FROM BEIJING TO BENTONVILLE:
DO MULTINATIONAL RETAILERS LINK MARKETS?

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## **ABSTRACT**

Each of the world's largest retailers---Walmart, Carrefour, Tesco, and Metro---entered China after 1995. Their subsequent expansion in China may have influenced Chinese exports through two channels. First, they may have enhanced bilateral exports between the retailers' Chinese operations and destination countries also served by stores in the retailers' networks. Second, Chinese city-level exports to all destinations may have grown if multinational retailer presence enhanced the general export capabilities of local suppliers. Evidence from Chinese city-level retail goods exports supports the capability hypothesis as the expansion of Chinese city exports follows the geographic expansion of the retailers' Chinese stores and global procurement centers.

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# 1 Introduction

In its 2006 negotiations with the Indian government, Walmart argued that India would benefit from future export expansion if it allowed Walmart to expand its retail presence in India. The story as reported by *The Economist* (April 15, 2006) was that Walmart's procurement of goods in India would familiarize local suppliers with the requirements their products needed to meet if they were to be sold in export markets. To support its case, Walmart highlighted its previous experience in China. Walmart is said to account for about 10% of all Chinese exports to the United States.[1] They might also have quoted the *People's Daily Online* (April 22, 2002), an official newspaper in China, which commented that "the direct supply of 'made in China' products to foreign chain groups had become a key channel for their entry into the global market." This paper turns to data on the Chinese experience to subject these claims to stringent econometric tests and analysis.

Each of the largest multinational retailers established operations in China in the 1990's. France-based Carrefour (the second largest retailer worldwide and the largest in Europe) moved first, entering China in 1995. It was followed by US-based Walmart (the largest retailer in the world) and German-based Metro AG (fourth-ranked) in 1996. UK-based Tesco (fifth-ranked) was the last of the giant generalist retailers to enter in 1998.[2] Locating in China serves dual purposes; these retailers operate stores selling products to Chinese consumers while they also use China as an important global purchasing base.

We investigate whether the presence of multinational retailers increases China's exports; and if so, what mechanisms tie retailer presence to the promotion of China's exports. Two potential mechanisms are proposed and tested. First, multinational retailers could increase

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[1] Fishman (2006, p. 103) reports that Walmart and its suppliers exported $18 billion to the US in 2004.

[2] Deloitte 2006 Global Retailing Powers Study provides the ranking. The fourth largest retailer Home Depot, is classified as a specialist retailer and is not included in this study.

the *bilateral* exports of a Chinese city to foreign country destinations in which the retailers operate stores. We call this mechanism the multinational retailers' "linkage effect." Second, the presence of retailers could stimulate *multilateral* exports of a city to all destinations, perhaps by raising local supplier productivity. We call this mechanism the "capability effect." It predicts that the presence of multinational retailers in a city will increase the Chinese city's exports to *all* destination countries, regardless of whether the destination countries host retail outlets.

To test these hypotheses our paper studies the exports of 35 Chinese major cities to 50 countries over the period 1997–2005. We confine the analysis to exports of retail goods because we expect the pro-trade effect of multinational retailers to be limited to the types of goods that are sold in stores such as Walmart. In addition to retail stores in China, each of the multinational retailers, i.e. Walmart, Carrefour, Metro and Tesco, has set up global procurement centers (GPC) in China. Thus, to measure the intensity of retailer connections, we create city-level linkage variables that reflect the number of retailer stores in each city and the proximity of each city to the nearest GPC.

Using standard gravity models and models with origin-destination dyadic fixed effects we test whether multinational retailer expansion is related to growth of Chinese city-level exports of retail goods. We find that the presence of multinational retailers is associated with bilateral trade above the level predicted by gravity models. Furthermore, since we control for dyadic fixed effects, this means that the identification of retailers' pro-trade effects is based solely on variation in the intensity of retailer activity within city-country dyads over time. To test the robustness of multinational retailer linkage effects, we apply the stringent gravity specification proposed by Baldwin and Taglioni (2006) which includes dyadic, origin-year, and destination-year fixed effects. Notably, the positive and significant association between retailer presence and city exports disappears when we control for city-year fixed effects.

To understand why origin-year fixed effects absorb the apparent linkage effects of multi-national retailers, we investigate whether retailer presence more generally enhances a city's

multilateral export capability. We test this possibility by examining how the origin-year fixed effects from the linkage regression are related to the origin city's proximity to global procurement centers and to the number of retailer outlets in the origin city. After including origin and year fixed effects to control for the current level of city development, we find that a city's general export capability increases by 2.7% as the city's distance to global procurement centers decreases by 10%. Similarly, an origin city's export capability increases by 2.55% when the number of outlets in the city increases by 10%.

Our work contributes to the newly emerging research that explores the effects of multinational retailers on international trade. In this area, Basker and Van have developed theory and evidence regarding the impact of multinational retailers on the imports of retailers' home countries. The model in Basker and Van (2008) demonstrates how multinational retailers' economies of scale in both retailing and importing increases the incentives for large retailers to import from distant, low-cost countries. Accompanying empirical work, Basker and Van (2010) finds evidence suggesting that large US retailers have a higher marginal propensity to import relative to small US retailers for every one dollar's increase in sales. In contrast, our paper takes the perspective of the countries hosting multinational retailers and focuses on the retailers' impact on the exports from retailers' host countries.

More broadly, our paper is related to recent work in international trade evaluating the role of intermediaries in trade. Analysis in this area including Ahn, Khandelwal, and Wei (2010), Bernard, Jensen, Redding, and Schott (2010), and Blum, Claro, and Horstmann (2010) find that intermediaries appear to connect firms to export markets that are more difficult to serve due to distance or smaller size. In general, this evidence suggests that intermediaries facilitate trade connections in a fashion that is consistent with reduced fixed costs of entering markets. Similarly, our finding that retailer presence is associated with enhanced city export capability could arise if multinational retailers, and their GPCs in particular, will perform a similar intermediary function in their promotion of Chinese products overseas.

A final strand of research is related to our project, as it implies that multinational retailers

generate spillovers that benefit local firm productivity in host countries. For example, Javorcik and Li (2008) discover that Walmart's entry in Romania was associated with productivity gains by Romanian supplier firms. The mechanisms for such productivity improvements are described in Javorcik, Keller, and Tybout (2008)'s case study which chronicles the effects of Walmart's entry on the soap, detergent and surfactant industry in Mexico. Iacovone, Javorcik, Keller, and Tybout (2009) incorporate these mechanisms in a dynamic industry model. One prediction of their model is that the presence of Walmart increases the productivity of the supplying industry as a whole. In contrast with this work, which focuses on productivity spillovers, our work focuses on another potential channel of influence in studying whether the presence of multinational retailers affects host country *exports*.

The remainder of the paper is structured as follows. To provide context and to motivate the analysis, the next section describes the procedures Metro and Walmart follow when they export Chinese products to their outlets outside China. It also describes the key developments in China's recent deregulation of its retail markets. In section 3 the background on Chinese retail developments is used to propose two potential hypotheses about the effects of retailer presence on Chinese city exports: a linkage hypothesis that forecasts trade expansion between bilateral city-country pairs that have retailer presence on both ends, and a capability hypothesis which proposes that retailer presence expands exports to all destinations. Section 4 provides the specifications that are used to test these two hypothesis, and describes the key data, while the broader data are described in section 5. Sections 6 and 7 show and discuss the econometric results. We conclude in section 8.

## 2   China's Retail Market

In this section, we provide some background information on the nature of and developments in China's retail market. First, to characterize the potential avenues for retailer effects on exports we present an overview of the purchasing procedures followed by Metro and

Walmart in China. Next, we describe important elements of China's deregulation of its retail market. The deregulation history highlights why the four multinational retailers chose distinct locations within China as the initial bases for their operations, and the points from which they spread. The resulting geographical and time diversity of the retailers' networks is the key source of variation we utilize to identify how multinational retailer linkages affect international export development.[3]

## 2.1 Procurement Procedures

The export procedures of Metro and Walmart are discussed below. While there is little public information on the other two retailers, there is no strong reason to believe that their procurement practices should differ dramatically from those of Metro and Walmart.

