

***Comparative advantage as a source of exporters' pricing power:
Evidence from China and India***^{*}

Sushanta Mallick
Queen Mary University of London, UK
Email: s.k.mallick@qmul.ac.uk

Helena Marques
University of the Balearic Islands, Spain
Email: helena.ferreira-marques@uib.es

ABSTRACT

The literature on ERPT has not considered product-level comparative advantage (CA) as a source of heterogeneous firm productivity. However, a firm's production choice may determine its productivity level and also its pricing decision as both the degree of market power and the fixed costs of exporting vary across products. This paper empirically analyses the export pricing behaviour of Chinese and Indian exporters while considering these countries' degree of international competitiveness in different commodity groups. Previous pass-through estimates that did not take product-level competitiveness into account could be biased as the degree of pricing power due to changing product-level competitiveness could be correlated with the exchange rate variations. We use 6-digit product-level data across different export destinations over the period 1994-2007 to compute China and India's product-level CA, showing that pass-through tends to be more incomplete when the industries increasingly specialize in exporting. However, export prices increase with export specialization. This is because a stronger presence in export markets allows both higher market power and lower fixed costs of exporting, but in this case the former effect prevails over the latter. Export prices of India are sensitive to the volatility of the trade-weighted real effective exchange rate (REER), indicating heterogeneity in prices to maintain competitiveness, while the nominal currency volatility for China has insignificant explanatory power given a fixed currency system.

Keywords: *exchange-rate pass-through, pricing-to-market, comparative advantage, India, China*

JEL Classifications: *F14, F41, O11*

^{*}The authors acknowledge financial support from the British Academy through a Small Research Grant (Project SG-46699). Thanks are due to Yong Yang for his research assistance in compiling the datasets from UN Comtrade. The usual caveat applies.

1. Introduction

China and India have been undergoing substantial trade liberalization and specialization reorientation in the last 20 years, for which these countries have been increasingly attracting the attention of academics and policy-makers around the world (see for example Feenstra and Wei (2010) for China and Girma (2012) for India). The interest in the study of these two countries has recently been augmented by the fact that both are important emerging markets that under the current economic downturn have taken up the role of growth engines in the world economy (Hanson, 2012).

China started opening up to international trade and investment in 1979, with the creation of the special economic zones (Huang, 2012). In India, the direct trade controls including quotas, licensing, and trading rights that were prevalent before the 1990s were phased-out during the reform period. In addition, the indirect trade controls, such as tariffs and non-tariff measures, were reduced in order to regulate the trade flows. Such trade liberalization policies have been instrumental in enhancing the international competitiveness of Indian industries (Alessandrini et al., 2011). These policy developments reveal China and India as two key emerging economies with changing product specializations and consequent changes in competitiveness. Moreover, China has kept a fixed exchange rate regime (low exchange rate volatility), whereas India has moved on to a flexible exchange rate regime (high exchange rate volatility).

The exchange rate pass-through literature has shown that the observed pass-through of exchange rate changes to foreign market prices is incomplete due to the sluggish price

adjustment originating in mark-up adjustment by the exporters following changes in costs or movements in the exporters' currency (see for example Devereux and Yetman (2003) and Nakamura and Zerom (2010)). Moreover, incomplete exchange-rate pass-through (ERPT) exists even in emerging economies (see Mallick and Marques (2012) for the case of India). Gust et al. (2010) find that with increased trade integration, exporters have become more responsive to the prices of their competitors, explaining a sizeable portion of the observed decline in the sensitivity of US import prices to the exchange rate. This suggests that industry-level competitiveness can be crucial in explaining ERPT along with considering the firm's pricing orientation and the degree of exchange rate uncertainty.

Recently, the ERPT literature has acknowledged the existence of firms with heterogeneous productivity and their role in the determination of the extensive and intensive margins of trade has started to be taken into account (see for example Auer and Chaney, 2009; Alessandria and Kaboski, 2011; Basile et al, 2012; Berman et al, 2012; Johnson, 2012). Assuming a home currency depreciation, Rodriguez-Lopez (2011) finds that, when firms have heterogeneous productivity, aggregate ERPT into home import prices can be negative even if at the firm level it is positive (although incomplete). This result is due to the adjustment of the extensive margin whereby only the most productive foreign exporters survive a depreciation of the home currency and each exporter adjusts the mark up differently depending on productivity.

On the other hand, the growing importance of North-South trade brought by the development of global value chains renewed the importance of inter-industry trade based on patterns of comparative advantage (Hanson, 2012). Hence it is not sufficient to study firm heterogeneity without looking into the characteristics of the industry the firms belong to. Bernard, Redding and Schott (2007) have shown that the effects of symmetric trade liberalization on a given country are different for comparative advantage (CA) and comparative disadvantage (CD) industries, so that resource reallocation takes place across firms within the same industry, as well as between industries.

Taking into account that China and India are two major emerging exporters that have been undergoing substantial trade liberalization which lead to important changes in competitiveness in the last 20 years, in this paper we compare their pricing-to-market decisions in response to exchange rate changes – as measured by the NEER (Nominal Effective Exchange Rate) – whilst controlling for the industry CA and CD levels. Firms operating within more competitive industries have a greater presence in international markets, which may allow them to have lower fixed costs of exporting, but on the other hand that presence allows them to exercise a greater degree of market power. So pricing strategies may differ according to the industry CA level. If the cost effect predominates, export prices should be lower in high CA industries, but if the market power effect dominates instead, export prices could actually be higher in those industries. The identification of these types of industries is done using a transformation of the Hanson (2012) RCA index, which is bounded between -1 (CD) and 1 (CA) with zero representing intra-industry trade. We use 6-digit product-level data across high- and low-income

export destinations over the period 2000-2007. At 6-digits we obtain a lower bound for intra-industry trade (and an upper bound for inter-industry trade).

On the other hand, high exchange-rate volatility causes ERPT to be incomplete in both the short and the long run (Corsetti *et al.*, 2008). In this context, considering two key emerging market exporters (China and India), where exchange rate fluctuations are respectively fully and partially managed by the authorities of these two countries, can reveal whether exchange rate volatility tends to increase price discrimination and thereby reduce the degree of ERPT.

Section 2 starts by exposing the theoretical set-up. Section 3 describes some stylized facts about the patterns of CA in China and India and explains the construction of the transformed Hanson (2012) RCA index. Section 4 presents short-run ERPT estimates in a static panel model. Section 5 introduces long-run ERPT estimates in a dynamic panel setting (System GMM). Section 6 concludes.

2. Theoretical set-up

Despite the influence of recent work on firm heterogeneity started off by Melitz (2003), the idea that industries may matter in trade has been rehabilitated by, among others, Bernard, Redding and Schott (2007). They take the argument that heterogeneous firms may react differently to market conditions depending on whether they operate in CA or CD industries. It is possible that export pricing behaviour also differs by industry type. On the one hand, because CA industries are those with a relatively large export margin,

we can expect firms within these industries to have lower fixed costs of exporting. If this effect dominates, export prices should decrease with the industry's CA level. On the other hand, we can expect a greater presence of CA industries in international markets, allowing firms in these industries to exercise a greater degree of market power through their pricing behaviour. If this effect dominates instead, export prices may actually increase with the industry's CA level.

