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ABSTRACT

This paper studies the relationship between multinational firm proximity and the formation of new export connections by private Chinese exporters between 1997 and 2003. The results indicate that growth in the presence of multinational firms is positively associated with the formation of new trade by local Chinese firms. Further exploration suggests that information spillovers may drive this result, as the positive association due to own-industry multinational presence is particularly strong in contexts where information improvements may be the most helpful. Thus, it appears that a growing presence of multinational firms may enhance the export capabilities of local domestic firms.

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Introduction

Many countries actively promote foreign investment within their borders expecting to reap the benefits arising from the presence of multinational firms.[1] One particular benefit that economists have studied is how proximity to multinational firms affects local firms' export capabilities. For example, Aitken, Hanson and Harrison's (1997) work on Mexican firms suggests that proximity to multinational firms increased Mexican firms' export probabilities. However, while work on UK firms by Greenaway, Sousa and Wakelin (2004) and Chinese provinces by Ma (2004) also find a positive association between multinational firm presence and export probabilities or export volumes, a positive effect is not uncovered in all contexts.

The fact that multinational presence is not always associated with elevated export performance may not be surprising. As Aitken and Harrison (1999) point out, the net effect of multinational presence on local firms may be negative if the effects of intensified product market competition outweigh the spillover benefits of improved firm productivity among the local firms. Multinational firm activity might also harm private firms if the multinational firms' demands for workers and other local factors drive up operating costs for firms in the area.

Most treatments of export spillovers from multinational firms study whether the export probabilities or export volumes of local firms are enhanced by proximity to multinational firms. In contrast, this paper examines another potential channel for export spillovers: whether proximity to multinational firms is associated with an expansion in the export relationships of host country exporters. This dimension of trade relationships

[1] Blomstrom and Kokko (1998), and Navaretti and Venables (2004), and Gorg and Greenaway (2004) provide comprehensive surveys of host country benefits and harms from multinational activity.

is important, since it addresses whether location near multinational firms enables local firms to increase the density of their trade networks, or the size of their newly introduced transactions. Such diversity is of interest, since there is a growing appreciation that increased export diversity may contribute to a country's economic growth.[2] In addition, Bernard, Redding and Schott's (2006) investigation of firm dynamics suggests that industries realize productivity improvements through firms' reallocation of activity across products.

To study how the growing presence of multinational firms affected the creation of new Chinese trading relationships, this paper studies Chinese trade data for 1997 to 2003 to learn observe the connection between the presence of multinational firms and the introduction of new HS8 product exports at the city level. These data provide an unusual opportunity to examine the relationship between multinational firm activities and the ability of local firms to increase their export connections. First, since the sample period includes China's entrance to the WTO, increased certainty about the international treatment of China's exports may have resulted in a more rapid formation of trading relationships than is typical for countries that have already attained WTO membership. As a result, the data set is likely to provide an especially large number of new trade transactions that allow one to identify spillover effects from multinational firms. Second, since China managed to attract an unusually large volume of foreign investment in the 1990's and early 2000's, there is sizable variation in the evolution of multinational variables at the city-hS2 industry level, that again facilitates identification of spillover effects to exports.

[2] See Feenstra and Kee (2004). In addition, since new product introductions represent an expansion in the diversity of products sold, they enable a country to expand exports without depressing the country's terms of trade [Kang (2004)].

While there is a large literature on the effects of multinational firms on host economies, this paper is the first to examine the association between the presence of multinational firms and the growth in the product and destination diversity of local exporters.[3] The results indicate that private Chinese firms and entrepreneurs were indeed more likely to form new trading relationships or to expand their range of traded products when the number of proximate multinationals increased. For China, the analysis implies that the actual change in own-industry multinational presence (size) between 1997 and 2002 was associated with a 2.8% (2.5) increase in new private export value between 1998 and 2003.

In addition, while it is well understood that multinational firm presence may bring both positive and negative spillovers to local firms, this paper exploits the fine data disaggregation to better understand the sources of multinational spillovers, with a particular emphasis on evidence regarding information spillovers.[4] To test whether the results support the idea that multinational firm presence helps local firms to learn about exporting I test whether the positive association is larger in contexts where information is the most important. This appears to be the case, as the estimated effects of multinational firm presence are largest for differentiated goods and for trade growth in China's interior. In addition, further support is found in the result that contact with foreign invested enterprises, which arguably provide the most information-rich form of contact, is associated with greater increases in trade formation than is related to other forms of

[3] The fine city-industry disaggregation of the data are used to identify the connection between multinational presence and local firm exports. In this sense, this paper takes the approach of many other authors who improve their identification of spillovers from foreign investment, by specifying the types of multinational linkages, or by studying data disagregated to the level at which the spillovers operate. See for example, Javorcik (2004), Kneller and Pisu (2005), Ruane and Sutherland (2004) or Keller and Yeaple (2003).

[4] The idea that local firms may learn from multinational firms is also supported by Haskel, Pereira and Slaughter's (2002) discovery that British firm productivity is enhanced by contact with multinational firms.

multinational contact. Taken together, these results support that idea that multinationals, by acting as a conduit of information, facilitate international economic integration.

2. Multinational contacts and local Export Behavior

Improved access to accurate information can help explain developments in the global integration of labor and product markets. Thus, if the presence of multinational firms provides informational spillovers which enable local firms to learn more about market opportunities in foreign locations, contacts with multinational firms may enhance the export capabilities of local firms. To test this idea, and to motivate the empirical analysis, I reinterpret Rauch and Trindade's (2003) model of globalization to form predictions about the effects of multinational contacts on the formation of new export relationships by local Chinese firms and entrepreneurs.

To begin, consider a Chinese firm that is interested in initiating new product exports, or in expanding the locations to which it exports. In either case, since the formation of a new export relationship requires the Chinese manager to identify a foreign buyer, the formation of the new trade relationship involves costly search. For example, while the Chinese firm can observe customer demand for radios in Britain, the Chinese firm requires further information if it is to learn whether it can profitably sell its variety of radios to British purchasers. Further, while the Chinese firm may possess enough information to avoid introductions with the worst-suited, lowest-profit distribution partners, search can be modeled as yielding a single introduction within the Chinese

firms' search range.[5] The Chinese exporter forges an export relationship with the foreign buyer as long as the expected profit from the sale exceeds the Chinese firm's reservation value, which is defined by outside opportunities in the Chinese market.

