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Non-price competitiveness of exports from emerging countries

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NON-PRICE COMPETITIVENESS OF EXPORTS FROM EMERGING COUNTRIES

Konstantins Benkovskis and Julia Wörz



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**THE COMPETITIVENESS
RESEARCH NETWORK**



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CompNet The Competitiveness Research Network



This paper presents research conducted within the Competitiveness Research Network (CompNet). The network is composed of economists from the European System of Central Banks (ESCB) - i.e. the 27 national central banks of the European Union (EU) and the European Central Bank – a number of international organisations (World Bank, OECD, EU Commission) universities and think-tanks, as well as a number of non-European Central Banks (Argentina and Peru) and organisations (US International Trade Commission).

The objective of CompNet is to develop a more consistent analytical framework for assessing competitiveness, one which allows for a better correspondence between determinants and outcomes.

The research is carried out in three workstreams: 1) Aggregate Measures of Competitiveness; 2) Firm Level; 3) Global Value Chains. CompNet is chaired by Filippo di Mauro (ECB). The three workstreams are headed respectively by Chiara Osbat (ECB), Antoine Berthou (Banque de France) and João Amador (Banco de Portugal). Julia Fritz (ECB) is responsible for the CompNet Secretariat.

The refereeing process of this paper has been coordinated by Editorial Board of the ECB Working Paper Series, led by Philipp Hartmann.

The paper is released in order to make the research of CompNet generally available, in preliminary form, to encourage comments and suggestions prior to final publication. The views expressed in the paper are the ones of the author(s) and do not necessarily reflect those of the ECB, the ESCB, and of other organisations associated with the Network.

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ABSTRACT

Building on the methodology pioneered by Feenstra (1994) and Broda and Weinstein (2006), we construct an export price index that adjusts for changes in the set of competitors (variety) and changes in non-price factors (quality in a broad sense) for nine emerging economies (Argentina, Brazil, Chile, China, India, Indonesia, Mexico, Russia and Turkey). The highly disaggregated dataset covers the period 1996–2011 and is based on the standardised 6-digit Harmonized System (HS). Our method highlights notable differences in non-price competitiveness across markets. China shows a huge gain in international competitiveness due to non-price factors. Similarly, Brazil, Chile, India and Turkey show discernible improvements in their competitive position when accounting for non-price factors. Oil exports account for strong improvement in Russia's non-price competitiveness, as well as the modest losses of competitiveness for Argentina and Indonesia. Mexico's competitiveness deteriorates prior to 2006 and improves afterwards.

JEL-codes

C43, F12, F14, L15

Keywords

non-price competitiveness, quality, relative export price, emerging countries

NON-TECHNICAL SUMMARY

The share of emerging economies in world trade has strongly risen during the last 15 years. Such a rapid growth of exports cannot be explained by price factors only, i.e. assessing export performance of an emerging country by looking solely at its real effective exchange rate dynamics will clearly fall short of providing a satisfactory explanation and is not able to explain recent gains in global market shares by many emerging countries. Actually, despite several sharp depreciations experienced in late 90's and early 2000's, Argentina is the only country among large emerging economies whose real effective exchange rate lies significantly below the levels observed in the mid-1990's. In contrast, China has shown an increase in its real effective exchange rate while its global market share has greatly increased over the same period. In this paper, we look for additional factors shaping the strong export performance of emerging countries. Recent empirical studies suggest that non-price factors such as quality are a vital ingredient of many emerging economies' success story.

