point estimates. * 10%, ** 5%, *** 1% significance levels.
Table 4: Effect on the Prices of Domestic Retailers - Heterogeneity

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<td>Log Price</td>
<td>Log Price</td>
<td>Log Price</td>
<td>Log Price</td>
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<tr>
<td>Average Effect</td>
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<td>(0.0119)</td>
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<td>Effect on Food &amp; Beverage Products</td>
<td>-0.0395***</td>
<td>(0.0137)</td>
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<td>Effect on Non-Food Products</td>
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<td>Effect on Traditional Retail Outlets</td>
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<tr>
<td>Effect on Food Products in Modern Outlets</td>
<td></td>
<td></td>
<td></td>
<td>-0.0559***</td>
</tr>
<tr>
<td>Effect on Non-Food Products in Modern Outlets</td>
<td></td>
<td></td>
<td></td>
<td>-0.0497*</td>
</tr>
<tr>
<td>Barcode-By-Store FX</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Product-By-Store Type-By-Month FX</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Region-By-Month FX</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Municipality Size-By-Month FX</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Observations</td>
<td>2,790,780</td>
<td>2,790,780</td>
<td>2,790,780</td>
<td>2,790,780</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.996</td>
<td>0.996</td>
<td>0.996</td>
<td>0.996</td>
</tr>
<tr>
<td>Number of Barcode-By-Store Cells</td>
<td>123,937</td>
<td>123,937</td>
<td>123,937</td>
<td>123,937</td>
</tr>
<tr>
<td>Number of Product-By-Store Type-By-Month Cells</td>
<td>33,516</td>
<td>33,516</td>
<td>33,516</td>
<td>33,516</td>
</tr>
<tr>
<td>Number of Region-By-Month Cells</td>
<td>705</td>
<td>705</td>
<td>705</td>
<td>705</td>
</tr>
<tr>
<td>Number of Municipality Size-By-Month Cells</td>
<td>705</td>
<td>705</td>
<td>705</td>
<td>705</td>
</tr>
<tr>
<td>Number of Municipality Clusters</td>
<td>76</td>
<td>76</td>
<td>76</td>
<td>76</td>
</tr>
</tbody>
</table>

Notes: The dependent variable is log barcode prices. Regressions are based on monthly price observations over the period 2002-2014 in 120 product groups and 76 municipalities. Foreign Entry indicates the presence of a foreign supermarket in a municipality. Estimations are based on regressions after excluding an adjustment period of 24 months. Standard errors are clustered at the municipality level and reported in parenthesis below the point estimates. * 10%, ** 5%, *** 1% significance levels.
Table 5: Ex-Post Price Differences for Identical Barcodes

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Outlets</td>
<td>0.118***</td>
<td>0.124***</td>
<td>0.0744***</td>
<td>0.173***</td>
</tr>
<tr>
<td></td>
<td>(0.00913)</td>
<td>(0.00979)</td>
<td>(0.00765)</td>
<td>(0.00874)</td>
</tr>
<tr>
<td>Food &amp; Beverage Products in Domestic Outlets</td>
<td>0.124***</td>
<td>(0.00979)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Food Products in Domestic Outlets</td>
<td>0.0744***</td>
<td>(0.00765)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional Domestic Outlets</td>
<td>0.173***</td>
<td>(0.00874)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modern Domestic Outlets</td>
<td>0.174***</td>
<td>(0.00942)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food &amp; Beverage Products in Traditional Domestic Outlets</td>
<td>0.170***</td>
<td>(0.0108)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Food Products in Traditional Domestic Outlets</td>
<td>0.170***</td>
<td>(0.0108)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food &amp; Beverage Products in Modern Domestic Outlets</td>
<td>0.0431***</td>
<td>(0.0124)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Food Products in Modern Domestic Outlets</td>
<td>0.0189***</td>
<td>(0.00713)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipality-By-Barcode-By-Month FX</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Observations</td>
<td>18,659,777</td>
<td>18,659,777</td>
<td>18,659,777</td>
<td>18,659,777</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.923</td>
<td>0.923</td>
<td>0.923</td>
<td>0.923</td>
</tr>
<tr>
<td>Number of Municipalities</td>
<td>151</td>
<td>151</td>
<td>151</td>
<td>151</td>
</tr>
</tbody>
</table>

Notes: The dependent variable is log barcode prices. Regressions are based on the microdata of the Mexican operation of a large international market research company for the years 2011-14. The reference category in all columns are barcode prices in foreign owned retailers. Regressions are weighed by household weights and expenditure weights across products. Standard errors are clustered at the municipality level and reported in parenthesis below the point estimates. * 10%, ** 5%, *** 1% significance levels.
Table 6: Store Exit