This form of search uncertainty in Rauch and Trindade's (2003) framework explains how North-South wage differentials may endure even when labor quality is identical across countries. In this reinterpretation of their model, search uncertainty can also explain why some profit-generating export transactions fail to commence. In particular, the Chinese firm may turn down a profitable foreign sales opportunity, if the Chinese firm has better sales opportunities in the Chinese market. In other cases, an ideal buyer may exist, but the failure of the search to reveal the potential partner, leaves profitable but undiscovered transactions unrealized. Finally, the sales associated with new partnerships may be small if the Chinese firm locates a viable buyer that is nonetheless inferior to the ideal, but undiscovered, partner.

Information-driven globalization can be represented as a reduction in search uncertainty, which enables firms to narrow their search, thus excluding a greater percentage of the least desirable matches. In the case of private Chinese firms or entrepreneurs, the expanding presence of multinational firms in China may have provided such information if observation of the product mix and product destinations of multinational firm exporters helped local firms learn about the types of products, and market locations where they could sell their products for the highest profit.[6] Information

[5] To conceptualize search uncertainty, Rauch and Trindade consider a setting in which partners are evenly distributed on the unit circle, with the optimal partner located at position 1/2. Search provides the random introduction to a partner in the range [1/2-k/2, 1/2+k2]. Thus search uncertainty is parameterized by k $\{0 \leq k \leq 1\}$. If k = 1 the search is equivalent to a random draw from entire unit circle, while for k = 0 there is no informational uncertainty and the search is guaranteed to identify the ideal partner.

[6] The scope for learning spillovers is suggested by Brambilla's (2006) discovery that multinational firms in China introduced twice as many new product varieties as did domestic firms between 1998 and 2000.

spillovers may have also occurred if employees brought information about foreign market opportunities with them when they left the multinational firms to take a job with one of the local Chinese firms.[7] Finally, local firms may have gained information due to the growing presence of multinational firms, even if they had no direct contact with multinational firms. For example, if the growing presence of multinational firms in a Chinese city drew an increasing number of trade agents to the city, the local Chinese firms may have gained information through the influx of agents who came to serve the new multinationals, rather than any direct contact with multinational firms. Regardless of the mechanism, if the presence of multinational firms refines the search process, the expected probability of finding an acceptable match increases since the random draw originates from a narrower interval that is more tightly centered around the set of acceptable partner draws. Further, if better information improves the probability of locating partner that is closer to the "ideal", newly introduced transactions may be larger in size.[8]

Nonetheless, while multinational firms may bring informational spillovers that help facilitate the formation of export relationships by Chinese firms, increased multinational firm activity may bring other effects that discourage the expansion of local firm exports. First, if multinational firms intensify competition in product markets, they may reduce export opportunities for local firms. Second, if multinational expansion elevates demand for labor and factors in the Chinese cities where they operate, multinational firms may increase local production costs, thus depressing the ability of

[7] Rodrik (2006) provides examples of such contacts in China.
[8] Further work by Rauch and Watson (2003) demonstrates how information improvements may increase transaction size. Besedes and Prusa (2006) find support for this idea in U.S. trade data. Similarly, if multinational proximity enables firms to learn more about buyer reliability, improved information may enable a larger fraction of new transactions to start at a larger size.

local Chinese firms to export profitably. Overall, the net effect of multinational presence will reflect the relative magnitude of the positive and negative spillovers to local firm export capabilities.

To more directly test whether the association between multinational presence and the trade of local firms exhibited evidence of informational spillovers, the regressions investigate whether the positive association with multinational presence was particularly strong in information-dependent sectors where the formation of trade relationships requires high-quality information.

3. Estimation and Data

To examine the relationship between multinational firm (MNC) proximity and the new export activity of local Chinese firms, I use the following regression specification:

(1) $VNew_{hct} = \alpha + \beta_1 * OwnInd\_MNC_{hc,t-1} + \beta_2 * OtherInd\_MNC_{hc,t-1} + \gamma * X + \varepsilon_{hct}$

The dependent variable, $VNew_{hct}$, is the value of new HS8 product trade transactions by private Chinese firms within an HS2 industry, where h represents the HS2 industry, c the Chinese city of origin, and t the year.

The key regressors of interest, $OwnInd\_MNC_{hc,t-1}$ and $OtherInd\_MNC_{hc,t-1}$, represent the level of multinational activity in the city, by multinationals in the same HS2 industry, and by multinationals in other HS2 industries, respectively. In both cases, multinational activity is measured by the MNC export activities, where the level of export activity is measured either by the value of MNC exports and or by the number of distinct MNC export transactions in the HS2 industry.

The error term is assumed to have two components. The first, Ψ_{hc} is a city -HS2 industry fixed effect, while the second η_{hct} is an iid error term.

(2) $\varepsilon_{hct} = \Psi_{hc} + \eta_{hct}$

The inclusion of City-HS2 Industry fixed effects is especially important for this analysis, since it is easy to imagine that there are a number of unobserved, and potentially unobservable factors, that make some cities well-suited for the export of some industry outputs and not for others.

The effects of multinational contact are identified from within variation, as the use of fixed effects removes time-invariant factors that attracted FDI and stimulated new private exports. While the validity of this approach relies on the assumption that comparative advantage or investment attractiveness at the city-HS2 industry level was static, this assumption may not be too far from the truth since the estimation window is only six years in length.

An instrumental variables (IV) strategy could deal with the issue of time-varying shocks. However, the implementation of a valid IV strategy faces a number of complications. First, while policy variables representing city efforts at promoting foreign investment are an ideal instrument, these variables can only be easily attained for the cross section of cities. As a result, it is not possible to use the policy variables in a panel IV setting which has city-HS2 fixed effects, since any time-invariant instruments are dropped in the first stage. Unfortunately, while the analysis could be performed under the assumption that the error component Ψ_{hc} is a random effect, the validity of the random effects approach is rejected by the Hausman test. Further, abandoning the panel format which includes city-HS2 industry controls would be problematic since it would be

difficult to include a sufficiently broad set of regressors to capture underlying differences in city- industry abilities.[9] Alternatively, if other-industry foreign investment is used as an instrument, it is possible to use fixed-effects panel methods since MNC activity is time-varying on the city-industry dimension.[10] However, this instrument is less than ideal in resolving concerns about endogeneity, since it is easy to imagine many circumstances where a shock to a local economy, or a change in local regulations would spur both private exports and foreign investment. For this reason I include policy variables as instruments, and discuss results from random-effects panel regressions in the robustness checks. However, while IV results are mentioned the robustness checks, the robustness checks focus instead on other strategies for controlling for time-varying shocks. A more developed focus on IV strategies is set aside for future work.