Relying solely on price factors in the assessment of a country's competitiveness may lead to wrong policy conclusions as this reduces the policy focus to pure price competitiveness and rules out any improvements of a country's competitive position due to non-price factors such as enhanced quality or better labelling of exported products. Incorporating non-price factors into the analysis of competitiveness is also policy-relevant from a macro-economic point of view: the perception of whether the exchange rate of an emerging country is over- or undervalued may be altered when one takes into account non-price factors. In order to fill the gap in the policy discussion, our paper develops a comprehensive measure of a country's competitiveness that takes into account non-price factors. Thus we provide an additional instrument for the analysis of a country's export performance. We propose an adjusted relative export price index, which has some similarities with the unit-value based real effective exchange rate but is adjusted for the changes in quality, taste and variety. The adjusted relative export price index is derived by solving a utility maximization problem under the assumption that consumers value quality and variety. Our index consists of three components. The first component represents price competitiveness and is defined as changes in relative export unit values. The second component takes into account changes in the variety of products available to consumers, thus accounting for changes in the set of competitors when seen from the exporter's point of view (we consider a product that is otherwise identical but comes from a different country of origin as a different variety). The most important innovation comes from the third component that captures the contribution of relative quality or taste preferences by the consumer for a specific country's export products. Although we do not observe the relative taste or quality parameter, we can derive it from relative unit values and export volumes.

We apply our methodology to exports of the nine largest emerging economies (Argentina, Brazil, Chile, China, India, Indonesia, Mexico, Russia and Turkey) over the period 1996-2011. The analysis is performed using the highly disaggregated UN Comtrade dataset at the product

level (yielding more than 5,000 products between any pair of trading partners in each year). Although we observe some losses in price competitiveness for several emerging countries when we base our conclusions on our newly developed indicator, these losses are far less pronounced than suggested by the CPI-based real effective exchange rate. However, as soon as we allow for non-price factors such as changes in quality or taste, we observe more pronounced trends for individual emerging countries.

Our foremost finding is that non-price factors have contributed strongly to China's gains in international competitiveness. We conclude that China has assumed its dominant role in the global market through non-price factors in addition to other, mainly structural factors, which are outside the scope of our analysis such as the size and structure of its labour force. With respect to price factors, our results suggest that the role of the exchange rate in explaining China's competitive position may have been overstressed by some of China's critics. Further, Brazil, Chile, India and Turkey show discernible improvements in their competitive position not least owing to non-price factors. The surprisingly strong non-price related improvement of Russia's export position is entirely related to developments in the oil sector. Further, also the rather pronounced losses in non-price competitiveness for Argentina and Indonesia were fully due to developments in the oil sector even though oil exports are far less important for these countries than for Russia. Finally, we observe a loss in Mexican non-price competitiveness before 2006, confirming earlier findings in the literature. It has to be noted though that the non-price competitiveness of Mexico has improved again after 2006.

I INTRODUCTION

Emerging economies account for an ever-increasing share of world trade. According to the *CPB World Trade Monitor* (May 2013), the share of emerging countries in total world exports was just 32% in 1996, but 49% in 2011. This gain in global export market share is largely the consequence of a substantial growth differential between emerging and advanced economies. Over the period 1996-2011, annual real export growth in emerging markets averaged 8.2% well outstripping the 3.9% annual performance of advanced countries. Moreover, real export growth in emerging countries outperformed that of advanced countries every year since 1996, with just two exceptions in 1997 and 2010.

In the general discussion, growing world market shares are mainly associated with improving price competitiveness. Hence, policy makers often focus on price measures and aim at achieving a real depreciation of their currency in order to support their exporters. However, real effective exchange rate statistics do not always support this prediction, especially in the case of emerging economies' currencies. Although several emerging countries experienced sharp depreciations in late 90's and early 2000's, these were followed by gradual real appreciation afterwards. Argentina is the only country among large emerging economies whose real effective exchange rate is significantly below levels of the mid-1990s. For other important emerging economies we observe either a gradually increasing REER (China, Mexico, Chile, India), or sharp real depreciations during a currency crisis with a subsequent overcompensating increase in the REER (Russia, Brazil, Turkey, Indonesia). This evidence suggests that the traditional REER indicator cannot explain the performance of emerging countries and we should add other factors to the analysis.

The real effective exchange rate indicator, initiated by the theoretical framework of Armington (1969) and further developed by McGuirk (1987), relies on a set of restrictive assumptions. One crucial assumption states that consumers' utility depends solely on consumed quantities, thus attributing no role to product quality or taste. These non-price factors could be the missing element that explains the discrepancy between REER developments and exports performance in emerging countries.