Metro uses the Chinese domestic market as a testing ground to evaluate the suitability of Chinese products for export. "Metro AG emphasizes the quality of products. The products which have entered Metro's procurement system will be sold in Chinese regional markets first. If they sell well, the products will be sold in all stores within China. At last they will be sold globally" (Wu, 2004, p. 74). This statement suggests that the number of Chinese products exported through Metro's procurement system is likely to increase as Metro expands its store presence in China.

Walmart Global Procurement (WMGP), established in Shenzhen in 2001, facilitates the purchase of Chinese goods by Walmart's outlets outside of China. WMGP regularly looks for new products and inquires about prices.[4] After WMGP classifies the products, it sends information by email to the buyers at all Walmart outlets. The outlet buyers then decide

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[3]Further differences in the retailers' geographic span arises because the four retailers have stores in different countries.

[4]The following procedures are summarized from an article on www.jamoo.net.

what kind of products their stores may need and which should be explored during their "buying trips." This procedure is time consuming. Outlet buyers routinely meet two to three times each year in China. Before the buyers arrive in China, WMGP prepares the required samples. The staff at WMGP mark the product's price and features on the sample but cover the manufacturer's name. In other words, when outlet buyers make their initial purchasing decision they do not know which firms manufacture the samples they are viewing. During the meeting, the buyers decide which products to buy. The staff at WMGP do not provide much input as the buyers make their decisions. Afterwards, the buyers and the WMGP staff privately discuss the price and other order details. Next, since WMGP contacts the manufacturing firms and starts negotiations, the outlets' buyers have little or no direct contact with the manufacturers. Finally, once the order is placed, WMGP handles the order's logistics. They check the factory to verify that there are no problems such as child workers, or excessive overtime. They also check product quality at least two times— once during production and once after production. In addition, WMGP contacts shipping companies and prepares export documents, including letters of credit.

These procurement procedures suggest that Chinese local suppliers may benefit from the presence of global procurement centers of multinational retailers. In particular, it appears that local Chinese firms may benefit from having their products introduced to purchasers in multiple foreign markets, with no advance payment of market-specific fixed costs. In addition, through the interaction with global procurement centers, Chinese suppliers will gain an understanding about international quality or safety standards. They may also learn about the general preferences of foreign consumers. All these benefits suggest that the presence of global procurement centers in China may stimulate China's exports of retail goods.

## 2.2 Deregulation of Retailing in China

Since our identification strategy exploits differences in the location and timing of retailer presence across Chinese cities to identify the importance of retailer linkages, it is important to understand why the retailers chose distinct entry locations in China. To this end, we summarize the elements of China's deregulation in retail markets that caused the retailers to differentially enter Chinese regions. Carrefour's 1995 placement of a hypermarket[5] in Beijing made it the first multinational retailer to enter China. In 1996, Walmart established its first super-center in Shenzhen, while Metro opened its first cash and carry in Shanghai. Finally, Tesco entered the Chinese retail market when it set up its first store in Shanghai in 1998.

Wang and Zhang (2006, p. 295) list important policy changes in the Chinese retail market, which we summarize in Table 1. Two points in the table are worth emphasizing. First, during the period 1992–1995, foreign retailers were allowed to operate in only 11 designated areas, and each area was permitted to host only one or two foreign retailers (including the retailers with headquarters in Hong Kong, Taiwan, and Macau, which were treated as foreign by the government). This restriction helps explain why Walmart, Tesco, Metro and Carrefour chose different entry locations when they first entered China. The second important point highlighted in Table 1 is that majority foreign-owned joint ventures of retailer chains were only conditionally permitted to enter between 1999 to 2004. The condition was that large quantities of domestically-made goods be exported through the retailer's distribution channels. This requirement meant that multinational retailers had another direct incentive to export Chinese products through their procurement systems, since exports helped them to gain the right to more freely operate their stores in Chinese *retail* market. All these restrictions were lifted after 2005.

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[5]A hypermarket or superstore is a retail self-service establishment offering a broad range of food and non-food products. (source: `http://stats.oecd.org/glossary/detail.asp?ID=6250`)

Table 1: Deregulation of Foreign Retailers in China's Retail Market

| Restrictions | 1992–1995 | 1995–1999 | 1999–2004 | After 2005[3] |
|---|---|---|---|---|
| Geographic | 6 cities and [1] 5 Special [2] Economic Zones | – | provincial capitals | lifted |
| Operational | | | | |
|   retail/wholesale | retail only | wholesale allowed | – | lifted |
|   single/chain | single only | chain only allowed in Beijing | chain | lifted |
| Percentages of Goods purchased within China | $\geq 70\%$ | – | – | lifted |
| Equity | joint venture minority stake | – | joint venture chains with majority stake as conditionally allowed | lifted |
| Permission | entry must be approved by both state and local governments | – | – | only local gov't permit is needed |

"–" implies no regulation is changed. 1.Beijing, Shanghai, Tianjin, Guangzhou, Dalian, and Qingdao. 2. Shenzhen, Zhuhai, Shantou, Xiamen, and Hainan. 3. Since December 11, 2004.

# 3  Two Mechanisms

Two potential mechanisms may cause the presence of multinational retailers to increase China's exports. First, multinational retailers could increase China's exports by creating information linkages with distant markets. For example, when managers in the multinational retailers' purchasing centers or retail stores learn about local Chinese suppliers they could convey information about newly discovered products to their stores outside China. Because information related to suppliers or products is shared systematically only with other affiliates in the retailer's global operations, this mechanism suggests that the presence of multinational retailers will increase the exports *only* for city-country dyads which are populated by affiliates of the same retailer at each end. In other words, if firm-specific network linkages are important, we predict that multinational retailers will facilitate exports from Chinese cities where these retailers have stores or nearby global procurement centers, to destination countries where the multinational retailers have established stores. We call this mechanism

the multinational retailers' "linkage effect." It can be seen as analogous to trade-increasing impact that Rauch and Trindade (2002) find for overseas Chinese populations. Here retail stores are the equivalent of Chinese ethnics. They are hypothesized to increase exports of the areas that host them, but only to countries that host their counterparts.

A second potential mechanism by which multinational retailers increase China's exports operates if multinational retailers stimulate the productivity growth of local Chinese suppliers, thus improving the general export capabilities of the Chinese suppliers. There are several reasons why multinational retailer presence may increase the productivity of local suppliers. As Javorcik et al. (2008) and Javorcik and Li (2008) emphasize, the entry of multinational retailers is likely to increase the competitive pressures facing suppliers in host countries. This is generally true, since multinational retailers often have more bargaining power relative to other retailers in host countries. When multinational retailers require suppliers to lower prices and/or upgrade products, high-cost suppliers are driven out of the market, while suppliers that remain in operation improve their productivity by labor-shedding and innovation. Javorcik and Li (2008) suggest the entry of multinational retailers may further increase supplier productivity, if the entry of multinational retailers introduces advanced retail technologies and international management practices. Local firm productivity is enhanced by this mechanism if suppliers reallocate their savings in distribution costs to production. The third channel for local supplier productivity increases comes into play if the activities associated with the multinational retailer allow local suppliers to achieve economies of scale. Each of these points support the argument that the presence of multinational retailers increases the productivity of local Chinese suppliers.

Iacovone et al. (2009) introduce a dynamic model which formalizes these ideas. One element of their model is a sorting mechanism which implies that high productivity suppliers sell their products through Walmart, while low productivity firms continue to sell their products through traditional retailers. The highest productivity suppliers choose to work with Walmart since the efficiency gains and increase in market share benefits of working with

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Walmart exceed losses due to Walmart's pressure on profit margins. Once Walmart enters the local retail market, its presence changes the price menu faced by all suppliers. Some who previously sold their products through traditional retailers then find it less costly to sell through Walmart. Through a cumulative process, the competitive pressure introduced by Walmart could drive some marginally profitable suppliers to exit the market entirely. Ultimately, overall industry productivity increases as the lowest productivity suppliers exit.

If multinational retailer presence improves Chinese supplier productivity, the improvements in productivity may imply that a larger number of suppliers will achieve a productivity level that enables them to export profitably given the fixed costs of exporting. Notably, since productivity improvements lower costs of serving all markets, this channel implies that an affected city will increase its exports to all destination countries through the capability effect.