3.1 Data

The primary data for this project are based on Chinese exports of products at the HS8 level of disaggregation, as reported in the Customs General Administration of the People's Republic of China for 1997-2003.[11] In addition to information on the Chinese city-district of origin and country destination of these exports, these data include information on the ownership type of the transactions, which enable one to distinguish transactions that were controlled by foreign versus Chinese-owned entities. Finally, while a 4-digit code distinguishes the city origin of Chinese exports, there is a fifth digit

[9] The relevance of city-industry effects is demonstrated in Table 2, since the coefficient on multinational contact is much smaller when city-industry fixed effects are used. Due to the diversity of industries and span of cities, it would be difficult to identify and collect a set of economic controls that adequately control for cross-city differences in sector abilities. Further, even if such data were available, economic data on Chinese cities is available for only a small set of cities in the data sample.

[10] Head and Ries (1996) find that the location choices of foreign multinationals in China responded not only to the location of local Chinese firms, but also to the location decisions of previous foreign firms.

[11] These data were used under license to the CID at the University of California, Davis.

in the geographic codes, which enables one to more finely distinguish the location of export within a city, thus identifying the activities of different exporters.

The dependent variable $VNew_{hct}$ is the total value of all new HS8 export transactions within an HS2 industry h, from city c in year t. Since collection of these data at the HS8 level of disaggregation began in 1997, it is possible to generate count measures for new trade transactions for the years 1998 to 2003. New private transactions arose for two different reasons. First, new transactions developed when private firms in a city expanded the number of countries to which they exported their products. For example, if a city exported a particular HS8 product to Germany in 1999, and then was observed exporting the product to the U.S. in 2000 for the first time, this expansion in destinations was defined to be a new trade transaction.[12] New trade was also generated when Chinese firms within a city started to export an HS8 product that had not been exported anywhere in the previous year. Table 1 presents summary statistics on the frequency of new private trades, and on the prevalence of multinational contacts. In the full sample, the average number of new trades created at the city-industry level was 6.55 per year. Of those new trades, 1.36 were new product exports, while the remainder represented exports to new country destinations of products that were exported to other locations in the previous year.

After the new private transactions were identified, the transactions values for the new transactions were aggregated to form a balanced panel whose dimensions are city, HS2 industry and year. All city-industry pairs were included, as long as the city-industry had at least one non-zero observation for multinational activity or new trade during the

[12] While new private trade transactions are defined with reference to the previous year, it is possible that such a connection existed in year t-2 or earlier. Further exploration of alternative definitions of *new* trade based on earlier years activities will become possible when the time dimension of the data panel expands.

sample period.[13] As a result, the dependent variable $VNew_{hct}$ will grow from one year to the next if the size of newly introduced transactions grew in size and/or the number of new transactions increased. The majority of the results are based on the observation of new trade value. However, since new trade can increase due to expansion on different dimensions, I examine the frequency of new private transaction introductions in the robustness checks.

To capture the economic influence of multinational firms I create a set of variables that measure the activities of multinational firms. First, to measure multinational *presence*, I created a multinational variable that is a synthetic count of "firms", where firms are defined by each unique combination of the geographic, regime-type, and firm-type identifiers in the data set.[14] Thus, $OwnInd\_MNC_{hc,t-1}$ is the count of "firms" exporting HS8 products within an HS2 industry from city c. Such a measure will overestimate the number of multinational firms when multinational firms ship more than one product. At the same time, such a measure conforms to the typical definition of a firm in most theoretical treatments, where each firm sells a single product variety. Further, it could be argued that when multinational firms are active in more than one product area, they are providing relevant information on more than one type of activity, and thus are providing information on activities that might otherwise be provided by multiple firms. Finally, since the information on multinational contact is based on product level export transactions data that are reported by multinational firms, the regressions are also run using an alternative measure of multinational firm activities

[13] The sample contains information on 98 HS2 industries and 504 cities. Of the 49,392 possible HS2-city combinations, 21,677 met the criteria of non-zero activity.

[14] Feenstra and Hanson (2005) note that even though the operational identifier is HS8 product code for each transaction, once the data are broken down to the HS8 product- city- zone – ownership- processing regime level of disaggregation, this data set begins to provide information that is close in nature to that available in firm-level data sets.

which is based on the *size* or volume of exports emanating from multinationals within Chinese cities. In this case, the variable $OwnInd\_MNC_{hc,t-1}$ is defined as the value of all exports of multinational firms from a Chinese city within an HS2 industry classification.

In the full sample, the average count of own-industry multinational contacts was 7.7.[15] While the number of multinational contacts and the number of new trades for the average HS2-city observation are very similar, the value of new trade transactions was considerably smaller than the value of established multinational trade relationships. In this sample the value of new private trade transactions at the HS2-city level was only 2.78% as large as the value of trade by established multinational firms.

Multinational contacts in other HS2 industries may also provide information spillovers, such as country-specific information about buyers that is of use to all Chinese firms regardless of industry. To account for multinational firm activity in other HS2 industries in the city, $OtherInd\_MNC_{hc,t-1}$, measures the activities of other HS2 industry multinational "firms" within a city. As with the variable for own-industry MNC contact, this measure is measured both by the *presence*, or count of other HS2 "firm" contacts, as well as by *size*, where size reflects the total export volume of multinational firms in the city, in other HS2 categories.

Since private Chinese firms may need time to react to information learned from multinational presence, each of these variables are lagged one period. The use of lags is also beneficial since it ensures that the multinational variables are predetermined relative to the dependent variable. Finally, the regressions include additional measures of

[15] Between 1997 and 2002, the number of own-industry contacts, which are used to explain new transactions for 1998 to 2003, rose from 150,586 to 193,920.

economic activity at the province or city level. In each case, these data were collected from multiple years of the *China Statistical Yearbook*.