Several recent empirical studies support the importance of non-price factors for the export performance of emerging countries. Khandelwal (2010) combines information on unit values and market shares for products exported to the US and concludes that quality of emerging countries' exports is heterogeneous being low for some products and high for others. Hallak and Schott (2011), who estimated export quality from export unit values, quantities and trade balances, find contradictory results regarding the quality performance of emerging countries. While some Asian countries improved their quality rank between 1989 and 2003 (Indonesia, Philippines, Malaysia), others just retained their place or even lost several positions (China, India, Mexico). Pula and Santabárbara (2011) analyse the quality of Chinese exports to the

European Union using Eurostat's very detailed COMEXT database and conclude that China gained quality relative to other competitors since the mid-1990s.

Our paper contributes to the literature by developing a measure of a country's competitiveness that takes into account changes in non-price factors. This measure is an adjusted relative export price index and has some similarities with the unit-value based REER, but in contrast to the REER it is adjusted for changes in quality, taste and variety that occur over time. Our analysis builds on the framework developed by Feenstra (1994) and Broda and Weinstein (2006) for the calculation of variety-adjusted import prices, but applies it to export prices, and modifies the approach developed in Benkovskis and Wörz (2012). Unobserved relative quality or taste is defined here as a function of observable unit values and volumes of exports as well as unobservable elasticities of substitution between varieties. Thus, we also follow Hummels and Klenow (2005) and Khandelwal (2010) in spirit.

Here, we illustrate the empirical use of the proposed competitiveness measure for a range of globally important emerging markets over the period 1996–2011. Our sample of nine emerging economies (Argentina, Brazil, Chile, China, India, Indonesia, Mexico, Russia and Turkey) represents roughly one-fifth of total world exports.

The paper proceeds as follows. Section 2 summarises the conventional wisdom with respect to price competitiveness as described by the real effective exchange rate and explains why the real effective exchange rate conceals non-price elements of competitiveness and therefore provides an insufficient picture of a country's competitiveness. Section 3 outlines our methodological approach to reveal these non-price aspects. Section 4 describes the data from UN Comtrade database and section 5 reports the results. Conclusions are given in section 6.

2 FROM PRICE TO NON-PRICE COMPETITIVENESS

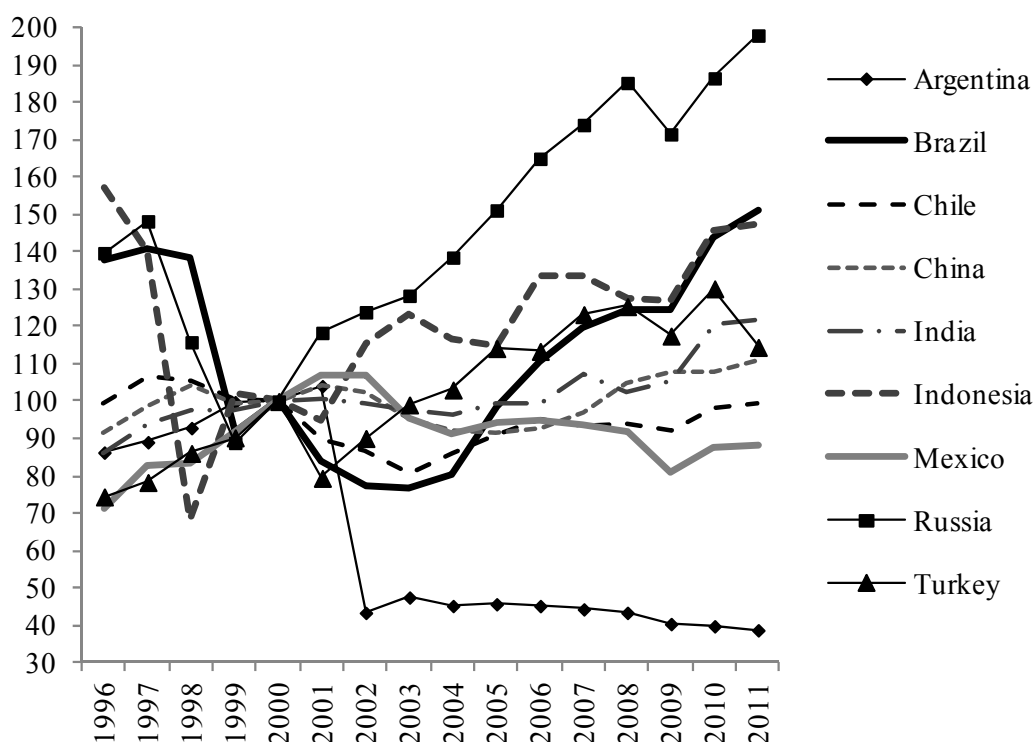
Competitiveness of a country relative to another is often assessed by its real exchange rate, a reflection of relative changes in nominal exchange rates net of differences in inflation rates. Inflation, in turn, can be measured in terms of consumer price inflation (CPI), producer prices (PPI) or unit labour costs. Beyond bilateral comparisons, competitiveness can also easily be measured through the real effective exchange rate (REER) index, a trade-weighted average of all bilateral real exchange rates. While REER calculation is tedious, the necessary data (exchange rates and inflation rates) are readily available.