Multinational retailers may also affect information and search costs in a way that enhances retailer export ability. In particular, while China has a reputation for providing low cost products, informational frictions of the sort modeled in Rauch and Trindade (2003) may prevent buyers outside of China from identifying the particular Chinese suppliers that carry products with the attributes, quality and reliability they seek.[6] For this reason, multinational retailers may reduce the fixed costs of export by expanding local firms' knowledge about export opportunities and export practices. Alternatively, if the salient fixed costs are borne by international purchasers outside of China, as large multinational retailers purchase goods from China, firms in other foreign countries may learn how to identify Chinese sup-

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[6]Thus, if the presence of multinational retailers in China provides information which reduces the Chinese supplier uncertainty about foreign market opportunities, or foreign purchasers' uncertainty about the location and availability of suitable Chinese producers, the new information may increase the frequency of successful matches and may even increase the intensity of searches in China. In related work, Hausman and Rodrik (2003)'s comparison of country-product export profiles suggests the importance of information in trade, by demonstrating that countries that are similar in their sources of comparative advantage, nonetheless specialize in exporting very different product portfolios.

pliers who produce high quality goods at reasonable prices and also start importing them from China.

Ultimately, if information gained from multinational retailer activities in China reduces the fixed cost of exporting, a greater number of local Chinese suppliers will be able to export, even if their productivities are unchanged. Thus, this mechanism would also generate a capability effect, which predicts that the presence of multinational retailers in a Chinese city will increase the city's exports to *all* countries.

# 4    Estimation Strategies

In this section, we discuss the empirical methods we use to test the linkage and capability effects. In each case, we discuss the regression specification and key multinational retailer presence variables that are used to test for these effects.

## 4.1    Method for Testing Linkage Effects

To underpin our examination of multinational retailer linkage effects, we turn to the gravity equation for bilateral trade. Our benchmark begins with Baldwin and Taglioni (2006)'s representation of the gravity model, which relates the log of exports from origin $o$ to destination $d$ as given by

$$\ln X_{od,t} = \ln Y_{o,t} - \ln \Omega_{o,t} + \ln E_{d,t} + (\sigma - 1) \ln P_{d,t} - (\sigma - 1) \ln \tau_{od,t}. \tag{1}$$

$X_{odt}$ is the total export value from origin $o$ to destination $d$ in year $t$. $\tau$ refers to trade costs, and $\sigma$ is the elasticity of substitution among varieties in the CES utility function. $Y_o$ is the exporting country's production output of traded goods. $E_d$ is the importing country's expenditure on traded goods. $P_d$ is country $d$'s CES price index. The term $\Omega_o = \Sigma \left( \tau_{od}^{1-\sigma} \frac{E_d}{P_d^{1-\sigma}} \right)$ is characterized by Baldwin and Taglioni as an index of the exporter's openness.

Equation (1) decomposes log bilateral exports into three components. The first component, $\ln Y_{o,t} - \ln \Omega_{o,t}$, is origin-year specific. The second component, $\ln E_{d,t} + (\sigma - 1) \ln P_{d,t}$, is destination-year specific. The final component, $(\sigma - 1) \ln \tau_{od,t}$, is a time-varying dyadic term. Standard gravity equations model the origin and destination effects with the GDPs and per capita incomes for the origin and destination countries while omitting the $\Omega$ and $P$ terms. These terms, often referred to as "remoteness" before Anderson and van Wincoop (2003) labeled them "multilateral resistance", depend on the $Y$ and $E$ of *all other countries*, discounted by trade costs. When these terms are omitted we expect the coefficient estimates to be inconsistent since it is likely that the omitted multilateral resistance terms are correlated with GDP and trade costs.

The final term in equation (1) encompasses both time-invariant trade costs between the origin and destination, and time-varying costs. In this paper, we propose that retailer linkage effects will affect the *time-varying* component of this term, and create multinational retailer variables to test this hypothesis. Remaining time-varying costs are assumed to be iid, and therefore, absorbed by the error term. In the standard gravity equation, distance is always used as a proxy for trade costs. Most studies add other proxies such as dummies for a common language or a prior colonial relationship to control for the time-invariant portion of the dyadic term. However, since the list of potential proxies is long, and few proxies are well-measured, we include a dyadic fixed effect to capture all time-invariant trade costs. Ultimately, we implement the specification advanced by Baldwin and Taglioni (2006), thus embedding our linkage hypothesis within their framework which controls for origin-year, destination-year, and dyadic fixed effects.

$$\ln X_{odt} = \alpha_{ot} + \beta_{dt} + \delta_{od} + \lambda L_{odt} + \varepsilon_{odt} \tag{2}$$

$$o : \text{origin} \qquad d : \text{destination} \qquad t : \text{year}$$

In this specification origin-year and destination-year fixed effects which influence the total value of exports $X_{odt}$ are represented by $\alpha_{ot}$ and $\beta_{dt}$ respectively. $\delta_{od}$ controls for origin-destination pair dyadic fixed effects.[7]

Since the variable $L_{odt}$ measures linkages formed by multinational retailer networks, our coefficient of interest is $\lambda$. We expect $\lambda$ to be positive and significant if linkage effects created by the expansion of retailer presence in China increase China's exports of retail goods between the Chinese city-origin and country-destination pairs that experience expansions in retailer presence.

We construct two variables to capture the linkage effects that arise from changes in the retail presence of the four multinational retailers in our study. The first linkage variable is based on the locations of the four retailers' global procurement centers in China; the second is based on the retailers' store counts by region. Due to the characteristics of retail operations in China, as discussed in section 2, we predict that Chinese regions that experienced expansions in retailer procurement and in retailer store presence may have benefitted from subsequent increases in exports.

When we create the two linkage variables we select functional forms that reflect the way global procurement centers and stores connect distant markets. To begin, suppose that each each city has $s_o$ retail products it could offer for distribution. While GPCs scour cities in their regions in search of product ideas and suppliers, search and communication frictions will impede the transfer of information about each city's $s_o$ retail product list from city $o$ to its nearest global procurement center. Thus, we assume that global procurement centers only become aware of some proportion of $s_o$ retail items that are available from the city, and that the fraction of the $s_o$ retail items that the GPCs learn about is decreasing with distance $D_o$ between city $o$ and the GPC. If we apply the standard functional form for distance costs found in gravity equations,[8] this implies that GPCs learn about the availability of $\frac{s_o}{D_o}$

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products offered by a city. Next, managers from the retailers' overseas stores will select items from the pool of products identified by the GPC. To represent this process, we assume that all products face a probability $\pi \in [0, 1]$ of being selected by any particular store of the retailers' network outside China. However, since retailer $r$ has a number of stores $n_{dr}$ in country $d$, the probability that a product is selected for export will rise with the retailer's presence in the destination market. When these items are combined, they imply that the activities of a retailer's GPC in China will cause $s_o \pi \sum_r \frac{n_{dr}}{D_{or}}$ products produced in city $o$ to be identified and selected for export to country $d$.

While retailer GPC presence creates formal procedures which link Chinese suppliers with their purchasers in destination countries, the expansion of retailer store networks in China provides an additional channel by which Chinese suppliers may be linked to overseas purchasers in the retailer's international network. To capture this idea, we assume that the retailers' stores may also bring product lists to their stores overseas. As before, we assume that the overseas purchasers in the retailers' networks will select items off these lists with probability $\pi$. If retailer $r$ has $n_{dr}$ stores located in country $d$, this implies that $s_o \pi n_{dr}$ items proposed by a single store are expected to be picked up by the retailer's purchasing managers in country $d$. If the retailer has $n_{or}$ stores in city $o$, all of which generate information on procurement opportunities, and the product lists are non-overlapping, we predict that retailer $r$'s stores in country $d$ will pick up a total number of $s_o \pi n_{dr} n_{or}$ items that are produced in city $o$. Finally, if we sum over the the full set of retailers in the city, the number of city $o$ products selected by retailers in country $d$ is $s_o \pi \sum_r n_{dr} n_{or}$.