3.2 Results

Equation (1), which examines how new trade volumes were related to the presence of multinational firms, is estimated both by OLS with a full set of HS2 industry and city dummies, and again by a panel regression that includes HS2-city fixed effects. The baseline estimates which are displayed in Table 2 establish two results. First, the estimates uniformly show that a growing *presence* of own-industry multinationals was associated with expanding volumes of new private trade. Second, the regressions uncover a positive association between other-industry multinational activity and the value of new private trade. For each of these results, the positive association between multinational firm contact and the value of new private exports is observed whether multinational proximity is measured by the size or number of multinational export contacts.

To compare the effects of multinational contact as measured by *size* with the effects of multinational contact as measured by *presence*, columns (3) and (6) in Table 2 include both measures of multinational contact. The new estimates indicate that the volume of new private exports is positively related to the *presence* of multinational firms, and negatively related to the *size* of local multinational firm activity. The dichotomous effect of multinational exposure suggests that the presence of multinational contacts may be helpful in generating information spillovers, while the size of multinational contacts may exert a negative influence due to the role of large multinational operations in

intensifying product market competition, or in creating congestion in local factor markets. Nonetheless, evaluated at the average level of multinational *size* and *presence* in the sample, the results suggest that net effect of multinational proximity was positive.

The controls in the baseline regression are all highly significant.[16] When specification (1) is estimated by OLS, the F-tests for the joint significance of the industry and for the city fixed effects are significant at the one-percent level. In addition, the time trend and the gross value of industrial output (GVIO) at the provincial level are similarly significant.

The last control for provincial economic activity is perhaps the most important, since it allows one to conclude that the positive association between the expansion of multinational firm activity and the subsequent expansion of new trade value is driven by more than a simple increase general economic activity or productive opportunities at the provincial level.[17] However, since the regression measures how city-level changes in multinational presence are related to changes in city-level trade, we repeat the baseline regression in Table 3 using city-level GVIO, rather than the provincial measure. In so doing, the number of observations declines, since this data is only available for 31 cities. Notably, replacing provincial GVIO with city GVIO has no effect on the general results: the coefficient magnitudes for own-industry multinational contact in Table 3 are very similar to those in Table 2. If anything, the coefficients on multinational *presence* are

[16] Since this significance carries through the entire paper, the control variables are not discussed in the following regressions.

[17] Amiti and Javorcik (forthcoming) find that multinational location decisions are influenced by market and supplier access. However, if provincial GVIO is generally correlated with developments on these dimensions, the coefficients on the multinational firm variables suggest that multinationals do something further to change the economic opportunities for domestic firms.

somewhat larger than they were in the original regression.[18] The only other change in table 3 relates to the fixed-effects estimates which measure effects related to the *size* of multinational contacts. The positive association between the size of other-industry multinational activity and the value of trade transactions disappears when local economic activity is represented by city-level GVIO. (Compare column (5) in Table 2 with column (5) in Table 3.) Thus, Table 2 results on the relationship between new trade and the size of other-industry multinational contact may simply reflect city-level economic activity, of which, multinational firm exports are one component. In sum, Table 3 shows that while growing levels of provincial or city GVIO assist new private trade creation, there appears to be an additional increase in new trade creation which is associated with a growing presence of own-industry multinational firms.

Information spillovers could explain the positive association between the growing activity of multinational firms and the subsequent increase in new local exports. However, if information spillovers are behind this relationship, industries where information is especially important should be particularly affected by the growth in multinational firm activities. To test for differential sensitivity based on information needs, Table 4 tests whether the positive association between multinational firm presence and the growth of new private trade was larger in differentiated goods industries.[19] This prediction is distinct from the result we would expect if evolving, and unmeasured,

[18] This change does not appear to be due to the differences in the samples. Estimation of Table 2's specification with provincial GVIO, if limited to the subsample of data for which city GVIO is available, yields results that are very similar to those reported in Table 2.

[19] Rauch (1999) argues that search costs for differentiated goods will exceed those of homogenous or reference-priced goods, since information is not as easily collected and compared in differentiated goods industries. I generate a dummy variable for differentiated goods that is based on Rauch's (1999) conservative classification. HS2 industries were classified as "differentiated" if the modal product in the industry was differentiated. While there is some heterogeneity in the product classifications within HS2 industries, most industries were almost exclusively populated by either differentiated or non-differentiated industry sub-categories. The results do not change if Rauch's liberal classification is used instead.

differences in comparative advantage at the local level drive the positive association between new private trades and changes in multinational presence. Under this alternative, we might predict a lower association between multinational presence and the growth of new trade in differentiated goods, if differentiated goods depend less on natural location-based sources of comparative advantage such as unmeasured differences in industry-specific endowments.

Consistent with the hypothesis of information spillovers, the results in Table 4 show that the positive association between the growth of multinational firm activity and the expansion in new private trade was especially large in differentiated goods industries. For example, column (1) indicates that an increase in own-industry multinational activity, when measured by the count of multinational contacts, was associated with an expansion in trade volumes that was twice as large for differentiated goods industries. This finding is echoed in column (5), when multinational firm contact is measured by the size of own-industry multinational trade flows.

As before, we may be concerned that the positive association between multinational firm growth and domestic trade expansion reflects general economic growth effects rather than the special benefits arising from multinational contact. To deal with this issue, columns (2) and (6) replace provincial GVIO with city-level GVIO to provide a more accurate measure of local growth. Once this change is made, the positive association between own-industry multinational contact and new private trade is observed for differentiated goods sectors only.

Geographic location in China is another factor which may have influenced the informational needs of private Chinese firms. In particular, the exceptional economic

growth of China's coastal provinces, and the resulting economic gap between China's coastal and interior provinces, may imply that firms in China's interior stood to gain more from an improvement in information-rich contacts. Thus, Table 4 also tests whether contact with multinationals was associated with equivalently large effects on the value of new export transactions introduced in China's coastal and interior provinces. Comparing column (3) with column (4), or column (7) with column (8), shows that the benefit of own-industry MNC presence in differentiated goods is observed for China's interior provinces, while the effect is absent in the coastal regions of China. This suggests that informational spillovers in differentiated goods sectors may have been especially important in facilitating the development of trade in China's interior.