Figure 1 below shows CPI-based real effective exchange rates for our nine countries between 1996 and 2011.¹ Increases reflect real appreciation, so they are associated with losses of international competitiveness. Although the majority of emerging countries from our sample experienced the sharp real devaluation of their currencies in the first half of the sample period (Indonesia and Russia in 1998, Brazil in 1999, Turkey in 2001 and Argentina in 2002), this was overcompensated by subsequent real appreciation in most cases. Indeed, apart from Argentina, the sample countries experience a loss (or at least no gains) in price competitiveness during the 15-year sample period as measured through the CPI-based REER. The increase in relative prices is especially pronounced for Russia, Brazil, Turkey and Indonesia in the second half of our sample period. In Russia's case, this increase is clearly related to the dominance of energy products in its exports. High oil revenues lead to higher incomes with a consequent upward pressure on inflation and the real effective exchange rate. In Turkey, the disinflation process after the 2001 crisis has supported a long-term appreciation trend with an adverse effect on external price competitiveness. India and China show no clear trend, although a trend towards rising relative prices emerges in the final years of the sample. All countries show signs of improving or stable price competitiveness in 2009 in the midst of the global financial crisis, while the upward trend in CPI-based REER recommences afterward.

The above analysis can be criticised for failing to illustrate competitiveness adequately as changes in consumer prices often do a poor job in explaining export performance. Domestic and export prices are often the products of largely distinct demand and supply conditions. Moreover, the CPI is subject to changes in indirect taxes (e.g. VAT) that do not affect export prices directly. While the PPI might be a better measure for purely production-related price dynamics, it usually refers primarily to production for the domestic sector, and in most cases, data on purely export-oriented producer prices are unavailable. Similar caveats apply for unit labour costs as a price measure as these often refer to the whole economy including services, especially in the case of emerging economies.

¹ For a description of the calculations, see Darvas (2012).

Figure I CPI-based real effective exchange rates of emerging countries (172 trading partners, 2000=100)



Source: Darvas (2012).

Notes: We change Darvas' (2012) base year of 2007 to 2000 for ease of comparison with our reported results. An increase denotes a real appreciation of the national currency that can be interpreted as a loss of competitiveness.

Our solution is to construct an index for export prices calculated at the most detailed product level available. However, a new problem arises from the use of real effective exchange rates, which only measure the price competitiveness of exports and ignore important factors such as changes in the quality of exported products (Flam and Helpman, 1987). Quality that has both an objective (e.g. physical properties and technological features) and a subjective aspect (e.g. consumer tastes, branding and labelling). Consumers also gain utility from the increased product variety that results from international trade. Thus, while for example the CPI or the PPI are adjusted for changes in product quality, neither takes into account the changes in the number of products or product variety available to the consumer.