We need to address three issues before we construct our measures of multinational retailer activity. First, the assumption of non-overlapping lists is unrealistic. In addition, we expect some products would be chosen for export, even in the absence of any stores. We incorporate these ideas by adding one and raising the sum to a power that is presumably less than one, to reflect diminishing returns due to redundancy of products across lists. With these changes, the number of products linked by global procurement centers and by retailer stores

are $(1 + s_o \pi \sum_r \frac{n_{dr}}{D_{or}})^\zeta$ and $(1 + s_o \pi \sum_r n_{dr} n_{or})^\eta$, respectively. Second, when we apply these two measures to panel data, $s_o$ is absorbed by the city fixed effects while $\pi$ is co-linear the regression constant. Thus, these two expressions become $\ln(1 + \sum_r \frac{n_{dr}}{D_{or}})$ and $\ln(1 + \sum_r n_{dr} n_{or})$.

Third, procurement is a time-consuming process. As in the example of Walmart, there are many steps that must be taken before any sales contracts are formed. Walmart's procurement centers need to accumulate manufacturers' information, send the product list to the buyers in overseas stores, get feedback from potential buyers, and arrange business trips. A spokeswoman with Carrefour China notes that "it usually takes us half a year, even a year, to clinch a deal."[9] After the contracts are signed, manufacturers also need time to manufacture the products. Due to the time-intensity of these activities, and the sequential aspect of the process, we expect a time lag between the opening of retailer global procurement centers or stores and the time when new trade arises due to these connections. To reflect the time delays that are inherent in the process, our regressions lag the retailer presence variables by one period.[10]

To capture the linkage effects generated by global procurement centers in China, we create the variable GPC as follows:

$$\text{GPC}_{odt} = \ln \left( 1 + \sum_{r=1}^{4} \frac{n_{drt}}{D_{or,t-1}} \right).$$

This reflects the network effects generated by the expansions by the four major retailers. The number of stores retailer $r$ has in country $d$ in year $t$ is $n_{drt}$. $D_{or,t-1}$ is the geographic distance from city $o$ to its nearest global procurement center of retailer $r$ in the previous

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[9]www.chinadaily.com.cn, October 14, 2006.

[10]We also performed tests which lag the retailer variables by one or two periods in case the effects of retailer procurement centers or stores require more time to manifest themselves in trade flows. The results are provided at `http://strategy.sauder.ubc.ca/head/sup/`.

year.[11]   The variable $\text{GPC}_{odt}$ increases when the retailer expands its number of stores in the destination country, or when the distance of the city to the nearest global procurement center decreases.

Since retail stores could also create linkage effects, we capture the expansion of retailer store networks through

$$\text{RS}_{odt} = \ln\left(1 + \sum_{r=1}^{4} n_{drt}n_{or,t-1}\right).$$

The number of stores of retailer $r$ in origin city $o$ in the previous year is given by $n_{or(t-1)}$, while $n_{drt}$ is the number of stores of retailer $r$ in destination country $d$ in year $t$.

When we construct the two linkage variables, we use lagged values of the variables that reflect the retailers' presence in China, while we use contemporaneous store counts to measure the intensity of the retailers' presence in the destination countries. Our choice of timing convention is motivated in part by the desire to maximize the size of the data set available for estimation. Since the data on the worldwide store distribution for the four multinational retailers begins with 1996, our data panel would be reduced by one year in length if we lagged the retailer destination variables by one period. However, our use of contemporaneous data for the retailers' destination activities may be reasonable as we expect that stores need to purchase products before they start operation. For this reason, the number of stores set to open could also affect the links formed by multinational retailers.[12]

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[11]For cities that have a global procurement center, the distance is calculated by inner distance using the formula $D = 0.376*(\text{area in sqm})^{\frac{1}{2}}$, where the variable area refers to the total area of the city.


[12]To check whether the timing conventions affect the results, we formed alternative measures that lag the origin and destination components of retailer exposure simultaneously. While the new variables reduce the sample size, they do not alter the qualitative conclusions.

## 4.2 Method for Testing Capability Effects

The second half of our analysis tests whether exposure to expanding retailer networks increased Chinese cities' general export capabilities. In contrast with linkage effects, which strengthen exports only along bilateral pathways connecting the retailers in Chinese cities with the retailers' stores in overseas destinations, the capability effect increases the worldwide exports of Chinese cities that experience an increase in multinational retailer presence.

To perform this analysis, we first run specification (2), and extract the estimated coefficients for each city-year fixed effect, i.e. $\hat{\alpha}_{ot}$. We interpret the city-year fixed effects as measures of the cities' time-varying export capabilities. Each city-year coefficient can thus be used as unit of observation as we create a data panel of city-year export capabilities, which we analyze in a second stage regression. In our second stage regressions, which test whether retailer activity enhances future city export capability, we also control for city and year fixed effects, as well as other time-varying city-level variables, i.e. gross value of industrial output per capita and population.

We are most interested in learning whether the export capabilities of Chinese cities are influenced by access to global procurement centers or the number of retail stores in the city. To evaluate the effects of GPCs, a city's access to GPCs is defined as:

$$\text{cityGPC}_{ot} = \ln \left( \sum_{r=1}^{4} \frac{1}{D_{ort}} \right),$$

where $D_{ort}$ refers to the distance from city $o$ to the nearest GPC of retailer $r$. The number of multinational retailers' stores available in a city is the sum of stores of the four retailers in the city. It is defined as

$$\text{cityRS}_{ot} = \ln \left( 1 + \sum_{r=1}^{4} n_{ort} \right),$$

in which $n_{ort}$ is the number of stores of retailer $r$ in city $o$ in year $t$. In contrast with the

variables we used to test for linkage effects, these new measures do not include the retailers' stores outside China. This is due to the hypothesis that capability effects enhance a city's exports to all destinations.

We use the following specification to test for the influence of retailer presence on city export capability:

$$\hat{\alpha}_{ot} = \theta + \gamma \text{cityGPC}_{o,t-1} + \eta \text{cityRS}_{o,t-1} + \zeta \ln \text{pop}_{ot}$$
$$+ \iota \ln \text{gviopa}_{ot} + \phi_o + \phi_t + \epsilon_{ot} \tag{3}$$

The estimated city-year fixed effects from the linkage regression, $\hat{\alpha}_{ot}$, are used as the dependent variable. To maintain the timing convention we use in the previous regression framework, we use values of cityGPC and cityRS that are lagged one period. The estimating equation also includes each city's population and gross value of industrial output per capita, or $\text{pop}_{ot}$ and $\text{gviopa}_{ot}$, respectively. Finally, the estimation framework includes city fixed effects, $\phi_o$, and year effects, $\phi_t$. The error term is $\epsilon_{ot}$.

# 5   Data

To study retailer effects, we combined three longitudinal data sets to create variables reflecting developments in multinational retailer exposure: a data set tracking information on the four retailers' store distributions in China, a data set following the retailers' store networks outside of China, and a data set compiling the distribution of global procurement centers in China.

The worldwide store distributions for each of the four multinational retailers were collected from the retailers' annual financial reports. Each retailer typically manages a number of store formats. In addition to the big-box retail format that sells the widest range of retail goods, many of the four retailers also operate specialty stores that are limited to sales of products such as electronics or apparel. In constructing our explanatory variables, the re-

tailer store variables are based solely on the retailers' operation of their main format stores.[13] We exclude the specialty stores from the retailer variables since the goods sold in the specialty stores often differ from those sold in the large-format retail stores. In addition, the sales areas in the main format stores are usually much larger than those handled by the other formats.[14]

The changing geographic presence of the four retailers in China was collected from the Chinese web site *linkshop*.[15] This site provides the location and the opening date of each new retail store they established.[16] The large majority of Carrefour, Metro, and Walmart's stores in China are the main format.[17] Information on the opening of the four retailers' global procurement centers in China were collected from Chinese and English language media reports. The sources for these data are available in our online supplemental materials. When we classify the timing of GPC presence, all GPCs established in July or later are coded as

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[13]In their annual reports the retailers use different names to refer to their main format stores: Carrefour—hypermarket; Metro—cash and carry; and Walmart—super-center and Sam's Club. Tesco's financial reports do not provide a clear description of their store formats, and only the total number of stores are provided. Hence, when generating the key variables for Tesco, we use the total number of Tesco stores in the formula.