We outline a simple model of exchange rate pass-through in a similar spirit as Devereux and Yetman (2003), Ghironi and Melitz (2005), Melitz and Ottaviano (2008), Chaney (2008) and Rodriguez-Lopez (2011). In this class of models based on the work of Melitz (2003), it is assumed that only a subset of domestic firms are exporters due to the interplay between heterogeneous productivity across firms and, in some models, the existence of fixed costs of exporting. In this paper we further assume that each firm produces a single exportable 6-digit product.

A firm located in country i and exporting to country j faces marginal and fixed costs in terms of domestic currency and sets prices in terms of domestic currency. The demand faced by the exporter in the overseas market is given by:

$$C_{ij} = \left(\frac{P_j^*}{p_{ij}^*} \right)^\lambda C_j \quad [1]$$

where p_{ij}^* is the firm's price of its exports to the destination market given in foreign currency, P_j^* is the composite price index for all foreign goods sold on the destination

market, also given in foreign currency, C_j is the expenditure level, or absorption, of the destination market; and λ is the price elasticity of external market demand, which is country-specific and a function of the exchange rate (see Corsetti and Dedola, 2005). This type of demand function is derived from the destination market's utility maximisation (see Betts and Devereux, 2000 or Helpman et al, 2008). As a result, the exporting firm gets a share of the destination market that depends on its price relative to the composite price index that includes the prices of all sellers.

Furthermore, the firm's price in foreign currency is obtained from its price in domestic currency by means of $p_{ij}^* = e_{ij} p_{ij}$, where e_{ij} is the bilateral exchange rate defined as the units of foreign currency per unit of domestic currency, such that an increase in the exchange rate means an appreciation. The composite price index in the foreign market can also be converted to domestic currency by the same means.

Following the formulation in Chaney (2008), the exporting firm's profit in terms of domestic currency is given by:

$$\pi_{ij} = \left(p_{ij} - \frac{w_i \tau_{ij}}{\varphi_i} \right) C_{ij} - F_{ij} \quad [2]$$

where $\frac{w_i}{\varphi_i}$ is the productivity-adjusted wage cost at the producer's location, τ_{ij} is the iceberg transport cost which depends on distance, and F_{ij} is the fixed cost of exporting,

which is country-specific but not firm-specific. Thus the profit-maximization problem faced by a firm in an imperfectly competitive industry can be derived by maximizing profit with respect to the choice variable p_{ij} . The first order condition can be written as:

$$f'(C_{ij}) \left(p_{ij} - \frac{w_i \tau_{ij}}{\varphi_i} \right) = -C_{ij} \quad [3]$$

Substituting the demand function [1] in this first order condition and assuming that the exporting firm could adjust its price at any time, the equilibrium export price can be derived as:

$$p_{ij}^* = \frac{\lambda}{\lambda - 1} \frac{e_{ij} w_i \tau_{ij}}{\varphi_i} \quad [4]$$

This pricing equation is a mark-up equation modified to reflect the existence of transport costs and heterogeneous firm productivities. Whilst wages and transport costs are defined at the country-level, productivity is defined at the firm level. This presents us with the problem of obtaining firm-level data and carry out the empirical work at the firm-level, as has been done by Chaney (2008) for the US, Berman et al (2012) for France, Manova and Zhang (2012) for China, Chatterjee et al (2010) for Brazil, among others.

Instead, in this paper we assume that unobservable firm productivity (φ_i) is, in a given country, a measure of competitiveness and thus it is a function of the industry-specific comparative advantage ($c_{A_{ij}}$) and of the market-weighted exchange rate (e_{ij}). In this

formulation, we assume that firms producing high comparative advantage products are also more productive, as they benefit from lower fixed costs of exporting through a greater presence in international markets. Thus we can write:

$$\varphi_i = \exp^{\gamma_i CA_{ij}} (e_{ij})^{\gamma_j CA_{ij}} \quad [5]$$

By taking logarithms, equation [5] can be written as:

$$\ln \varphi_i = \gamma_i CA_{ij} + \gamma_j CA_{ij} \times \ln e_{ij} \quad [6]$$

Upon substitution, the pricing equation [4] can therefore be written as:

$$\ln p_{ij}^* = \ln \left(\frac{\lambda}{\lambda - 1} \right) + \ln (e_{ij}) + \ln w_i + \ln \tau_{ij} - \gamma_i CA_{ij} + \gamma_j CA_{ij} \times \ln e_{ij} + \gamma_{ij} \quad [7]$$

Facing different demand levels in each market, the exporting firm will establish a market-varying mark-up over marginal costs. The mark-up established over destination country j partly depends on the wage level of that country (Alessandria and Kaboski, 2011) or relative wage between exporting and importing countries as opposed to absolute wage cost in the importing country. If we assumed, as in Rodriguez-Lopez (2011), that wages are sticky, we could proxy wages by an exporting country specific fixed effect. However, his model is a developed country model, whereas here we are working with emerging markets showing very fast growth, including wage growth. Indeed, Chamarbagwala and Sharma (2011) argue that industrial wages have risen in India due to the labour force's skill upgrading, among other factors. Therefore, it would not be appropriate to assume sticky wages. In a context of very fast growth, it is preferable to assume almost perfect sectoral mobility within each country and to use the average manufacturing wage in each country as a measure of production costs. In this way, we are still able to capture time

variation in those costs. In studies on other emerging markets, Alvarez and Fuentes (2011) use the income per capita of Chile's export markets, whilst Marmolejo (2011) includes both Mexican and US wages in a model of exchange rate pass-through into Mexican import prices after the constitution of NAFTA. In the absence of wage data, using income per capita would be a good proxy to control for increasing globalisation of production activity, when a large share of international trade occurs through intra-firm transactions, leading to incomplete pass-through (see Hellerstein and Villas-Boas, 2010). Ferrantino, Feinberg and Deason (2012) have also used the per capita income of exporters to introduce vertical differentiation and the per capita income of importers to introduce pricing-to-market in a cross-section of 6-digit unit values for 2005. We will use income per capita in relative terms as data is available for the whole sample and this can also reflect external demand making it a key determinant of the extent of foreign exchange exposure in a particular market by exporters.

The lack of responsiveness of export pricing to exchange rate fluctuations may be partially on the back of hedging activities by trading agents due to foreign exchange volatility to eliminate exchange rate risk, as hedging against foreign exchange uncertainty can affect the structure of pricing behaviour and pass-through. In addition to the variables reflecting mark-up adjustment, a reduction in currency risk exposure due to hedging activities could lead to a decline in the transmission of changes in the exchange rate. Thus pricing-to-market estimates must be obtained by controlling for bilateral foreign exchange volatility in order to observe whether there is a differential impact of high and low volatile destination markets on international pricing.

3. Comparative advantage in China and India

In this paper we operationalize the theoretical concepts of CA and CD by means of a transformation of the Hanson (2012) RCA index. For product k exported by country A , this index is defined as the ratio between the difference and the sum of the share of product k in country A 's exports and the share of product k in country A 's imports:¹

$$RCA = \frac{\frac{x_k^A}{X^A} - \frac{M_k^A}{M^A}}{\frac{x_k^A}{X^A} + \frac{M_k^A}{M^A}} \quad (8)$$

This index is bounded between -1 (maximum CD when product k is imported by country A but not exported) and 1 (maximum CA when product k is exported by country A but not imported). Values close to 0 are interpreted as a sign of predominance of intra-industry trade (see, for example, Neven 1995).

We employ a panel data set from UN Comtrade consisting of location- and product-specific export price data from China and India to show the relative market power of Chinese and Indian exporters in different product categories during our sample period, allowing us to identify price discrimination in traded goods at the 6-digit level. Given the global crisis that has been unfolding since 2008 which has interfered with the normal trade flows due to lack of credit to firms, we use data up to 2007. Still, at the 6-digit product level, we have over 1 million observations.