Another way to analyze the informational content of multinational firm contact is to distinguish between alternative forms of multinational activity. Chinese trade data record whether multinational export transactions were conducted by foreign invested enterprises (FIEs), joint ventures or outsourcing firms. Since FIE activity implies that foreign firms set up a subsidiary and have a greater local presence that may span a greater number of tasks in the firm's production process, FIE operations may provide informational spillovers that are particularly rich. If so, increases in FIE presence are predicted to have a stronger positive association with increases in local private exports than would a similar increase in outsourcing or joint venture operations. To see if this was the case, the own-industry multinational contact variable was divided into its constituent components.

As the results in Table 5 show, two primary differences arise when one distinguishes between alternative types of multinational activity. First, the positive

association between new private trade and own-industry multinational contact is greatest for contacts with foreign-invested enterprises. In Panel A, where multinational contacts are measured by multinational counts, joint venture contacts are also found to have a positive association in some cases, though the FIE coefficients are larger and statistically distinct. In contrast, when multinational contact is measured by the volume of multinational exports (Panel B), FIE activity still has the largest positive association with new private trade, though own-industry outsourcing presence is at times found to have a positive association which is similar in magnitude to the effects of FIE expansion. Second, the association between the value of new private trade and the growth of multinational activity remains strongest for differentiated goods sectors (compare column (3) with column (4), or column (7) with column (8)). This further supports the idea that growing multinational firm activity helped spur trade in those sectors where information was most vital to the creation of new trading relationships.

3.*3 Robustness Checks*

A primary concern in interpreting the correlation between changes in multinational activity and the subsequent changes in new private trade is that there may have been other economic determinants that were changing during the six-year estimation window that simultaneously altered multinational activity as well as new private exports. As a result, the first set of robustness checks estimates alternative specifications which include additional measures of economic activity. If the correlation between multinational firm activity and new trade was driven by underlying changes in the economic environment, we would expect that changing the controls for provincial

economic activity would affect the estimated coefficients on multinational firm proximity. As a result, I experimented with numerous specifications, and report some representative regressions in Table 6. Notably, while the coefficients on the measures of provincial economic activity change from specification to specification (for example, the sign on provincial GDP changes if population is taken out of the regression), the inclusion of extra provincial economic controls has no apparent effect on the coefficients describing the relationship between multinational firm activity and new private trades.

We might still be concerned that unmeasured growth in economic opportunities at the city-industry level drives the positive association between multinational presence and new trade relationships. For example, one might note that the number of multinational firms increased in Jiangsu in 2002, and that in 2003, the number of new trade connections in Jiangsu increased as well. While this set of events is consistent with the presence of spillovers, it could also arise if the multinationals came to Jiangsu in 2002 to produce and export digital cameras, and the private entrepreneurs started exporting digital cameras in 2003 too because Jiangsu gained valuable infrastructure that made it the best location for both multinational and private Chinese to produce and export consumer electronics products. Thus, to address whether there were city-industry-year shocks that were beneficial to Chinese and foreign exporters, the second robustness check adds the count of new contemporaneous own-industry trade relationships formed by multinational firms as an explanatory variable in column (3), and the value of new own-industry multinational trade in column (4). If unmeasured shocks at the city-year level made some cities more attractive for all types of activities, while information spillovers were non-existent, the coefficient on the measures of new multinational trade transactions should

be positive, while the coefficients on previous period multinational firm activity should lose significance. However, while the new regressions uncover a strong correlation between the value of new private trade and the contemporaneous increase in own-industry multinational trade, the magnitude of the originally estimated multinational coefficients are not changed by inclusion of these new variables.

As a final check on issues related to simultaneity, I ran IV using random effects. To instrument for foreign investment, I used 1) a binary variable indicating whether the city provided any incentive programs (SEZ, High-Tech Development Zone, or Economic Development Zone), 2) A count variable for the number of programs offered in the city, and 3) ln(Wage in State-owned enterprises), and 4) Other-industry MNC activity.[20] While the use of random effects estimation is called into question, it is worth noting that similar to results in Aitken, Hanson and Harrison's (1999) study of firm export probabilities, the coefficient on own-industry multinational contact is larger when IV is applied.[21]

As a third robustness check, the original transactions data are re-aggregated to create a panel of data whose dimensions are province, HS2 industry and year.[22] The regressions for the provincial-level regressions are reported in columns (5) and (6) of Table 6. When the regressions are run at the provincial level, all of the qualitative results

[20] Head and Ries (1996), Cheng and Kwan (2000), and Rodrik (2006) show and discuss the effects of evolving incentives for foreign investment. While many Chinese incentive areas were open to all firms, Naughton (2007) notes that differences in regulations meant that multinational firms were given more leeway in using the programs than were domestic firms. The variable definitions are based on a data appendix in Feenstra, Deng, Ma and Yao (2004).

[21] The IV coefficient for own-industry MNC activity is three to five times larger than it is in a regular random effects panel setting. Unfortunately, the appropriateness of a random-effects approach is rejected by the Hausman test. These results are available from the author by request.

[22] Since the new dependent variables are created by summing across city values within a province, they are based on the assumption that, even at the HS8 level of product disaggregation, plants in different cities produce differentiated outputs

remain. Notably, the estimated effects of own-industry contact increase a bit in magnitude, which suggests that own-industry spillovers may operate at the provincial level.[23]

To provide further insight into the results, and to check further for robustness, Table 7 examines two alternate dependent variables: the count of new private trade transactions and the count of new private product trade transactions. If the reallocation of economic activity in China, as in the U.S., reflects product switching, then the ability to introduce new product trades, rather than initial entry to exporting, may be of particular importance.[24] Since the dependent variable is now a count measure, the new regressions are estimated using negative binomial methods. As before, all variables are measured at the city-HS2 level of aggregation. For example, the count variable for new private trade transactions is the count of all new trade transactions at the HS8 level emanating from a particular city, aggregated to the city-HS2 industry level.

The count regressions in Table 7 show that the number of new private trade transactions increases when own-industry and other-industry multinational presence increases. Further, if an interaction between MNC presence and differentiated industry is added, we learn that the effects of own-industry contact are associated with a reduced number of new product introductions, which may indicate competitive effects. This implies that own-industry contact may reduce new trade introductions, while informational spillovers improve the size or quality of trades that are introduced. In contrast, the presence of other-industry multinational presence is associated with both an

[23] This suggests that the original city regressions could be augmented to include measures of own- and other-industry multinational contact at the province-level (that is not already included in the city measures). However, the estimated coefficient on provincial MNC activity outside the city is generally insignificant.
[24] See Bernard, Redding and Schott (2006) for evidence on firm-level product switching.

increase in the number of trade transactions as well as an increase in the number of new product trades introduced – an effect that is especially large for differentiated goods sectors.