[14]These issues are particularly relevant for a large number of convenience stores operated by the retailers.

[15]http://www.linkshop.com.cn

[16]This data source does not provide similar information on the time and location of store closings. However, over the period of 1996–2005, on average, only 7.6% of the store numbers documented in retailers' financial reports are missing from the data generated from the linkshop website. Since the financial reports do not provide information on store locations, we can not use the financial reports to construct our key variables.

[17]The one exception is Walmart, which opened a few neighborhood stores in Guangdong province in the later years of our sample.

present from the subsequent year and onward.

The Chinese export data for 1997–2005 are collected from the eight-digit product data of the Customs General Adminstration of the People's Republic of China.[18] The export data identify the origin city in China as well as the destination country. We began by aggregating the city-country export data to the four-digit harmonized system level. The HS4 data were then classified as retail or non-retail based on whether products of the HS4 industry are typically available at retailer stores such as Walmart. The retail component of the data were then aggregated to form our dependent variable — city-country retail exports by year. The data sources for the remaining control variables are reported in the data appendix.

The maps in Figure 1 illustrate the retail footprints for the four retailers in 1996 and 2005, respectively. In 1996, the retailers were concentrated in China's three large cities — Beijing, Shanghai, and Shenzhen. By 2005, the retailers had expanded their store operations to China's second-tier cities, and their procurement centers had expanded inland from their original coastal locations. These changes in the retailers' geographic footprint greatly reduced the distances of major Chinese cities to the global procurement centers of the four retailers.

Over our sample period, average city exports of retail goods increased at a rapid and sustained pace. At the same time, the expansion of retailer presence in China was more rapid yet. To show the coevolution of these series, Figure 2 illustrates the changes over time in Chinese cities' proximity to global procurement centers, the number of retailer stores, and average city exports of retail goods.[19] Each series, expressed as an index relative to its 1997 value (set equal to 1), grew substantially during the sample period. Moreover, the figure shows that there was a positive association between Chinese cities' exports and the presence of multinational retailers in China.

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[18]This data set was used under the license to the Center for International Data at the University of California, Davis.

[19]Procurement center and retail store proximity are measured by $\sum_{r=1}^{4} \frac{1}{D_{ort}}$ and $\sum_{r=1}^{4} n_{ort}$.
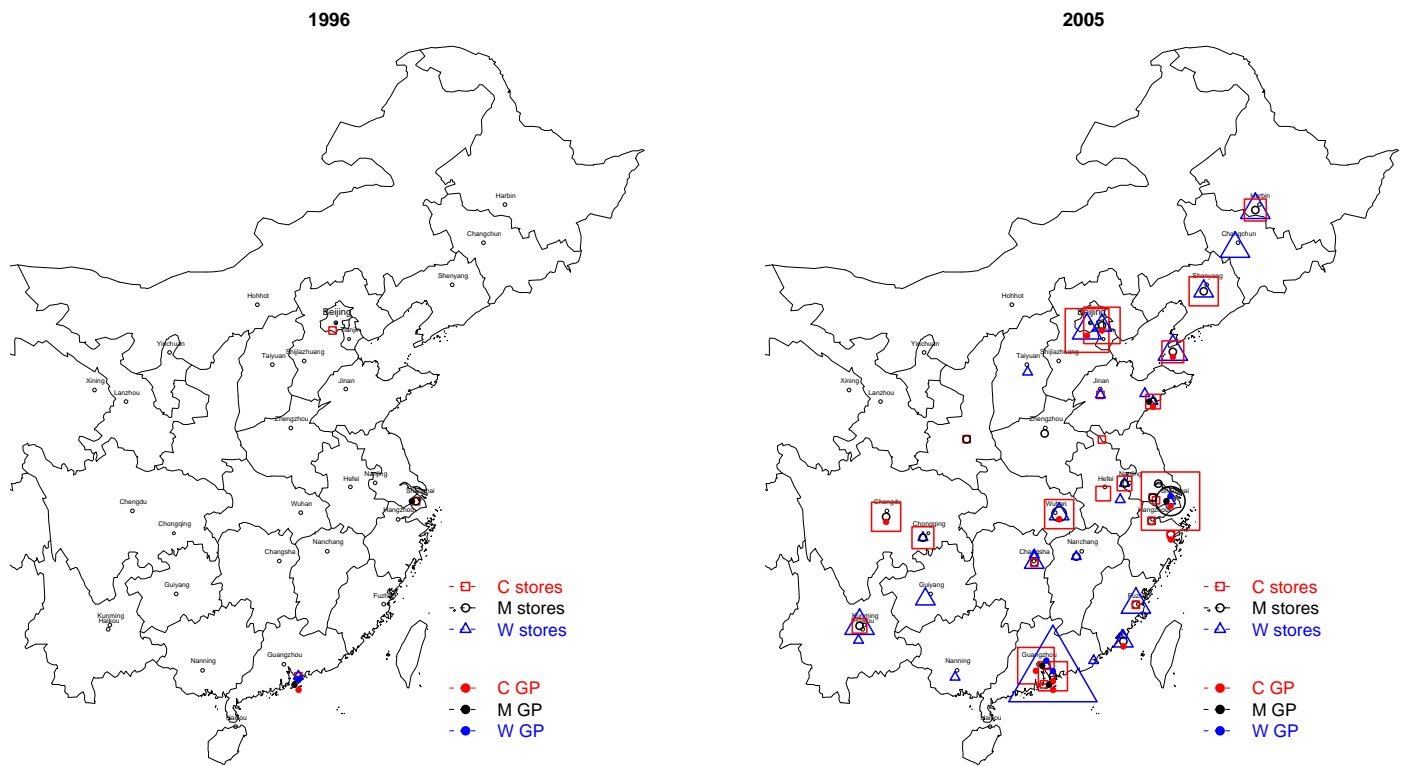
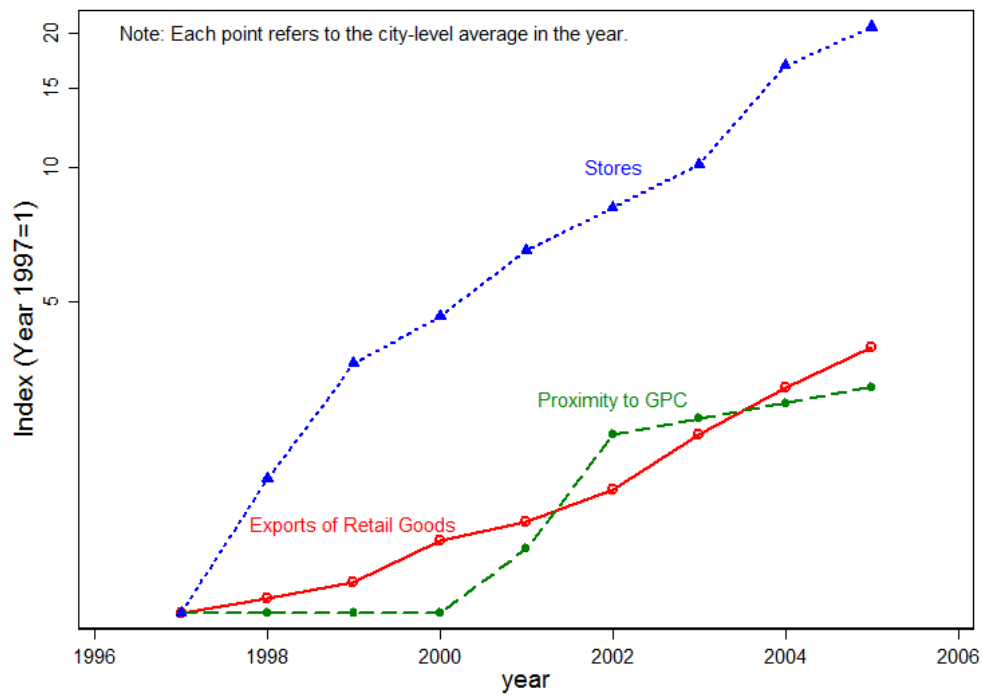Figure 1: Operations of The Four Multinational Retailers in China
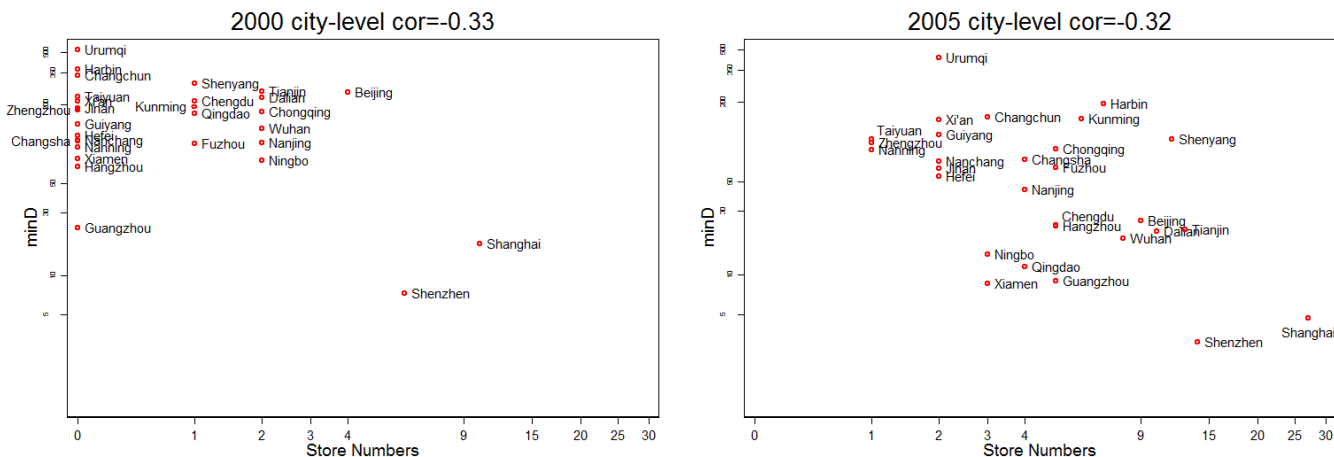