¹ There are of course many different formulations for CA indexes. Some use both export and import data, some are multiplicative, and others are additive (see, for example, Hoen and Oosterhaven (2006), who use the formulation $\frac{x_k^A}{X^A} - \frac{x_k^{REF}}{X^{REF}}$. Hanson (2012), in turn, takes $\frac{x_k^A - M_k^A}{GDP^A}$ as a CA measure and $\log\left(\frac{x_k^A}{x_k^W} / \frac{X^A}{X^W}\right)$ as an RCA measure.

Some preliminary inspection of product export shares calculated for our data shows that no product takes more than 20% of any country's exports, but those few product groups with more than a 5% export share reveal some (already expected) differences in the specialization pattern (Figure 1). This pattern is somewhat dynamic for China and India, as would be expected of emerging markets. Also, contrary to the popular belief that China is mostly a clothing exporter, the fact is that exports of machinery have risen sharply and in 2007 took about 40% of exports, four times more than clothing.² India, on the other hand, is a strong textile exporter, especially of cotton, and is thus more of a supplier than a competitor to advanced countries in the clothing industry. It also exports strongly products derived from natural resources such as mineral fuels, precious metals, stones and jewellery.

Figure 1 here

Imports are more concentrated than exports, with three sectors having import shares between 10% and 25% for China and between 10% and 35% for India (Figure 2). The reliance on imports of mineral fuels and machinery, together with the overlap of these same exports, shows the mixed condition of emerging markets. They are, above all, integrated in world supply chains (see Amiti and Freund, 2010).

Figure 2 here

Using export and import shares, we compute the RCA index of China and India as per equation (1) for 2-digit industries (Figure 3). This level of aggregation provides an upper

² Hanson (2012) also proposes arguments based on outsourcing and accumulation of human and physical capital to explain China's move away from textiles and clothing into electronics. Amiti and Freund (2010) argue that outsourcing causes China's electronics exports to have low value-added. Nevertheless, the sectoral shift may have an impact on the export pricing strategy, which is the object of this paper.

bound for the level of intra-industry trade (a lower bound for inter-industry trade). At this level, the RCA index is very evenly distributed across 2-digit industries for both China and India, such that we find cases of high CD, of predominance of intra-industry trade, and some cases of very high CA, with an RCA index between 0.90 and 1, where China and India almost only export.³

Figure 3 here

Taking a look at the RCA index for 6-digit products (Table 1), China's mean and median started very close to zero (intra-industry trade) but progressively shifted to positive values (CA). India, on the contrary, started out with a mean and median CD, improved up to 2004, but has since then deteriorated its mean and median CA. Moreover, China has more industries at the top RCA index quartile than India. On the other hand, the extensive margin of China decreased over the sample period, whilst the extensive margin of India increased, so that China specialized whilst India diversified up to 2006. Probably this is the case because India opened up to trade relatively late, having been a rather closed economy until the 1991 reforms (see Mallick and Marques, 2012). The consequence was that China, having started from a broader product base in 2000, got to 2007 with a product base similar to that of India.

Table 1 here

³Melitz and Trefler (2012) show that, due to outsourcing, high shares of intra-industry trade can be found in emerging markets. A very detailed analysis of China and India's foreign trade, including the issue of outsourcing, can be found in Amiti and Freund (2010), Harrigan and Deng (2010) and Hsieh and Klenow (2009), among others. In this paper we focus on the relevance of CA for the measurement of export pricing strategies.

4. Pricing-to-market estimates in the short-run

Taking into account equation (7), we estimate the following equation:

$$\begin{aligned} \Delta \ln p_{ij,t}^k = & \beta_0 + \beta_1 \Delta \ln(e_{ij,t-1}) + \beta_2 \ln GDPpc_{i,t-1} + \beta_3 \ln GDPpc_{j,t-1} + \\ & + \beta_4 \text{var}[\Delta \ln(e_{ij,t-1})] + \beta_5 pshare_{ij,t-1} + \beta_6 HSshare_{i,t-1}^k + \\ & + \gamma_i CA_{ij} + \gamma_j (CA_{ij} \times \Delta \ln(e_{ij,t-1})) + \gamma_{ij} + u_{ij,t}^k \end{aligned} \quad (9)$$

where $GDPpc_i$ and $GDPpc_j$ are the exporter and the importer GDP per capita, e is the exporting country's NEER with a rise indicating an appreciation of the exporter's currency, and $\beta_0 = \ln\left(\frac{\lambda}{\lambda-1}\right)$.⁴ Beladi *et al.* (2010) develop a model of exchange rate pass-through allowing for a stochastic process of the exchange rate. Here we capture that stochastic process by including a lagged exchange rate variable. Moreover, Tarasov (2012) shows that high-income countries have better market access, that is, lower average trade costs, and so they trade more along the intensive and the extensive margins, whilst Johnson (2012) shows that a positive correlation between export prices and market income exists if exports are of heterogeneous quality, whilst with homogeneous quality exports there should be a negative correlation between export prices and market income.

We take three variables as measures of trade costs τ_{ij} . The first measure is exchange rate volatility, specifically currency risk expressed as $\text{var}[\Delta \ln(e_{ij,t-1})]$, which may explain why markets have not become fully integrated, as in the case of deviation from absolute

⁴ This implies that the constant term gives us information about the price elasticity of external market demand for each market in each moment in time. This elasticity determines the base price level.

PPP as evidenced in Alessandria and Kaboski (2011). Hedging is one such activity that aims to reduce trade costs and hence we need to control for this factor before deriving the PTM or ERPT estimates. If these hedging activities are not taken into account, the average pass-through coefficient could be underestimated. If the estimated degree of pass-through is used to measure the market or pricing power, such power in the industry may also have been underestimated without considering the impact of exchange rate volatility. Our measure of exchange rate volatility is obtained according to the procedure explained in Mallick and Marques (2010). Briefly, we use a GARCH(1,1) model for variance as the simplest and most robust of the family of volatility models which looks like this:

$$h_t = \omega + \alpha h_{t-1} \varepsilon_{t-1}^2 + \beta h_{t-1}.$$

This model computes the variance (h) of the current exchange rate as a weighted average of a constant and previous period's variance forecast and squared error.

The two other measures of trade costs, or the costs of exporting, are the share of exporter i in market j ($pshare_{ij,t-1}$) and the share of product k in exporter i 's export basket ($HSshare_{i,t-1}^k$). As in Helpman et al (2008), we consider that a high presence in a destination market or in a product market lowers the costs of exporting to that country or of exporting that product. However, that measure differs from the RCA index in equation (8), where intra-industry trade (exports and imports of the same product) is taken into account as a measure of net competitiveness in a given product.

Table A1 in the Appendix shows export price data availability for our sample of those high and low-income markets defined as in Hanson (2012) which are the main markets of China and India. Overall, we have a very large number of export price observations (over 1 million). NEER data (and later REER) is taken from Datastream (2005=100). GDP per capita is taken from the World Bank Development Indicators.