<table>
<thead>
<tr>
<th>Dependent Variable: ΔLog(Number Stores) 2003-08</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign Entry 2004-2008</td>
<td>-0.049*</td>
<td>-0.047</td>
<td>-0.048</td>
<td>-0.051*</td>
<td>0.0088</td>
<td>-0.0065</td>
<td>-0.036</td>
<td>-0.035</td>
</tr>
<tr>
<td>Foreign Entry Pre 2003</td>
<td>-0.087***</td>
<td>-0.082***</td>
<td>-0.071***</td>
<td>-0.081***</td>
<td>0.20***</td>
<td>0.16***</td>
<td>0.17***</td>
<td>0.17***</td>
</tr>
<tr>
<td>Δlog(Public Expenditures)</td>
<td>0.042</td>
<td>0.038</td>
<td>0.026</td>
<td>0.027</td>
<td>0.053</td>
<td>0.058</td>
<td>0.060</td>
<td>0.062</td>
</tr>
<tr>
<td>Δlog(GDP per Capita)</td>
<td>0.061*</td>
<td>0.012</td>
<td>0.045</td>
<td>0.063</td>
<td>(0.035)</td>
<td>(0.12)</td>
<td>(0.066)</td>
<td></td>
</tr>
</tbody>
</table>

Geographical Region FX  
Municipality Size FX  
Observations 608 608 564 564 608 608 564 564  
R-squared 0.014 0.069 0.071 0.064 0.015 0.085 0.107 0.107  
Median Number of Stores Per Municipality in 2003 and 2008 800 800 800 800 8 8 8 8  
Number of Municipality Clusters 608 608 564 564 608 608 564 564  

Notes: Estimations are based on 608 urban municipalities in the confidential microdata of the Mexican retail census for 2003 and 2008. * 10%, ** 5%, *** 1% significance levels.
### Table 7: Effect on Incomes - Heterogeneity

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>(1) Log (Monthly Income)</th>
<th>(2) Log (Monthly Income)</th>
<th>(3) Log (Monthly Income)</th>
<th>(4) Employed</th>
<th>(5) Employed</th>
<th>(6) Employed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect on Modern Retail Workers</td>
<td>-0.000278 (0.0192)</td>
<td><strong>-0.0348</strong> (0.0204)</td>
<td>-0.0278 (0.0212)</td>
<td>0.0406*** (0.00420)</td>
<td>-0.00350 (0.00495)</td>
<td>0.000817 (0.00432)</td>
</tr>
<tr>
<td>Effect on Traditional Retail Workers</td>
<td>-0.0356* (0.0199)</td>
<td>-0.0571*** (0.0216)</td>
<td>-0.0592** (0.0240)</td>
<td>0.0334*** (0.00399)</td>
<td>-0.00300 (0.00540)</td>
<td>-0.000368 (0.00525)</td>
</tr>
<tr>
<td>Effect on Manufacturing</td>
<td>0.0265 (0.0264)</td>
<td>0.0218 (0.0311)</td>
<td>0.0202 (0.0307)</td>
<td>0.0287*** (0.00498)</td>
<td>-0.000929 (0.00553)</td>
<td>0.00384 (0.00435)</td>
</tr>
<tr>
<td>Effect on Agriculture</td>
<td>-0.00513 (0.0174)</td>
<td>-0.00612 (0.0186)</td>
<td>0.0117 (0.0187)</td>
<td>0.0206*** (0.00368)</td>
<td>-0.00427 (0.00453)</td>
<td>-0.000619 (0.00383)</td>
</tr>
</tbody>
</table>

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 5,068,812 5,068,812 5,068,812
R-squared: 0.340 0.340 0.341 0.058 0.060 0.060
Number of Individuals: 1,455,911 1,455,911 1,455,911 1,681,575 1,681,575 1,681,575
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:** Estimations are based on 273 urban municipalities over the period 2002-2012. We exclude an adjustment period of two years. Standard errors are clustered at the municipality level and reported in parenthesis below the point estimates. * 10%, ** 5%, *** 1% significance levels.
Table 8: Effect on Store Profits

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign Entry 2004-2008</td>
<td>-0.049*</td>
<td>-0.047</td>
<td>-0.048</td>
<td>-0.051*</td>
</tr>
<tr>
<td></td>
<td>(0.028)</td>
<td>(0.029)</td>
<td>(0.030)</td>
<td>(0.030)</td>
</tr>
<tr>
<td>Foreign Entry Pre 2003</td>
<td>-0.087***</td>
<td>-0.082***</td>
<td>-0.071***</td>
<td>-0.081***</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.024)</td>
<td>(0.026)</td>
<td>(0.027)</td>
</tr>
<tr>
<td>Δlog(Public Expenditures)</td>
<td>0.042</td>
<td>0.038</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.046)</td>
<td>(0.045)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Δlog(GDP per Capita)</td>
<td></td>
<td></td>
<td>0.061*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.035)</td>
<td></td>
</tr>
</tbody>
</table>

|                          |    |    |    |    |
| Geographical Region FX   | x  | ✓  | ✓  | ✓  |
| Municipality Size FX     | x  | ✓  | ✓  | ✓  |
| Observations             | 608| 608| 564| 564|
| R-squared                 | 0.014| 0.061| 0.064| 0.071|
| Median Number of Stores Per Municipality in 2003 and 2008 | 800 | 800 | 800 | 800 |
| Number of Municipality Clusters | 608 | 608 | 564 | 564 |