The final regressions in Table 7 add multinational product diversity as a regressor. In this context, multinational product diversity, which is measured at the city level is the count of distinct HS8 products exported by multinational firms in the city within an HS2 industry. Regressions which include measures of MNC product diversity are reported in columns (5) and (10) of Table 7. When these regressors are added, they are found to be negatively associated with new transaction creation by private Chinese firms, which may reflect increased competition in product markets. In particular, if multinational firms already offer a full range of products in the HS2 industry, there may be less room for a local entrepreneur to enter the product space for the industry. However, when the regression controls for MNC product diversity, the coefficient on own-industry multinational activity rises. Thus it appears that when Chinese firms had good products that were not already offered by MNCs, their ability to export was enhanced when they were located near local multinationals who may have increased their awareness of destinations to which they could export.

4. Discussion

Development economists are particularly interested in learning whether the activities of multinational firms enhance economic outcomes for local firms and economies. While China's remarkable growth means that China's growth prospects may be of less concern than the growth outcomes in other developing locations, the results

from this analysis suggest that growth in multinational firm activities may help local firms in developing countries to increase their export engagement with the global economy.

From a policy perspective, it is important to ask how large the implied effects of increased multinational firm activity are. Based on the actual change in multinational presence (size) between 1997 and 2002 the coefficient estimates in columns (4) and (5) of Table 2 imply that growth in the presence of own-industry multinational firms was associated with a 2.8% (2.5) increase in new private export value between 1998 and 2003. Similarly the coefficients in column (1) of Table 7 imply that the growth in MNC activities between 1997 and 2002 was associated with a 2.6% increase in the number of trade transactions, while the coefficients column (2) of Table 7 imply that the same increase in MNC activities was associated with a 15.9% increase in new product trades by private Chinese firms. Thus, it appears that exposure to multinational firms may help Chinese firms to move more quickly through the product cycle. If so, this may be yet another channel of multinational firm spillovers that has helped speed China's growth.[25]

Due to the method of measuring multinational contact, the estimated results in this paper may represent an upper bound on the effects of multinational contact. In particular, since the multinational measures in this paper are based on multinational export activities, they do not capture contact with multinational firms that located in China to serve local customers.[26] If contacts with "market-seeking" multinational firms

[25] Feenstra and Rose (2000) use a semi-parametric procedure to rank counties based on their sequence of U.S. trade relationships as indicated by the time when they first export different products to the U.S. In suggestive regressions, Feenstra and Rose show that countries that were more highly ranked, as being at the forefront of product cycle introductions, grew more rapidly than less favorably ranked countries.

[26] Buckley and Meng (2005) argue that the majority of MNCs in China located to serve local customers, rather than to export.

provided less information about export opportunities, such contacts may have a weaker effect on private firm export capabilities.

While most of the analyses in this paper also find a positive association between other-industry multinational contacts and the growth in private firm exports, the correlation may be influenced by both information and other factors. First, one potential benefit of multinational firms is the creation or strengthening of supply or purchasing networks. If multinational networks enable local firms to purchase a more diverse set of higher quality inputs this benefit may assist local firms in their efforts to initiate new projects and export abroad. Further, if increased multinational activity encourages local governments to providing infrastructure, or deregulation that is beneficial to all firms, expansion in the scale of multinational export operations will improve the operating environment for local firms as well. However, the fact that expansion in the *size* of multinational export operations is negatively correlated with new export transactions by private Chinese firms, once the *presence* of multinational contacts is controlled for, suggests that multinational firm activity brings negative externalities due to competition, or effects on factor prices in local markets.

5. Conclusion

This paper studies how the presence of multinational firms contributed to the formation of private Chinese export transactions between 1997 and 2003. The evidence, which is based on the activities of multinational firms at the fine industry-city level shows that an expanded presence of multinational firms was associated with an elevated

creation of trading relationships, and that the effect of multinational presence was especially large when the multinationals were in the same industry.

The fact that the association between own-industry multinationals and new exports is especially strong in cases where information was the most important – differentiated goods industries, and for firms in China's interior – suggests that information is part of the story. This interpretation is further supported by the fact that the effects are strongest for contacts with multinational foreign-invested enterprises, that arguably provide the most information-rich form of contact. Taken together, the results suggest that multinationals, since they act as a conduit of information, help local firms to integrate and further engage in the international economy.

Table 1: Summary Statistics

	Full Sample		Differentiated Good Industries		Homogenous Good Industries	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Count of All New HS8 Trade Connections – City/HS2/Yr	6.55	43.9	8.25	52.0	3.60	11.1
Count of All New Trade in HS8 Products – City/HS2/Yr	1.36	4.95	1.59	5.56	.966	.302
Multinational Contacts:						
Foreign Invested Enterprises (FIEs)	5.49	22.8	6.89	27.5	3.04	9.85
Joint Ventures	.75	5.04	.95	6.10	.402	2.38
Outsourcing	1.46	9.70	1.91	11.9	.671	3.49

Table 2: The Effect of Multinationals on the Value of All New Trade Connections

	(1)	(2)	(3)	(4)	(5)	(6)
Own-Ind_MNC (Count Measure)	.511[a] (.008)		1.967[a] (.033)	.081[a] (.010)		.140[a] (.046)
Other-Ind_MNC (Count Measure)	.312[a] (.023)		.609[a] (.070)	.412[a] (.020)		.968[a] (.063)
Own-Ind_MNC (Value Measure)		.112[a] (.002)	-.400[a] (.008)		.022[a] (.003)	-.018[a] (.008)
Other-Ind_MNC (Value Measure)		.084[a] (.007)	-.098[a] (.022)		.101[a] (.006)	-.180[a] (.019)
Gross Value of Industrial Output in Province	1.233[a] (.161)	1.286[a] (.161)	1.171[a] (.160)	1.298[a] (.139)	1.333[a] (.139)	1.263[a] (.139)
Year	1.269[a] (.027)	1.276[a] (.027)	1.276[a] (.027)	1.283[a] (.023)	1.289[a] (.024)	1.285[a] (.032)
City Effects	Yes	Yes	Yes	-	-	-
HS2 Industry Effects	Yes	Yes	Yes	-	-	-
City-HS2 FE	-	-	-	Yes	Yes	Yes
R^2	.397	.392	.410	.159	.148	.163
Observations	130,002	130,002	130,002	130,002	130,002	130,002

Notes: Standard Errors in ( ). The superscripts [a], [b], and [c] denote statistical significance at the 1%, 5% and 10% levels. Dependent variable is the value of new trade transactions, at the HS2 city level. Aside from year, all variables are in logs.