Table 2 presents the results of estimating equation (9) using fixed effects as determined by the Hausman test.⁵ China's export price changes more than one-to-one with the exchange rate (the foreign currency price absorbing 15% in excess of the exchange rate change), but in the case of India we find incomplete ERPT (the foreign currency price absorbing around 70% of the exchange rate change). With depreciating currencies, this means that China's exporters decrease their yuan price in addition to the yuan's depreciation, but India's exporters use the depreciation to disguise rupee price increases. Hence China has shown a more aggressive pricing strategy geared towards gaining market share, whereas India has shown more interest in increasing mark-ups. The CA level does not show any direct short-run effect on the pricing strategy of exporters, but in the case of India it is possible to detect an indirect effect operating through the exchange rate whereby the mark-up increase in response to exchange rate changes declines according to the CA level of their industry. In general, exporters are more concerned with defending their market share in more competitive industries.

⁵ The Hausman test carried out for fixed and random effects reveals that the random effects estimator is inconsistent. Hence we prefer the consistent, although less efficient, fixed effects estimator. Moreover, we use variance-covariance estimates clustered by exporter-importer-product groups to account for correlation of observations within each group. This essentially recognizes that exports of the same product to the same market are correlated over time and accounts for some persistence in export patterns.

Table 2 here

5. Pricing to market estimates in the long-run

The model presented in the previous section allows us to study short-run ERPT. Following equation (9), we estimate a System GMM (Arellano and Bover, 1995; Blundell and Bond, 1998) in order to examine long-run ERPT:⁶

$$\begin{aligned}\Delta \ln p_{ij,t}^k = & \beta_0 + \beta_1 \Delta \ln(e_{ij,t-1}) + \beta_2 \ln GDPpc_{i,t-1} + \beta_3 \ln GDPpc_{j,t-1} + \\ & + \beta_4 \text{var}[\Delta \ln(e_{ij,t-1})] + \beta_5 pshare_{ij,t-1} + \beta_6 HSshare_{i,t-1}^k + \\ & + \gamma_i CA_{ij} + \gamma_j (CA_{ij} \times \Delta \ln(e_{ij,t-1})) + \beta_7 \Delta \ln p_{ij,t-1}^k + \beta_8 \Delta \ln p_{ij,t-2}^k + u_{ij,t}^k\end{aligned}\quad (10)$$

This equation includes two lagged terms for the dependent variable. We could have inserted more price lags, but given that we have an unbalanced panel where the average number of years observed per importer-product group is between 5 and 6 on average, we prefer to use only one and two-period lags for the dependent variable. Besides, the estimated lagged values of the dependent variable shown in the dynamic model results of Table 3 seem to imply that there is a long-term significantly declining trend in export prices, justifying the use of the dynamic model.

⁶Campa et al (2008) and Brun-Aguerre et al (2012), for example, estimated an Error Correction Model to obtain long-run estimates. However, given that the cross-sectional dimension of our panel is so large compared to its time-series dimension, a system GMM is more appropriate. Moreover, we have a high number of gaps in our data and this prevents us from testing a full error correction model using a test such as the Westerlund (2007) panel test. Still we can incorporate both the level and difference exchange rate terms in order to determine long-run ERPT using the system GMM.

The short-run ERPT estimates maintain the characteristics found in the short-run model in Table 2: China's export pricing amplifies exchange rate changes, whereas for India exporters absorb a part of the exchange rate change (ERPT is incomplete). Moreover, in the dynamic system GMM model export prices increase with competitiveness, although we detect once again that competitiveness decreases ERPT. Note, however, that the direct effect of competitiveness on export prices is higher than its indirect effect operating through the exchange rate (15 times higher for China and 3 times higher for India). So, the overall effect of competitiveness is to increase export prices. This is because, although the fixed costs of exporting may be lower, firms in strongly exporting industries have more market power that allows them to have higher mark-ups even if costs are lower. So, with imperfect competition, higher competitiveness is reflected in higher mark-ups rather than in lower prices.

Table 3 here

6. Robustness check: the REER as measure of relative producer prices

Instead of using the NEER and the per capita GDP of the importer and the exporter, we can use the REER, which is the NEER weighted by the ratio of importer and exporter prices, in this way already accounting for the price or income differential. Figure 4 shows that the evolution of REER has followed that of NEER in India, implying a stable price ratio, whilst in China the NEER exceeded the REER between 1997 and 2004, implying inflationary pressures in China, that were controlled from 2005.

Figure 4 here

The GARCH variability of NEER and REER has been very low in India, but in China the variability of REER started out from high levels, decreasing dramatically during the sample period (Figure 5). The variability is very small for India due to its central bank's regular intervention in minimising FX volatility on a regular basis. In the case of China, the fixed rate has been adjusted a few times and the inflation has fluctuated widely from double digit levels to negative numbers (deflation). In the case of India, inflation has remained somewhat stable although at a high single digit level that has made India's REER more stable than China's REER. However, if we had plotted the REER variability separately with different y-axis scales, then India's REER variability would reveal more fluctuation.

Figure 5 here

The estimating equation now omits income terms as the REER already contains the relative price ratio:

$$\Delta \ln p_{ij,t}^k = \beta_0 + \beta_1 \Delta \ln(reer_{ij,t-1}) + \beta_2 \text{var}[\Delta \ln(reer_{ij,t-1})] + \gamma_1 CA_{ij} + \gamma_j (CA_{ij} \times \Delta \ln(reer_{ij,t-1})) + \beta_3 pshare_{ij,t-1} + \beta_4 HSshare_{i,t-1}^k + u_{ij,t}^k \quad (11)$$

Results are presented in Table 4 for the short-run and in Table 5 for the long-run. The use of REER to account for relative production prices does not change the signs and relative magnitudes of the direct and indirect effects of competitiveness on export prices. It does, however, change the ERPT estimates. In the static model of Table 4, it is now India's export pricing that amplifies exchange rate changes, whereas China's exporters absorb a part of the exchange rate change (ERPT is incomplete). In the dynamic system GMM

model of Table 5, we cannot reject zero ERPT (the USD export price does not react to REER changes). This is due to the inflationary pressures described above that counteract the effect of currency depreciation on foreign currency export prices.

Table 4 here

Table 5 here

7. Conclusions

Following the significant shift in trade policy from import substitution to outward orientation in China and India in the recent decades, this paper attempts a comparative analysis of exporters' pricing power due to changing comparative advantage. The conventional wisdom that ERPT is always complete and rapid in developing economies, as they are price takers and hence cannot exercise PTM is no longer valid in these emerging market economies. In this paper, we find diverse pricing strategies at a 6-digit product level for Chinese and Indian exporters. The paper investigated the degree of PTM or the pricing behaviour of Chinese and Indian exporters across destination markets, controlling for the destination market per capita income, the currency volatility of the exporter and uncovering any asymmetric pattern in price variation. It considered export prices from two countries with different exchange rate regimes and different modes of participation in world value chains. We show that pass-through has been higher and faster for a country with a fixed currency regime and outward processing trade (China) relative to a country with a managed floating currency regime and arms-length trade (India).

The paper also presented an analysis of the sources of incomplete pass-through that uncovered the patterns of comparative advantage according to commodity groups as a source of mark-up adjustment in explaining the degree of pass through by emerging market exporters. The paper showed that Indian exporters are more sensitive to exchange rate changes than Chinese exporters. Thus we conclude that external demand conditions, the degree of currency volatility and changing comparative advantage according to commodity groups play an important role in relating exchange rate changes to price variations in the buyers' currency. In this way we established the evidence for differences in PTM behaviour by Chinese and Indian exporters across their more competitive industries relative to less competitive industries and demonstrated the existence of an industry-specific component in export pricing strategies.