Notes: Estimations are based on 608 urban municipalities in the confidential microdata of the Mexican retail census for 2003 and 2008. * 10%, ** 5%, *** 1% significance levels.
<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log(Store Price Index)</td>
<td>0.535*** (0.0153)</td>
<td>-2.819** (1.248)</td>
</tr>
<tr>
<td>Product-by-Income-by-Municipality-by-Quarter FX</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Store-by-Quarter FX</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Observations</td>
<td>115,224</td>
<td>104,979</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.735</td>
<td>18.940</td>
</tr>
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</table>

Notes: The estimates are based on the microdata of the Mexican operation of a large international market research company and the specifications discussed in 6.1.
<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>Total Effect</th>
<th>Direct Price Index Effect</th>
<th>Pro-Comp Price Effect</th>
<th>Pro-Comp Exit</th>
<th>Wage Effect</th>
<th>Profit Effect</th>
<th>Other Income Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Effect</strong></td>
<td>0.0751***</td>
<td>0.0620***</td>
<td>0.0158***</td>
<td>-0.00558***</td>
<td>0.00410***</td>
<td>-0.00127***</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(0.00121)</td>
<td>(0.00116)</td>
<td>(0.000247)</td>
<td>(8.13e-05)</td>
<td>(0.000402)</td>
<td>(0.000274)</td>
<td>(0)</td>
</tr>
<tr>
<td>Max</td>
<td>0.249</td>
<td>0.204</td>
<td>0.055</td>
<td>0.000</td>
<td>0.025</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Min</td>
<td>-0.979</td>
<td>0.000</td>
<td>0.000</td>
<td>-0.005</td>
<td>-0.057</td>
<td>-1.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Proportion Negative</td>
<td>0.0158</td>
<td>0</td>
<td>0.999</td>
<td>0.0666</td>
<td>0.0569</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Observations (Households)</td>
<td>12,293</td>
<td>12,293</td>
<td>12,293</td>
<td>12,293</td>
<td>12,293</td>
<td>12,293</td>
<td>12,293</td>
</tr>
<tr>
<td>Number of Municipality Clusters</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>240</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>Total Effect</th>
<th>Direct Price Index Effect</th>
<th>Pro-Comp Price Effect</th>
<th>Pro-Comp Exit</th>
<th>Wage Effect</th>
<th>Profit Effect</th>
<th>Other Income Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Effect</strong></td>
<td>0.0345***</td>
<td>0.0207***</td>
<td>0.0109***</td>
<td>0</td>
<td>0.00410***</td>
<td>-0.00127***</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(0.000636)</td>
<td>(0.000288)</td>
<td>(0.000240)</td>
<td>(0)</td>
<td>(0.000402)</td>
<td>(0.000274)</td>
<td>(0)</td>
</tr>
<tr>
<td>Max</td>
<td>0.074</td>
<td>0.062</td>
<td>0.019</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Min</td>
<td>-0.991</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>-0.057</td>
<td>-1.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Proportion Negative</td>
<td>0.0535</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.0666</td>
<td>0.0569</td>
<td>0</td>
</tr>
<tr>
<td>Observations (Households)</td>
<td>12,293</td>
<td>12,293</td>
<td>12,293</td>
<td>12,293</td>
<td>12,293</td>
<td>12,293</td>
<td>12,293</td>
</tr>
<tr>
<td>Number of Municipality Clusters</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>240</td>
<td>240</td>
</tr>
</tbody>
</table>

**Notes:** The graph is based on 12,293 households residing in 240 urban municipalities between 2006-2012 that had not experienced foreign retail entry at the time of the ENIGH survey. The graph depicts 95% confidence intervals based on standard errors that are clustered at the municipality level. * 10%, ** 5%, *** 1% significance levels.
Online Appendix - Not for Publication