Figure 2: City Trend

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Figure 3: Correlations between Global Procurement Centers and Retail Stores in China

Each of the retailer linkage variables shares a common component, which is the number of stores outside China. If retailer expansion implied a constant geographic spread of retail store and of retail global procurement centers, our variables for stores and GPCs would be collinear. For this reason, we checked the correlation between our two retailer variables before we proceeded with estimation. The simple correlation between $GPC_{odt}$ and $RS_{odt}$ over all years is 0.208. The correlations between $cityGP_{ot}$ and $cityRS_{ot}$ is 0.599. For the years 2000 and 2005, Figure 3 displays individual city values of $cityRS_{ot}$ and the inverse of $cityGP_{ot}$, which is labeled minD. Each point in the figure is labeled with the city's name. In both years, the correlation of the two key variables is not especially high, which alleviates concerns about collinearity. Figure 3 also shows that as time progresses, the plots shift to the right and downwards, which implies that cites served by an increasing number of retailer stores tended to become closer to procurement centers over time.

# 6 Tests for Linkage Effects

In this section, we investigate the linkage channel by studying how multinational retailer presence in Chinese cities is related to the expansion of Chinese city-level exports to desti-

nation countries where the retailers operate outlets. While we find that retailer city-country networks have a positive correlation with Chinese city-level exports, the influence of such retailer linkages is not robust to the most stringent gravity specification, which allows for time-varying city-origin fixed effects.

Though our preferred regression specification (2) allows for greater heterogeneity at the city origin, country destination, and partner dyad level, we begin our analysis with the standard gravity model specification to provide a direct comparison with other research on linkage effects and trade. The gravity regressions displayed in Table 2 introduce retailer linkage effects through the inclusion of controls for retailers' general procurement centers $\text{GPC}_{odt}$ and for retailers' stores in China $\text{RS}_{odt}$. Additionally, since China's earliest liberalization efforts through its "open door policy" targeted China's coastal cities, we expect that a city's distance to the nearest port will play a role in determining city exports. To account for this effect, a variable which measures the city's distance to its nearest port $\text{intD}_{ot}$ is added to the traditional gravity specification.

The coefficient on the retailer procurement center variable, $\text{GPC}_{odt}$, displayed in column 1 of Table 2 indicates that retailer procurement activities were positively associated city-level exports of retail goods. The estimated GPC coefficient suggests that a 10% increase in GPC linkages boosts city-level retail goods exports by 2.5%. In contrast, retailers' Chinese-based stores do not appear to have a significant influence on Chinese cities' retail goods exports.[20]

The coefficients on the traditional gravity variables enter with the expected signs and

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[20]To examine the effects of our timing conventions, we repeated the regressions, entering the retailer variables with different lags. In particular, we replaced the retailer variables with ($\text{GPC}_{od,t-1}$ and $\text{RS}_{od,t-1}$) and then with ($\text{GPC}_{od,t-2}$ and $\text{RS}_{od,t-2}$). The use of more distant lags is appropriate if the effect of retailer proximity requires a longer time to manifest itself in trade flows. Indeed, before we control for city-year fixed effects, the estimated coefficients on the retailer variables are larger in magnitude than those displayed in Table 2. Nonetheless, the retailer coefficients have the same qualitative pattern as those we report in Table 2.

magnitudes. In implementing the gravity model, we measure the economic mass of Chinese cities through the gross value of industrial output per capita at the city level gviopa$_{ot}$. As expected, cities that produce more also export more. Interestingly, the coefficient in column 1 exhibits a more than one-for-one effect.

In column 2 of Table 2, we add city and country fixed effects to control for the unobserved time-invariant city and country characteristics that affect exports. These fixed effects also capture the permanent component of the multilateral resistance terms. The inclusion of city and country fixed effects causes the coefficient on GPC$_{odt}$ to fall slightly to 0.229, though the coefficient remains significant at the 1% level. Consistent with Disdier and Head (2008), who report that the mean effect of distance on trade is $-0.9$, the distance coefficient in this regression, extD$_{od}$, is estimated as having value $-0.916$.

In column 3 of Table 2, we replace the city and country fixed effects, with fixed effects for each city-country partner dyad. This set of fixed effects controls not only for the features captured in column 2 but also for all observed and unobserved permanent features of the city-country pair, including geographic distance, common border, etc. The inclusion of dyadic fixed effects removes inconsistency from the regression that arises if the global procurement center linkage variable is correlated with dyadic characteristics of the city-country pairs. When we include dyadic fixed effects, the identification of the coefficient for general procurement centers is based on the variation in the presence of GPC$_{odt}$ within the dyad over time. The new estimates imply that a 10% increase in GPC linkages are associated with a 1.39% increase in the exports of retail goods. In sum, the first three columns of Table 2 show that global procurement centers are positively associated with bilateral trade above the level predicted by both the standard gravity and dyadic fixed effects models.

In columns 4 and 5 of Table 2, we first add country-year fixed effects and then city-year effects. These dummies capture the time-varying components of the multilateral resistance terms. Perhaps more importantly, they control for unobserved influences (e.g. trade policy of country $d$, manufacturing quality in city $o$) that change over time. When only the country-