References

- Alessandria, G. and J.P. Kaboski (2011), Pricing-to-Market and the Failure of Absolute PPP, *American Economic Journal: Macroeconomics*, 3 (1): 91-127.
- Alessandrini, M., Fattouh, B., Ferrarini, B., and Scaramozzino, P. (2011), Tariff Liberalization and Trade Specialization: Lessons from India. *Journal of Comparative Economics*, 39 (4): 499-513.
- Alvarez, R. and Fuentes, J.R. (2011), Entry into Export Markets and Product Quality, *World Economy*, 1237-1262.
- Amiti, M. and Freund, C. (2010), "The Anatomy of China's Export Growth", in *China's Growing Role in World Trade*, R. Feenstra and S. Wei (eds.), Chicago: NBER and University of Chicago Press, pp. 35-61.
- Arellano, M., and Bover, O. (1995), Another look at the instrumental variable estimation of error-components models, *Journal of Econometrics*, 68, 29-51.
- Arkolakis, C. (2010), Market Penetration Costs and the New Consumers Margin in International Trade, *Journal of Political Economy*, 118,1151-1199.

- Auer, R. and Chaney, T. (2009), Exchange Rate Pass-Through in a Competitive Model of Pricing-to-Market, *Journal of Money, Credit and Banking*, 41(1), 151-175.
- Aw, Bee-Yan, G. Batra, and M.J. Roberts (2001) Firm heterogeneity and export-domestic price differentials: A study of Taiwanese electronics products, *Journal of International Economics*, 54 (1): 149-169.
- Aw, Bee-Yan (1993) Price discrimination and mark-ups in export markets, *Journal of Development Economics*, 42 (2): 315-336.
- Basile, R., de Nardis, S. and Girardi, A. (2012), Pricing to market, firm heterogeneity and the role of quality, *Review of World Economics*, 148, 595–615.
- Beladi, H., A. Chakrabarti, and S. Marjit (2010), Exchange rate pass-through: A generalization, *Journal of Mathematical Economics*, 46 (4): 493-504.
- Bergin, P.R. and Feenstra, R.C. (2009), Pass-through of exchange rates and competition between floaters and fixers, *Journal of Money, Credit and Banking*, 41 (1): 35-70.
- Bergin, P., R. Feenstra and G. Hanson (2009), Offshoring and Volatility: Evidence from Mexico's Maquiladora Industry, *American Economic Review*, 99, 1664–1671.
- Bergin, P., R. Feenstra and G. Hanson (2011), Volatility due to Outsourcing: Theory and Evidence', *Journal of International Economics*, 85, 163–173.
- Berman, N., P. Martin, and T. Mayer (2012), How do Different Exporters React to Exchange Rate Changes?, *The Quarterly Journal of Economics*, 127(1): 437-492.
- Bernard, A., Redding, S. and Schott, P. (2007), "Comparative Advantage and Heterogeneous Firms", *Review of Economic Studies*, 74, 31-66
- Bernard, A., B. Jensen, S.J. Redding and P.K. Schott (2009), The Margins of US Trade, *American Economic Review P&P*, 99, 487–493.
- Betts, C., and M.B. Devereux (2000), Exchange Rate Dynamics in a Model of Pricing to Market, *Journal of International Economics*, 50 (1): 215-244.
- Blundell, R. and Bond, S. (1998), Initial conditions and moment restrictions in dynamic panel data models, *Journal of Econometrics*, 87, 115-143.
- Brun-Aguerre, R., Fuertes, A. and Phylaktis, K. (2012), Exchange rate pass-through into import prices revisited: What drives it?, *Journal of International Money and Finance*, 31 (4): 818-844.
- Campa, J. M., Gonzalez-Minguez, J. M., Sebastia-Barriel, M. (2008), Non-linear adjustment of import prices in the European Union, *Bank of England Working Paper 347*.

- Chamarbagwala, R. and Sharma, G. (2011), Industrial de-licensing, trade liberalization, and skill upgrading in India, *Journal of Development Economics*, 96, 314-336.
- Chaney, T. (2008), Distorted Gravity: Heterogeneous Firms, Market Structure and the Geography of International Trade, *American Economic Review*, 98(4), 1707-21.
- Chatterjee, A., Carneiro, R.D. and J. Vichyanondy (2010), Multi-Product Firms and Exchange Rate Fluctuations, FREIT WP224
- Corsetti, G., and L. Dedola (2005) A macroeconomic model of international price discrimination, *Journal of International Economics*, 67 (1): 129-155.
- Corsetti, G., L. Dedola, and S. Leduc (2008), High exchange-rate volatility and low pass-through, *Journal of Monetary Economics*, 55 (6): 1113-1128.
- Dekle, R., H. Jeong and H. Ryo (2009), A Re-Examination of the Exchange Rate Disconnect Puzzle: Evidence from Firm Level Data, Working Paper, University of Southern California.
- Devereux, M.B. and J. Yetman (2003) Price Setting and Exchange Rate Pass-through: Theory and Evidence, in *Price Adjustment and Monetary Policy*, Bank of Canada, pp.347-371.
- Fang, W.S., Y.H. Lai, and S.M. Miller (2009), Does exchange rate risk affect exports asymmetrically? Asian evidence, *Journal of International Money and Finance*, 28 (2): 215-239.
- Feenstra, R. and S. Wei (2010), China's Growing Role in World Trade, Chicago: NBER and University of Chicago Press.
- Ferrantino, M.J., Feinberg, R.M. and Deason, L. (2012), Quality Competition and Pricing-to-Market: A Unified Framework for the Analysis of Bilateral Unit Values, *Southern Economic Journal*, 78(3), 860-877.
- Ghironi, F. and M. J. Melitz (2005), International Trade and Macroeconomic Dynamics with Heterogeneous Firms, *Quarterly Journal of Economics*, 120(3), 865-915
- Girma, S. (2012), "Twenty Years of Economic and Financial Reforms in India: Special Issue Introduction", *The World Economy*, 1-2.
- Gust, C., S. Leduc, and R. Vigfusson (2010), Trade integration, competition, and the decline in exchange-rate pass-through, *Journal of Monetary Economics*, 57 (3): 309-324.
- Hanson, G. (2012), The Rise of Middle Kingdoms: Emerging Economies in Global Trade, *Journal of Economic Perspectives*, 26(2), 41-64.

Harrigan, J. and Deng, H. (2010), China's Local Comparative Advantage", in *China's Growing Role in World Trade*, R. Feenstra and S. Wei (eds.), Chicago: NBER and University of Chicago Press, pp.109–136.

Heckman, J. (1976), The common structure of statistical models of truncation, sample selection, and limited dependent variables and a simple estimator for such models, *Annals of Economic and Social Measurement*, 5, 475-492

Hellerstein, R., S.B. Villas-Boas (2010), Outsourcing and pass-through, *Journal of International Economics*, 81 (2): 170-183.

Helpman, E., Melitz, M. and Rubinstein, Y. (2008), Estimating Trade Flows: Trading Partners and Trading Volumes, *Quarterly Journal of Economics*, 123(2), 441-487

Hoen, A. and Oosterhaven, J. (2006), On the Measurement of Comparative Advantage, *Annals of Regional Science*, 40:677–691.

Hoffmann, M. (2007), Fixed versus Flexible Exchange Rates: Evidence from Developing Countries. *Economica*, 74: 425–449.

Hsieh, C. and P. J. Klenow (2009), Misallocation and Manufacturing TFP in China and India, *Quarterly Journal of Economics*, 124(4), 1403–48.