Additional Figures and Tables

Figure A.1: Effect on Foreign Retail Market Shares: Restricted Estimation Sample

Notes: The graphs depict quarterly household retail expenditure shares on foreign stores among municipalities that have experienced foreign store entry between two and three years ago. The point estimates are based on regressions of household expenditure shares on the indicated income group or product group dummy variables in addition to municipality-by-quarter fixed effects. The data source for this graph are the microdata of the Mexican operation of a large international market research company for the years 2011-14. Both graphs depict 95% confidence intervals based on standard errors that are clustered at the municipality level.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign Entry - Four Quarters Before</td>
<td>-0.0238</td>
<td>-0.0183</td>
<td>-0.0160</td>
<td>-0.00502*</td>
<td>-0.00590**</td>
<td>-0.00352</td>
</tr>
<tr>
<td></td>
<td>(0.0146)</td>
<td>(0.0147)</td>
<td>(0.0179)</td>
<td>(0.00283)</td>
<td>(0.00296)</td>
<td>(0.00392)</td>
</tr>
<tr>
<td>Foreign Entry - Three Quarters Before</td>
<td>-0.0176</td>
<td>-0.0154</td>
<td>-0.00525</td>
<td>-0.00219</td>
<td>-0.00191</td>
<td>-0.000650</td>
</tr>
<tr>
<td></td>
<td>(0.0122)</td>
<td>(0.0126)</td>
<td>(0.0120)</td>
<td>(0.00270)</td>
<td>(0.00273)</td>
<td>(0.00341)</td>
</tr>
<tr>
<td>Foreign Entry - Two Quarters Before</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Foreign Entry - One Quarter Before</td>
<td>-0.0182</td>
<td>-0.0193</td>
<td>-0.0127</td>
<td>-0.00630**</td>
<td>-0.00844***</td>
<td>-0.00499</td>
</tr>
<tr>
<td></td>
<td>(0.0153)</td>
<td>(0.0143)</td>
<td>(0.0161)</td>
<td>(0.00332)</td>
<td>(0.00314)</td>
<td>(0.00354)</td>
</tr>
<tr>
<td>Foreign Entry - One Quarter After</td>
<td>-0.0150</td>
<td>-0.0171</td>
<td>-0.0143</td>
<td>-0.00304</td>
<td>-0.00491*</td>
<td>-0.00287</td>
</tr>
<tr>
<td></td>
<td>(0.0130)</td>
<td>(0.0126)</td>
<td>(0.0154)</td>
<td>(0.00275)</td>
<td>(0.00283)</td>
<td>(0.00388)</td>
</tr>
<tr>
<td>Foreign Entry - Two Quarters After</td>
<td>0.00196</td>
<td>-0.00887</td>
<td>0.0104</td>
<td>0.000311</td>
<td>-0.000487</td>
<td>0.00211</td>
</tr>
<tr>
<td></td>
<td>(0.0156)</td>
<td>(0.0158)</td>
<td>(0.0177)</td>
<td>(0.00284)</td>
<td>(0.00280)</td>
<td>(0.00397)</td>
</tr>
<tr>
<td>Foreign Entry - Three Quarters After</td>
<td>-0.0244</td>
<td>-0.0345**</td>
<td>-0.0190</td>
<td>-0.00271</td>
<td>-0.00383</td>
<td>0.00105</td>
</tr>
<tr>
<td></td>
<td>(0.0154)</td>
<td>(0.0156)</td>
<td>(0.0199)</td>
<td>(0.00314)</td>
<td>(0.00310)</td>
<td>(0.00497)</td>
</tr>
<tr>
<td>Foreign Entry - Four Quarters After</td>
<td>-0.0217</td>
<td>-0.0309**</td>
<td>-0.0124</td>
<td>1.90e-05</td>
<td>-0.00212</td>
<td>-8.29e-06</td>
</tr>
<tr>
<td></td>
<td>(0.0166)</td>
<td>(0.0162)</td>
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Quarter FX ✓ ✓ ✓ ✓ ✓ ✓ ✓
Municipality FX ✓ ✓ ✓ ✓ ✓ ✓ ✓
Person Controls ✓ ✓ ✓ ✓ ✓ ✓ ✓
Region-By-Quarter FX ✗ ✓ ✗ ✗ ✓ ✓ ✓
Municipality Size-By-Quarter FX ✗ ✓ ✗ ✗ ✓ ✓ ✓
Person FX ✗ ✗ ✓ ✗ ✗ ✓ ✓
R-squared 0.300 0.301 0.809 0.020 0.021 0.561
Number of Individuals 1,579,372 1,579,372 1,579,372 1,796,587 1,796,587 1,796,587
Number of Municipality Clusters 273 273 273 273 273 273

Notes: The dependent variable is log monthly incomes in Column 1-3 and a binary employment indicator in Columns 4-6 across 273 urban municipalities over the period 2002-2012. Standard errors are clustered at the municipality level and reported in parenthesis below the point estimates. * 10%, ** 5%, *** 1% significance levels.