Table 3: The Effect of Multinationals on the Value of All New Trade Connections

	(1)	(2)	(3)	(4)	(5)	(6)
Own-Ind_MNC (Count Measure)	.664[a] (.026)		2.237[a] (.092)	.095[a] (.034)		.467[a] (.131)
Other-Ind_MNC (Count Measure)	.902[a] (.043)		2.846[a] (.133)	.338[a] (.084)		3.132[a] (.261)
Own-Ind_MNC (Value Measure)		.162[a] (.007)	-.458[a] (.025)		.018[b] (.009)	-.107[a] (.034)
Other-Ind_MNC (Value Measure)		.332[a] (.019)	-.953[a] (.057)		.006 (.031)	-1.103[a] (.097)
Gross Value Industrial Output in City	.640[a] (.079)	1.617[a] (.071)	-.890[a] (.107)	-1.0972[a] (.185)	-1.132[a] (.186)	-1.233[a] (.185)
Year	1.708[a] (.038)	1.467[a] (.038)	2.134[a] (.043)	2.211[a] (.055)	2.244[a] (.055)	2.269[a] (.055)
City Effects	Yes	Yes	Yes	-	-	-
HS2 Industry Effects	Yes	Yes	Yes	-	-	-
City-HS2 FE	-	-	-	Yes	Yes	Yes
R^2	.416	.392	.441	.139	.088	.259
Observations	15,762	15,762	15,762	15,762	15,762	15,762

Notes: Standard Errors in ( ). The superscripts [a], [b], and [c] denote statistical significance at the 1%, 5% and 10% levels. Dependent variable is the value of new trade transactions, at the HS2 city level. Aside from year, all variables are in logs.

Table 4: Product Differentiation and the Effect of Multinationals on New Trade

Panel A: MNC Contact Measured by the Count of MNC Contacts

	(1)	(2)	(3)	(4)
	All China	***All China***	***Coast***	***Interior***
Own-Ind_MNC	.050[a]	.010	.040[c]	.047[c]
	(.017)	(.052)	(.022)	(.027)
Own-Ind_MNC	.051[b]	.145[b]	.004	.095[b]
*Differentiated	(.022)	(.069)	(.028)	(.033)
Other-Ind_MNC	.312[a]	.338[b]	1.029[a]	.269[a]
	(.034)	(.142)	(.162)	(.036)
Other-Ind_MNC	.155[a]	-.009	.494[a]	.137[a]
*Differentiated	(.042)	(.174)	(.195)	(.044)
Gross Value Industrial	1.297[a]	-1.094[a]	7.230[a]	.123
Output*	(.139)	(.185)	(.359)	(.161)
Year	1.283[a]	2.211[a]	.196[a]	1.482[a]
	(.023)	(.055)	(.061)	(.026)
R^2	.167	.140	.096	.153
Observations	130,002	15,762	78,282	51,720

Panel B: MNC Contact Measured by the Value of MNC Contacts

	(5)	(6)	(7)	(8)
	All China	***All China***	***Coast***	***Interior***
Own-Ind_MNC	.012[a]	-.006	.011[c]	.011[c]
	(.004)	(.013)	(.006)	(.007)
Own-Ind_MNC	.017[a]	.043[b]	.003	.028[b]
*Differentiated	(.006)	(.018)	(.007)	(.009)
Other-Ind_MNC	.064[a]	.006	.089[a]	.063[a]
	(.010)	(.052)	(.065)	(.011)
Other-Ind_MNC	.0572[a]	-.003	.411[a]	.048[a]
*Differentiated	(.013)	(.064)	(.084)	(.013)
Gross Value Industrial	1.331[a]	-1.131[a]	7.914[a]	.119
Output*	(.139)	(.185)	(.352)	(.161)
Year	1.290[a]	2.244[a]	.113[a]	1.491[a]
	(.023)	(.055)	(.060)	(.026)
R^2	.153	.091	.075	.145
Observations	130,002	15,762	78,282	51,720

Notes: Each regression includes HS2-City fixed effects. Standard Errors in ( ). The superscripts [a], [b], and [c] denote statistical significance at the 1%, 5% and 10% levels. Dependent variable is the value of new trade transactions at the HS2-city level. Aside from year, all variables are in logs. The gross value of industrial output is measured by provincial values, except for columns (2) and (6) which use the city values of industrial output. Beijing, Tianjin, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan are defined as "Coast", while all other provinces are "Interior".

Table 5: The Effect of MNC Type on New Trade

Panel A: MNC Contact Measured by the Count of MNC Contacts

	(1)	(2)	(3)	(4)
	Full Sample	***Full Sample***	***Diff Goods***	***Hom Goods***
Own–Ind_FIE	.081[a]	.148[a]	.094[a]	.057[a]
	(.011)	(.033)	(.014)	(.018)
Own–Ind_Outsourcing	.008	-.101[a]	.023	-.025
	(.015)	(.037)	(.018)	(.026)
Own–Ind_JointVenture	.040[b]	.027	.051[b]	.017
	(.019)	(.049)	(.024)	(.033)
Other-Ind_MNC	.415[a]	.355[a]	.456[a]	.335[a]
	(.020)	(.084)	(.025)	(.031)
Gross Value Industrial Output	1.296[a]	-1.093[a]	1.089[a]	1.770[a]
	(.139)	(.185)	(.166)	(.255)
Year	1.282[a]	2.187[a]	1.384[a]	1.150[a]
	(.023)	(.055)	(.028)	(.042)
R^2	.162	.133	.185	.121
Observations	130,002	15,762	82,548	47,454