Huang, Y. (2012), How Did China Take Off ?, *Journal of Economic Perspectives*, 26(4), 147–170.

Johnson, R.C. (2012), Trade and prices with heterogeneous firms, *Journal of International Economics*, 86, 43-56.

Knetter, M.M. (1994) Is export price adjustment asymmetric?: evaluating the market share and marketing bottlenecks hypotheses, *Journal of International Money and Finance*, 13 (1): 55-70.

Mallick, S. and H. Marques (2010), Data frequency and exchange rate pass-through: Evidence from India's exports, *International Review of Economics and Finance*, 19 (1): 13-22.

Mallick, S. and H. Marques (2012), Pricing-to-Market with Trade Liberalization: The Role of Market Heterogeneity and Product Differentiation in India's Exports, *Journal of International Money and Finance*, 31(2), 310-336.

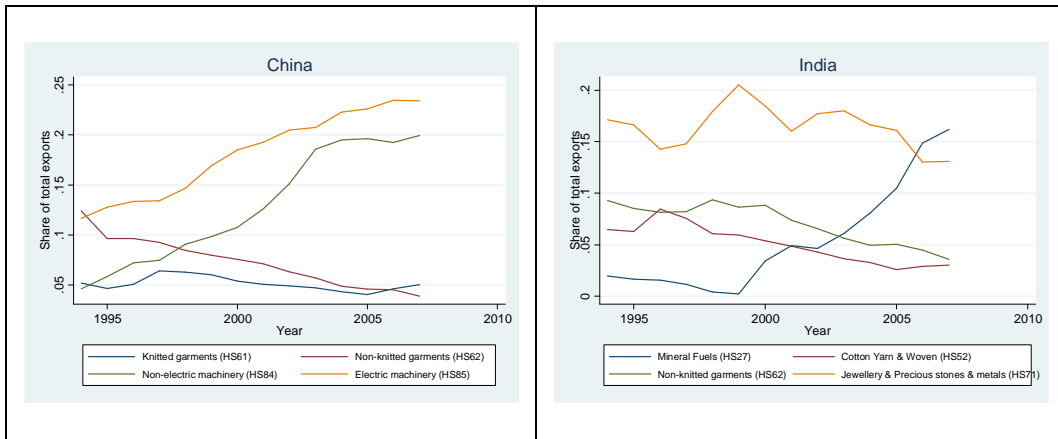
Marmolejo, A. (2011), Effects of a Free Trade Agreement on the Exchange Rate Pass-through to Import Prices, *Review of International Economics*, 19(3), 475–493.

Manova, K., and Z. Zhang (2012), Export Prices Across Firms and Destinations, *The Quarterly Journal of Economics*, 127 (1): 379-436.

- Melitz, M. (2003), The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity, *Econometrica*, 71(6), 1695-1725.
- Melitz, M. and Ottaviano, G. I. P. (2008), Market Size, Trade, and Productivity, *Review of Economic Studies*, 75, 295–316.
- Melitz, M. and Trefler, D. (2012), Gains from Trade when Firms Matter, *Journal of Economic Perspectives*, 26(2), 91-118.
- Nakamura, E. and D. Zerom (2010), Accounting for Incomplete Pass-Through, *Review of Economic Studies*, 77(3): 1192-1230.
- Neven, D. (1995), “Trade Liberalization with Eastern Nations: some Distribution Issues”, *European Economic Review*, 39, 622-32
- Rodriguez-Lopez, J.A. (2011), Prices and exchange rates: a theory of disconnect, *Review of Economic Studies*, 78, 1135-77.
- Tang, H. and Zhang, Y. (2012), Exchange Rates and the Margins of Trade: Evidence from Chinese Exporters, *CESifo Economic Studies*, Advance Access published March 13, doi:10.1093/cesifo/ifs006
- Tarasov, A. (2012), Per capita income, market access costs, and trade volumes, *Journal of International Economics*, 86, 284-294.
- Westerlund, J. (2007), Testing for error correction in panel data, *Oxford Bulletin of Economics and Statistics*, 69, 709-748.