Table 2: Linkage Effects Test, City-level

| Fixed effects controlled | (1) $t$ | (2) $t$ country city | (3) $t$ dyadic | (4) dyadic country-$t$ | (5) dyadic country-$t$ city-$t$ |
|---|---|---|---|---|---|
| GPC$_{odt}$ global procurement centers | 0.250$^a$ (0.0615) | 0.229$^a$ (0.0489) | 0.139$^a$ (0.0392) | 0.400$^a$ (0.0526) | -0.0705 (0.0643) |
| RS$_{odt}$ retailer stores | 0.00115 (0.0156) | 0.0260$^b$ (0.0113) | 0.0277$^a$ (0.00978) | 0.0495$^a$ (0.0100) | 0.0121 (0.0122) |
| ln(gviopa$_{ot}$) gross value of indust. output per capita | 1.380$^a$ (0.0442) | 0.225$^a$ (0.0408) | 0.224$^a$ (0.0394) | 0.181$^a$ (0.0391) | |
| ln(pop$_{ot}$) population of the origin | 0.901$^a$ (0.0425) | -0.384$^a$ (0.125) | -0.398$^a$ (0.125) | -0.321$^a$ (0.117) | |
| ln(gdppa$_{dt}$) GDP per capita of the destination | 0.936$^a$ (0.0252) | 1.026$^a$ (0.0881) | 1.064$^a$ (0.0848) | | |
| ln(pop$_{dt}$) population of the destination | 0.918$^a$ (0.0293) | 2.479$^a$ (0.734) | 2.977$^a$ (0.731) | | |
| ln(extD$_{od}$) external distance | -0.802$^a$ (0.0463) | -0.916$^a$ (0.119) | | | |
| ln(intD$_{od}$) internal distance | -0.386$^a$ (0.0254) | | | | |
| $N$ | 14022 | 14022 | 14022 | 14141 | 14141 |
| $R^2$ | 0.661 | 0.820 | 0.156 | 0.244 | 0.305 |
| groups | | | 1714 | 1716 | 1716 |
| S.E of $u_i$ | | | 3.537 | 2.941 | 3.592 |
| S.E.of $e_{it}$ | | | 0.915 | 0.880 | 0.854 |
| RMSE | 1.609 | 1.174 | 0.857 | 0.823 | 0.798 |

Note: Robust standard errors in parentheses are clustered at the dyadic level with $^a$, $^b$, and $^c$ respectively denoting significance at the 1%, 5% and 10% levels.

year effects are added (in column 4), the $\text{GPC}_{odt}$ coefficient remains significant and its estimated magnitude grows. Column 5 reports the preferred specification (2) which includes both city-year and country-year fixed effects. Now the coefficient on $\text{GPC}_{odt}$ declines in magnitude and becomes statistically insignificant.[21]

The coefficient on retailer stores $\text{RS}_{odt}$ also exhibits the same pattern. While the coefficients on retailer store presence both appear to be positive and significant in columns 2 to 4 of Table 2, they lose their significance in the last column. In sum, while we still need to test for broad export capability spillovers, the results from the most stringently specified trade regression in Table 2 do not support the hypothesis that multinational retailers increase China's exports via linkage effects.

To test whether our results are sensitive to the decision to use of cities as our geographic unit of analysis, we also created provincial measures of retailer exposure and ran the regressions on province-level exports. The province-level export data is more comprehensive than the data of the 35 major Chinese cities. Nonetheless, estimation results at the provincial level, shown in the online supplemental material, exhibit the same pattern as the ones at the city level. Once the origin-year fixed effects are included—in this case for provinces—the positive and significant coefficients on $\text{GPC}_{odt}$ and $\text{RS}_{odt}$ disappear.

The fact that the estimated retailer effects are dramatically altered when we include time-varying city fixed effects suggests that changes in unobserved local (city or province) factors underpinned recent developments in China's export of retail goods. Notably, the regressions

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[21]We examined whether our results for global procurement centers were sensitive to the functional form used to construct $\text{GPC}_{odt}$. In particular, to learn whether the export results are driven by more than the nearest procurement center of each retailer, we generated $\text{SGPC}_{odt}$, which captures a city's exposure to *all* procurement centers of these four retailers in China. Results with $\text{SGPC}_{odt}$ (along with the formula used to calculate it) are shown in the online supplemental materials. In this estimation, the estimated coefficient and significance levels are similar to those estimated using $\text{GPC}_{odt}$. Similarly, once we control for city-year fixed effects, the significant coefficient on $\text{SGPC}_{odt}$ disappears.

which control for city-time effects cast doubt on the importance of retailer linkage effects that are confined to the export pathways connected by retailers. These results suggest that multinational retailer presence may have had a broader impact, enabling cities to increase their exports to *all* country destinations.

# 7   Capability Effects Test

In this section, we test whether the evolving presence of multinational retailers in China helps explain the patterns in city-year effects from the export regressions that we attribute to unobserved developments in city export capabilities. In other words, we seek to test whether the growing presence of multinational retailers in China exerted a direct effect on the time-varying export capabilities of Chinese cities.

As discussed in section 2, we use specification (3) to test whether city proximity to multinational retailers' global procurement centers, or to a large number of retailer stores in the city, improves the city's multilateral exports. For this test we take the city-year fixed effects obtained by estimating specification (2) as our measure of each city's time-varying export capability. City proximity to retailers' global procurement centers are captured by the variables $\text{cityGPC}_{o,t-1}$ while the concentration of retail stores is denoted by $\text{cityRS}_{o,t-1}$.[22]

As we examine the connection between retailer presence and city export capabilities, we control for other economic factors including the gross value of industrial output per capita, population, city fixed effects, and year effects. These controls alleviate the potential for endogeneity caused by location choice decisions. When retailers select city locations for their new stores, we expect them to seek cities that offer profitable opportunities due to high disposable income and a large population of middle class customers. If we fail to control

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[22]When we run robustness checks that test whether changes in retailer presence at the provincial level can explain changes in province-year export capabilities, retailer variables are constructed in the same fashion as the one for cities.

for factors influencing retailer city selection motives, a positive and significant coefficient on cityRS$_{ot}$, might reflect the economic characteristics of the local market that affect exporting rather than providing support for our hypothesis of multinational retailer capability effects. Similarly, we need to control for economic factors at the city level, as we expect that multinational retailers may seek locations with strong export capability, when they choose the geographic location for their global procurement centers. City fixed effects capture the time-invariant component of heterogeneity across cities, which may include the existence of harbors or other waterways, the degree and extent of government preferential policies towards foreign direct investment and exports, and the consumption habits of local consumers. The year effects capture nationwide policy changes that affect the export capabilities of all Chinese cities.

Because this section uses the city-year fixed effects from the linkage regression as the dependent variable, the data set used here has a unique structure. While the data set is based on the retail exports of N cities and t years, specification (2) is capable of estimating $N_o \times (t-1)$ city-year dummies, not $N_o \times t$. This is due to the perfect collinearity between city-year and dyadic fixed effects. Our online supplemental materials demonstrate this issue with a simple example. In the following regressions, we set the earliest city-year dummy for each city as the default. Therefore, in total, $280 \ (= 35 \times (9-1))$ city-year dummies are estimated in specification (2). In the following analysis, zeros are plugged in as the estimated parameters for the 35 first years of city-year dummies since they are taken as default groups.[23]

Table 3 contains the estimation results for our regressions relating the time-varying city-level export capabilities to city-level retailer developments and changes in the city's economic environment. To explore the time dimension for retailer effects, the retailer measures are

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[23]In a robustness test with estimated standard errors as regression weights, only the 280 estimated coefficients are utilized.

Table 3: Capability Effects Robustness Tests, City, Unweighted

| Lagged $t$ | (1) $t=1$ | (2) $t=2$ | (3) $t=3$ | (4) All | (5) With F.1 |
|---|---|---|---|---|---|
| cityGPC$_{o,t-1}$ LAG−1, global procurement centers | 0.253$^a$ (0.083) | | | -0.026 (0.058) | -0.032 (0.061) |
| cityRS$_{o,t-1}$ LAG−1, retail stores | 0.102 (0.074) | | | -0.113$^b$ (0.056) | -0.154$^c$ (0.079) |
| cityGPC$_{o,t-2}$ LAG−2, centers | | 0.268$^a$ (0.091) | | 0.085 (0.064) | 0.147$^b$ (0.062) |
| cityRS$_{o,t-2}$ LAG−2, stores | | 0.203$^b$ (0.081) | | 0.048 (0.071) | 0.119 (0.072) |
| cityGPC$_{o,t-3}$ LAG−3, centers | | | 0.270$^a$ (0.081) | 0.179$^a$ (0.060) | 0.294$^b$ (0.130) |
| cityRS$_{o,t-3}$ LAG−3, stores | | | 0.255$^a$ (0.081) | 0.184$^b$ (0.069) | 0.090 (0.064) |
| cityGPC$_{ot}$ Contemporaneous centers | | | | 0.173$^a$ (0.057) | 0.097 (0.075) |
| cityRS$_{ot}$ Contemporaneous stores | | | | 0.118 (0.070) | 0.051 (0.070) |
| cityGPC$_{o,t+1}$ FWD+1 centers | | | | | 0.085 (0.060) |
| cityRS$_{o,t+1}$ FWD+1 stores | | | | | 0.030 (0.068) |
| ln(pop$_{ot}$) population | -0.292 (0.218) | -0.271 (0.204) | -0.309$^c$ (0.178) | -0.130 (0.205) | -0.135 (0.202) |
| ln(gviopa$_{ot}$) gross value of indust. output per capita | 0.154$^b$ (0.072) | 0.136$^c$ (0.074) | 0.073 (0.099) | 0.058 (0.080) | 0.057 (0.073) |
| $N$ | 315 | 315 | 315 | 315 | 280 |
| $Within R^2$ | 0.870 | 0.876 | 0.880 | 0.890 | 0.875 |
| RMSE | 0.241 | 0.236 | 0.231 | 0.224 | 0.207 |