Panel B: MNC Contact Measured by the Value of MNC Contacts

	(5)	(6)	(7)	(8)
	Full Sample	***Full Sample***	***Diff Goods***	***Hom Goods***
Own–Ind_FIE	.028[a]	.039[a]	.031[a]	.023[a]
	(.003)	(.008)	(.003)	(.004)
Own–Ind_Outsourcing	.035[a]	-.004	.038[a]	.026[a]
	(.004)	(.008)	(.004)	(.006)
Own–Ind_JointVenture	.007	.004	.010	.002
	(.006)	(.014)	(.007)	(.010)
Other-Ind_MNC	.101[a]	.003	.118[a]	.070[a]
	(.006)	(.031)	(.008)	(.010)
Gross Value Industrial Output	1.315[a]	-1.129[a]	1.101[a]	1.798[a]
	(.139)	(.185)	(.166)	(.255)
Year	1.289[a]	2.229[a]	1.355[a]	1.157[a]
	(.023)	(.055)	(.028)	(.042)
R^2	.172	.104	.190	.133
Observations	130,002	15,762	82,548	47,454

Notes: Each regression includes HS2-City fixed effects. Standard Errors in ( ). The superscripts [a], [b], and [c] denote statistical significance at the 1%, 5% and 10% levels. The dependent variable is the value of new trade transactions at the HS2-city level. Aside from year, all variables are in logs. The gross value of industrial output is measured by provincial values, except for columns (2) and (6), which use city value of industrial output. Rauch's conservative definition of differentiated goods is used to classify differentiated goods.

Table 6: The Effect of Multinationals on Trade Connections – Robustness Checks

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Value of New Exports - City	Value of New Exports - City	Value of New Exports - City	Value of New Exports - City	Value of New Exports - Province	Value of New Exports - Province
Own-Ind_MNC (Count Measure)	.078[a] (.010)		.076[a] (.010)		.103[a] (.013)	
Other-Ind_MNC (Count Measure)	.395[a] (.020)		.378[a] (.020)		.702[a] (.016)	
Own-Ind_MNC (Value Measure)		.021[a] (.003)		.020[a] (.003)		.045[a] (.005)
Other-Ind_MNC (Value Measure)		.096[a] (.006)		.093[a] (.006)		.324[a] (.007)
Gross Value of Industrial Output in Province	.403[a] (.153)	.421[a] (.154)	.396[a] (.153)	.412[a] (.153)	-2.081[a] (.108)	-1.998[a] (.108)
GDP	7.066[a] (.487)	7.190[a] (.487)	6.956[a] (.486)	7.089[a] (.487)	-11.062[a] (.344)	-11.391[a] (.344)
Population	-7.827[a] (.559)	-7.977[a] (.487)	-7.742[a] (.558)	-7.889[a] (.558)	5.392[a] (.395)	5.537[a] (.395)
Wage	2.595[a] (.410)	2.701[a] (.411)	2.502[a] (.410)	2.627[a] (.411)	7.093[a] (.290)	7.372[a] (.289)
Year	.431[a] (.064)	.410[a] (.062)	.444[a] (.064)	.428[a] (.064)	2.201[a] (.045)	2.185[a] (.045)
Increase in MNC Trade in HS2			[Count] .082[a] (.007)	[Value] .035[a] (.003)		
City-HS2 FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	.053	.046	.061	.046	.028	.039
Observations	130,002	130,002	130,002	130,002	16,014	16,014

Notes: Standard Errors in ( ). The superscripts [a], [b], and [c] denote statistical significance at the 1%, 5% and 10% levels. The dependent variable is the value of new trade transactions at the HS2-city level. Aside from year, all variables are in logs.

Table 7: The Effect of Multinationals on New Trade on New Trade Transactions

Panel A: Dependent Variable - Count of all New Private Transactions

	(1)	(2)	(3)	(4)	(5)
Own-Ind_MNC	.147[a]	.178[a]	.149[c]	.184[a]	.475[a]
	(.003)	(.052)	(.004)	(.027)	(.022)
Own-Ind_MNC *Differentiated			-.006	-.012	
			(.005)	(.012)	
Other-Ind_MNC	.148[a]	.064[b]	.135[a]	.052[b]	.144[a]
	(.005)	(.026)	(.005)	(.026)	(.005)
Other-Ind_MNC *Differentiated			.021[a]	.019[a]	
			(.003)	(.006)	
MNC Product Diversity in HS2					-.342[a]
					(.022)
Gross Value Industrial Output*	-.662[a]	-.089[b]	-.664[a]	-.089[b]	-.696[a]
	(.059)	(.036)	(.059)	(.036)	(.059)
Year	.637[a]	.524[a]	.637[a]	.524[a]	.641[a]
	(.011)	(.011)	(.011)	(.011)	(.011)
Log-Likelihood	-171,245	-32,642	-171,221	-32,687	-171,130
Observations	130,002	15,762	130,002	15,762	130,002

Panel B: Dependent Variable - Count of all New Private Product Transactions

	(6)	(7)	(8)	(9)	(10)
Own-Ind_MNC	.156[a]	.205[a]	.164[a]	.227[a]	.349[a]
	(.003)	(.007)	(.004)	(.027)	(.024)
Own-Ind_MNC *Differentiated			-.015[a]	-.037[a]	
			(.005)	(.012)	
Other-Ind_MNC	.129[a]	.104[a]	.117[a]	.098[a]	.126[a]
	(.005)	(.027)	(.005)	(.027)	(.005)
Other-Ind_MNC *Differentiated			.021[a]	.012[a]	
			(.003)	(.006)	
MNC Product Diversity in HS2					-.203[a]
					(.024)
Gross Value Industrial Output*	-1.834[a]	-.286[a]	-1.835[a]	-.286[a]	-1.849[a]
	(.067)	(.038)	(.067)	(.038)	(.067)
Year	.708[a]	.392[a]	.708[a]	.392[a]	.709[a]
	(.012)	(.012)	(.012)	(.012)	(.012)
Log-Likelihood	-131,284	-24,371	-131,256	-24,366	-131,250
Observations	130,002	15,762	130,002	15,762	130,002

Notes: Standard Errors in ( ). The superscripts [a], [b], and [c] denote statistical significance at the 1%, 5% and 10% levels. Each regression estimated by negative-binomial including HS2-City random effects. Aside from year, all variables are in logs. * The gross value of industrial output is measured by provincial values, except for columns (2), (4), (6) and (8), where the city value is used.

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