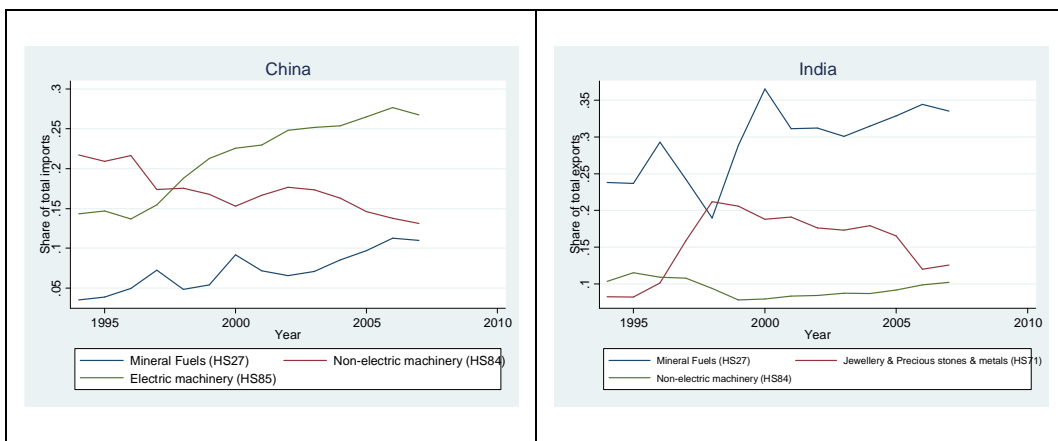
Figures and Tables

Figure 1: Industries with over 5% share of exports



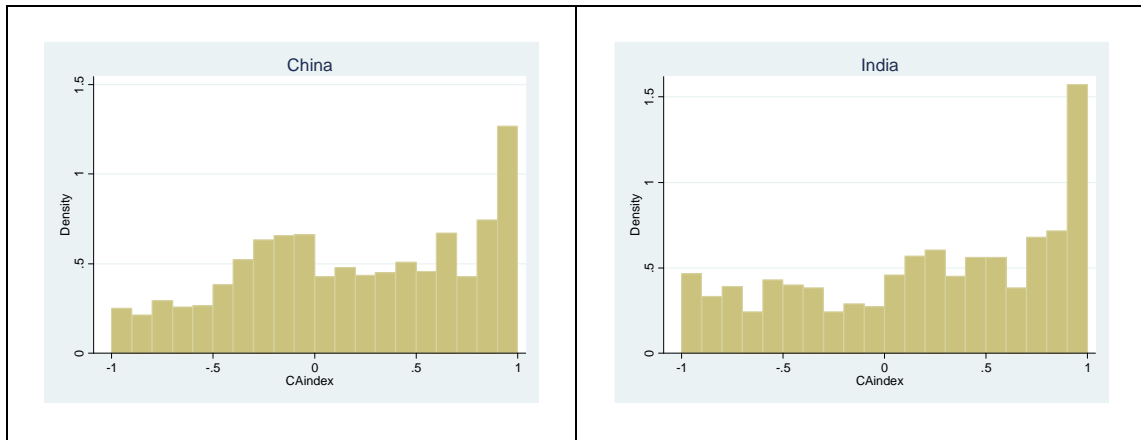
Source: COMTRADE data

Figure 2: Industries with over 10% share of imports



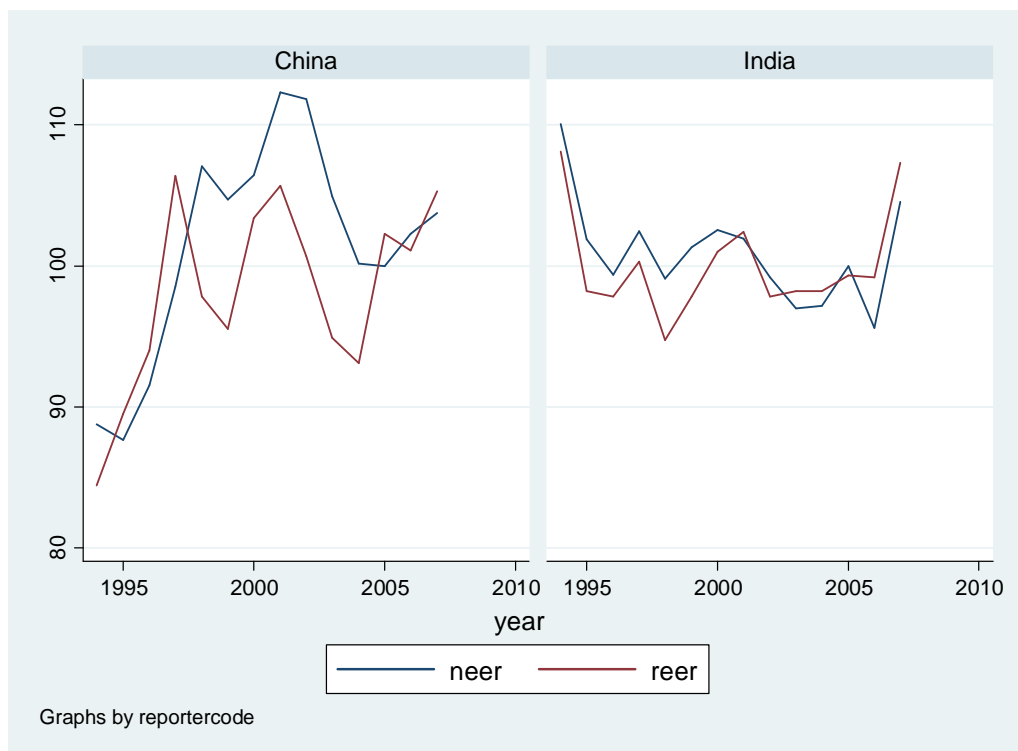
Source: COMTRADE data

Figure 3: CA index distribution for China and India at 2-digits HS (1994-2007)



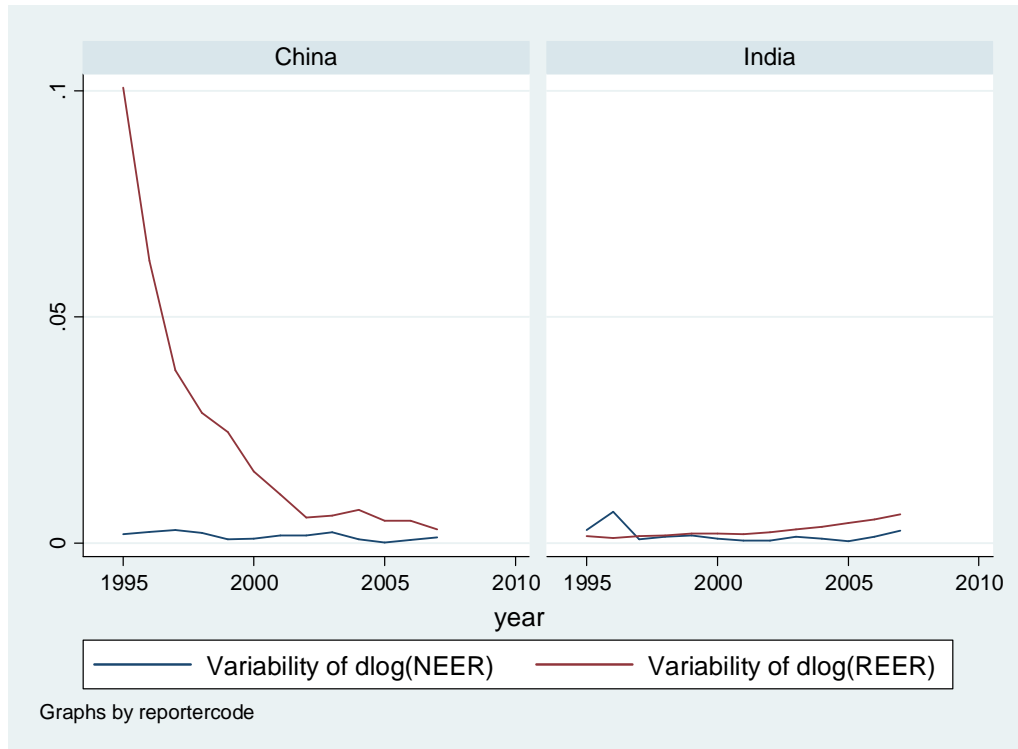
Source: COMTRADE data

Figure 4: Evolution of NEER and REER in China and India (1994-2007)



Source: Datastream

Figure 5: Evolution of the GARCH variability of NEER and REER in China and India (1994-2007)



Source: Datastream

Year	China					India				
	Mean	P25	Median	P75	Freq.	Mean	P25	Median	P75	Freq.
1994	0.003	-0.765	-0.036	0.808	4807	-0.075	-0.806	-0.206	0.715	3354
1995	0.040	-0.710	0.026	0.834	4682	-0.079	-0.808	-0.204	0.704	3510
1996	0.030	-0.725	0.014	0.817	4725	-0.037	-0.777	-0.140	0.742	3599
1997	0.022	-0.736	-0.014	0.827	4759	-0.026	-0.764	-0.109	0.757	3802
1998	0.021	-0.730	-0.029	0.830	4753	-0.011	-0.733	-0.102	0.775	3914
1999	0.013	-0.732	-0.033	0.815	4742	0.009	-0.725	-0.017	0.771	4028
2000	0.040	-0.706	0.027	0.826	4725	0.035	-0.669	0.021	0.797	4140
2001	0.039	-0.710	0.026	0.833	4719	0.029	-0.675	0.017	0.782	4291
2002	0.061	-0.685	0.102	0.831	4668	0.024	-0.696	0.014	0.766	4358
2003	0.081	-0.656	0.130	0.842	4653	0.066	-0.630	0.087	0.789	4440
2004	0.107	-0.597	0.190	0.855	4649	0.079	-0.608	0.113	0.805	4435
2005	0.138	-0.557	0.249	0.860	4665	0.052	-0.635	0.059	0.764	4466
2006	0.169	-0.503	0.291	0.873	4675	0.040	-0.627	0.018	0.759	4486
2007	0.189	-0.470	0.331	0.870	4426	0.019	-0.673	-0.017	0.764	4372

Source: COMTRADE data

Table 2: panel fixed effects with CA index interaction			
	ALL	CHINA	INDIA
$\Delta \ln(e_{ij,t-1})$	-1.161**† (0.024)	-1.154**† (0.027)	-0.692**† (0.110)
CAindex* $\Delta \ln(e_{ij,t-1})$	-0.005** (0.002)	-0.004 (0.002)	-0.006* (0.003)
$\ln GDPpc_{i,t-1}$	0.045** (0.004)	0.017** (0.005)	0.125** (0.010)
$\ln GDPpc_{j,t-1}$	0.049** (0.006)	0.063** (0.007)	-0.012 (0.013)
$\text{var}[\Delta \ln(e_{ij,t-1})]$	12.445** (1.295)	2.658 (1.836)	24.356** (2.689)
$pshare_{ij,t-1}$	-0.327** (0.021)	-0.430** (0.026)	-0.151** (0.036)
$HSshare_{i,t-1}^k$	-3.081** (0.440)	-3.720** (0.672)	-2.221** (0.611)
CAindex	-0.008 (0.006)	-0.004 (0.007)	-0.011 (0.010)
Constant	-0.721** (0.040)	-0.642** (0.049)	-0.673** (0.080)
Observations	926175	688064	238111
Importer-product groups	152599	106926	45673
F-test	699.80**	597.95**	134.13**
Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. † different from 1 at 5%.			