Note: Robust standard errors in parentheses are clustered at the city level with $^a$, $^b$, and $^c$ respectively denoting significance at the 1%, 5% and 10% levels. City and year fixed effects are included in all specifications.

lagged one, two, and three periods with respect to general export capabilities, and the results are reported in first three columns of Table 3. To alleviate concerns about autocorrelation, column 4 provides estimates from a specification that includes contemporaneous measures of cityGPC and cityRS. In the final column, future cityGPC and cityRS are added to the regression to test whether the significant and positive coefficients shown in the first four columns are driven by multinational retailers locating their stores or procurement centers in the cities with the highest export *potential*. However, our primary focus is on the regressions that are based on lagged measures of cityGPC and cityRS. Econometrically, this is beneficial since lagged measures are pre-determined with respect to the dependent variable. More importantly, this specification is economically appropriate as long as retailer entry is not determined by the market's future retail export potential.

The estimated retailer effects displayed in the first three columns of Table 3 indicate that proximity to global procurement centers has a positive and significant effect on city general export capabilities.[24] In addition, the effect of global procurement centers grows over time. The results show that the presence of retail stores also have a positive association that grows in size over time. The positive and significant coefficients on the retailer variables such as cityGPC$_{o,t-1}$ provide direct evidence that city time-varying effects absorb the positive impacts of multinational retailers on exports. The coefficients shown in column 3 predict that a city's general export capability will increase by 2.7% in response to a 10% increase in procurement center activity three years prior; the same specification predicts that general export capability will increase by 2.55% three years following a 10% expansion in the number

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[24]Since the dependent variable in the capability tests consists of estimated coefficients, there is a potential efficiency gain from using the Saxonhouse (1976) procedure of weighting each observation by $1/s.e.(\widehat{\alpha_{ot}})^2$. Under this approach, less precisely estimated city effects are given lower weights in the second stage analysis. The results, shown in the online supplemental materials, confirm our previous findings: lagged cityGPC and cityRS remain significant at the 5% level.

of retail stores.[25]

To evaluate whether our results are driven by reverse causation and time-series correlations, the fourth column of Table 3 adds contemporaneous cityGPC$_{ot}$ and cityRS$_{ot}$ to the regression. If our results are due to reverse causation, and current values of the retail variables are correlated with the past values of the retail variables, positive coefficients on the retailer variables may arise in estimation, even if retail activity does not enhance city export capability. Fortunately, the results in column 4 show that this issue is not a big concern. Each of the three lags of cityGPC and cityRS are significant even though contemporaneous cityGPC is significant as well. Since these changes in retailers' presence predate the changes in cities' export capabilities, this result suggests the relationship is causal.

As a final robustness check, we also ran tests to rule out the possibility that our results are driven by retailers locating their stores or procurement centers in anticipation of cities' export *potential*. If so, it is possible that large multinational retailers, due to their sophistication and experience, may be able to predict which Chinese cities are likely to experience the biggest jumps in their future export capabilities. If retailers' locations choices are also positively affected by a city's export potential, the variables cityGPC and cityRS will be positively correlated with error terms in future periods, and fixed effect estimates will be inconsistent. To assess the relevance of this concern, we implement the "strict exogeneity test" of Wooldridge (2002, p. 285) by adding future measures of cityGPC and cityRS to the regression framework. If cityGPC and cityRS are strictly exogenous to export capabilities, the coefficients on cityGPC$_{o,t+1}$ and cityRS$_{o,t+1}$ should not be statistically different from zero. Reassuringly, the results which are displayed in column 5 of Table 3 demonstrate that this is

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[25]If multinational retailers primarily contribute information from abroad to local suppliers, then capability effects might be larger for exports of domestic firms. In estimates available upon request, we find that the effects of retailer presence have the same signs and statistical significance for exports by foreign and domestic firms, but the effects for foreign firms are slightly stronger.

the case; neither of the coefficients on future retailer activity are statistically significant, and the p-value for the F-test of joint significance for these two variables is 0.339. Thus, the timing indicates that changes in centers and stores occur prior to changes in multilateral exports, supporting the causal story, rather than a model of endogenous locations by forward-looking retailers.

To evaluate the robustness of our results, we also repeated the analysis of Table 3 using province-level data, since province-level export data provides a comprehensive measure of Chinese exports. The results from the province-level regressions corroborate the findings we note at the city-level. In particular, the economic effects implied by the provincial data analysis indicate that after global procurement centers have been operating for three years, a 10% increase in $\text{provGPC}_{o,t-3}$ will boost provincial general export capability by 1.41%. After the stores have been operating for three years, a 10% increase in $\text{provRS}_{o,t-3}$ induces a 1.91% increase in general export capabilities.[26]

In summary, this section provides evidence from the geographic and time series developments in multinational retailer presence that supports the capability hypothesis. In particular, the regression results suggest that the presence of multinational retailers increases future exports by improving the general export capabilities of the Chinese cities where they locate.

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[26]The dependent variable for the province-level analysis are the province-year fixed effects that are estimated when specification (2) is applied to provincial export data. The robustness checks also yield similar results to those found with city-level data. In the provincial regressions the p-value for the F-test of the joint significance for the two future variables, i.e. $\text{provGPC}_{o,t+1}$ and $\text{provRS}_{o,t+1}$, is 0.47. The p-value for the F-test of the joint significance for current and lagged measures of provGPC and provRS is smaller than 0.002.

# 8 Conclusion

Our paper evaluates an argument offered by Walmart to the government of India in its bid to expand in that country: "Were it to have outlets in India, its procurement would naturally increase. Suppliers would become familiar with its requirements, and exports would also climb."[27] Our results shed light on a number of elements of Walmart's claim. First, estimates from the standard gravity model show that cities near retailer purchasing centers export significantly more to countries with stores in the retailers' networks than do other cities of similar size and distance from international markets. However, this positive effect does not seem to arise directly due to retailers procuring Chinese products for sale in their retail stores outside of China. Rather, retailer presence (proximity to purchasing centers and the placement of stores in a city) is correlated with the city's export capabilities. In other words, we find that cities with an expanding multinational retailer presence subsequently experience more rapid multilateral export growth in retail sectors. The export expansion is not limited to destination countries that host large number of the retailers' stores. Finally, the evidence that changes in retailer presence occur prior to changes in city export capabilities supports the idea that the effect is causal.

One lesson of our econometric analysis is that the estimation of linkage effects is highly sensitive to the choice of econometric specification. In our analysis, estimates from simple gravity or dyadic fixed effects specifications both suggest that linkages have a significant effect on bilateral exports. However, the estimated linkage effects disappear once we control for the general export capabilities of origins, as captured by origin-time fixed effects. The next step in this research agenda is to devise methods to uncover the economic mechanisms by which proximity to multinational retailers enhances city export capabilities.

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# Data Appendix

Table 4: Data Sources for Control Variables

| Variable | Source |
|---|---|
| Countries' GDP and populations | World Bank Development Indicators |
| Chinese provinces' GDP and populations | China Data Online |
| The longitudes and latitudes of country capitals | CEPII |
| The longitudes and latitudes of province capitals | Map of World website |
| Chinese city land areas | China Data Online |
| Chinese ports | Lloyd's ports of the world (1995) |