Table 3: system GMM dynamic panel estimation with CA index interaction			
	ALL	CHINA	INDIA
$\Delta \ln(e_{ij,t-1})$	-1.371** † (0.036)	-1.584** † (0.042)	-0.316** † (0.112)
CAindex* $\Delta \ln(e_{ij,t-1})$	-0.010** (0.002)	-0.011** (0.003)	-0.012** (0.003)
$\ln GDPpc_{i,t-1}$	0.118** (0.011)	0.067** (0.013)	-0.045 (0.025)
$\ln GDPpc_{j,t-1}$	0.024 (0.014)	0.072** (0.017)	0.141** (0.022)
$\text{var}[\Delta \ln(e_{ij,t-1})]$	5.751** (1.726)	13.745** (2.225)	22.278** (5.353)
$pshare_{ij,t-1}$	-0.437** (0.039)	-0.605** (0.052)	-0.159** (0.059)
$HSshare_{i,t-1}^k$	-4.554** (0.668)	-5.902** (1.140)	-4.142** (0.832)
CAindex	0.067** (0.012)	0.156** (0.016)	0.035* (0.017)
$\Delta \ln p_{ij,t-1}^k$	-0.327** (0.003)	-0.303** (0.004)	-0.390** (0.005)
$\Delta \ln p_{ij,t-2}^k$	-0.114** (0.002)	-0.087** (0.003)	-0.188** (0.005)
Constant	-0.993** (0.080)	-1.128** (0.102)	-1.004** (0.154)
Observations	675783	499760	176023
Importer-product groups	116933	83445	33488
Wald chi2test	15850.59**	10802.57**	6978.02**
Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. † different from 1 at 5%. Instruments for differenced equation: GMM-type: L(2/.)D.ln_uv. Standard: LD2.ln_neer LD2.CA_neer LD.ln_GDPpc_xLD.ln_GDPpc_mD.garch_var_neerLD.pshareLD.HSshareD.CAindex. Instruments for level equation: GMM-type: LD2.ln_uv. Standard: _cons. Number of instruments = 85.			

	ALL	CHINA	INDIA
$\Delta \ln(reer_{ij,t-1})$	-0.305**† (0.018)	-0.240**† (0.018)	-1.136**† (0.077)
CAindex* $\Delta \ln(reer_{ij,t-1})$	-0.009** (0.002)	-0.007** (0.002)	-0.009** (0.003)
var $[\Delta \ln(reer_{ij,t-1})]$	-1.035** (0.084)	-1.163** (0.086)	25.545** (1.028)
$pshare_{ij,t-1}$	-0.325** (0.021)	-0.413** (0.026)	-0.127** (0.036)
$HSshare_{i,t-1}^k$	-2.974** (0.427)	-3.481** (0.640)	-2.181** (0.611)
CAindex	0.021** (0.006)	0.034** (0.007)	-0.007 (0.010)
Constant	0.059** (0.003)	0.060** (0.003)	-0.040** (0.006)
Observations	828719	605975	222744
Importer-product groups	137727	95290	42437
F-test	173.06**	163.10**	143.48**
Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. † different from 1 at 5%.			

	ALL	CHINA	INDIA
$\Delta \ln(reer_{ij,t-1})$	0.027† (0.020)	0.031† (0.021)	-0.066† (0.092)
CAindex* $\Delta \ln(reer_{ij,t-1})$	-0.009** (0.002)	-0.009** (0.003)	-0.012** (0.003)
var $[\Delta \ln(reer_{ij,t-1})]$	-3.249** (0.329)	-3.997** (0.333)	23.287** (2.462)
$pshare_{ij,t-1}$	-0.443** (0.039)	-0.599** (0.052)	-0.165** (0.059)
$HSshare_{i,t-1}^k$	-4.537** (0.676)	-5.825** (1.155)	-4.036** (0.828)
CAindex	0.064** (0.012)	0.137** (0.016)	0.036* (0.017)
$\Delta \ln p_{ij,t-1}^k$	-0.328** (0.003)	-0.305** (0.004)	-0.389** (0.005)
$\Delta \ln p_{ij,t-2}^k$	-0.117** (0.002)	-0.092** (0.003)	-0.187** (0.005)
Constant	0.077** (0.006)	0.067** (0.007)	-0.039** (0.012)
Observations	675783	499760	176023
Importer-product groups	116933	83445	33488
Wald chi2test	13040.32**	7977.22**	6708.06**
Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. † different from 1 at 5%. Instruments for differenced equation: GMM-type: L(2/.)D.ln_uv. Standard: LD2.ln_reer LD2.CA_reer D.garch_var_reerLD.pshareLD.HSshareD.CAindex. Instruments for level equation: GMM-type: LD2.ln_uv. Standard: _cons. Number of instruments = 83.			

Appendix

Table A1: Export price data availability for high and low-income markets using the 10,000USD classification as in Hanson (2012)

High-income (1994-2007 GDP per capita average higher than 10,000USD)				Low-income (1994-2007 GDP per capita average lower than 10,000USD)			
China		India		China		India	
Australia	34760	Canada	22919	Argentina	23896	Argentina	8469
Austria	15292	Hong Kong	19429	Brazil	26461	Brazil	11508
Belgium	21433	France	25938	Bulgaria	12475	Chile	8547
Canada	36431	Germany	33225	Chile	25746	China	16211
Hong Kong	57011	Israel	15027	Colombia	17638	Colombia	6358
Cyprus	13147	Italy	27169	Czech Rep.	15717	Egypt	16198
Denmark	19485	Japan	23943	Egypt	27193	Indonesia	17997
Finland	18656	Korea Rep.	16585	Estonia	8347	Iran	11821
France	33845	USA	42905	Hungary	15739	Jordan	10553
Germany	40910	UK	37458	India	31805	Malaysia	25845
Greece	21764			Indonesia	38279	Mexico	10882
Iceland	4756			Iran	22991	Morocco	6836
Ireland	13541			Jordan	18453	Pakistan	9030
Israel	26480			Latvia	9909	Peru	4818
Italy	37066			Lithuania	10568	Philippines	12838
Japan	53661			Malaysia	35607	Russian Fed.	12413
Luxembourg	2753			Mexico	22063	South Africa	16719
Malta	9106			Morocco	16582	Thailand	20109
Netherlands	30015			Pakistan	26052	Tunisia	4224
New Zealand	24535			Peru	16974	Turkey	14756
Norway	16346			Philippines	30580	Viet Nam	10218
Portugal	16605			Poland	20321		
Korea Rep.	5420			Romania	16184		
Singapore	37356			Russian Fed.	28005		
Slovenia	10529			Slovakia	8097		
				South Africa	20990		