In response to these challenges, we employ an index that adjusts for quality and the set of competitors to improve on existing measures and disentangle changes in pure price competitiveness from changes in non-price competitiveness (i.e. changes in variety and quality). Specifically, we define “variety” following the Armington assumption (Armington, 1969) as products of different origin within the same product category. “Quality” is defined as the tangible and intangible attributes of a product that change the consumer’s valuation of it (Hallak and Schott, 2011), i.e. the combination of physical attributes of the product and consumer preferences.

3 DISAGGREGATED APPROACH TO MEASURE PRICE AND NON-PRICE COMPETITIVENESS

We now describe the disaggregated approach to measure price and non-price competitiveness of exports of emerging countries (see also Benkovskis and Wörz, 2012 for earlier version of the approach). Our approach combines the methodology developed by Feenstra (1994) and Broda and Weinstein (2006) with an evaluation of an unobserved quality or taste parameter based on the work of Hummels and Klenow (2005). The insight here is that consumers value physical attributes of products and variety (i.e. the set of exporters in line with the Armington assumption) and that consumer utility depends to a certain extent on the quality or taste preference. By solving this consumer maximization problem, it is possible to introduce non-price factors into a measure for relative export prices (see Appendix, sections A1-A4 for technical derivations). Having derived a formula for a variety- and quality-adjusted import price index, we then use the mirror image of trade flows to apply this formula to export prices. In other words, we interpret imports of product g originating from country c as country c 's export of product g to the importing country.

Changes in the adjusted relative export price of good g exported to a particular market ($RXP_{gk,t}$) are defined as

$$RXP_{gk,t} = \prod_{c \in C_g} \left(\frac{p_{gk,t}}{p_{gc,t}} \frac{p_{gct-1}}{p_{gk,t-1}} \right)^{(\sigma_g - 1)w_{gc,t}} \left(\frac{\lambda_{g,t-1}}{\lambda_{g,t}} \right) \prod_{c \in C_g} \left(\frac{d_{gk,t}}{d_{gc,t}} \frac{d_{gct-1}}{d_{gk,t-1}} \right)^{-w_{gc,t}} \quad (1)$$

where k denotes a particular emerging country, $p_{gc,t}$ is the price of good g imported from country c , $d_{gc,t}$ is the unobservable quality or taste parameter of a product, C_g is the set of countries exporting particular product in both periods, $w_{gc,t}$ represents the shares of exporting countries serving a particular market and $\lambda_{g,t}$ shows the share of new or disappearing exporters. Note that $RXP_{gk,t}$ shows changes in emerging country k 's adjusted export price relative to the world adjusted export prices.

The index of adjusted relative export price in (1) can be divided into three parts:

- The first term gives the traditional definition of changes in relative export prices driven by changes in relative export unit values. These changes in relative unit values are weighted by the importance of competitors in a given market (represented by $w_{gc,t}$) and elasticity of substitution (therefore, putting more weight to price competitiveness in the market with higher degree of competition). An increase in relative export unit values is interpreted as a loss in price competitiveness.
- The second term represents Feenstra's (1994) ratio for capturing changes in varieties. It accounts for the fact that consumers value variety, thus the appearance of a new variety increases consumers' utility and diminishes the import price index. However, our mirror-image framework allows for alternative interpretation of the second term.

Variety represents the set of exporters and new variety can be viewed as entrance of an additional exporter of this product in the market. If more competitors sell the same product minimum unit costs are lower and consumers' utility is increased. At the same time, the market power of each exporter is lowered. Therefore, additional competitors for a specific product imply a positive contribution to the adjusted relative export price index and are associated with a loss in non-price competitiveness.

- The third term is simply the change in relative quality or taste preference for a country's export products. If the quality or taste preference for a country's exports rises faster than that of its rivals, the contribution to the adjusted relative export price index is negative, thereby signalling an improvement in non-price competitiveness. Although relative quality or consumer tastes are unobservable, it is possible to evaluate it using information on relative unit values and real market shares (see Appendix, section A3).

Finally, we need to design an aggregate relative export price index as the index in (1) describes relative export prices for a specific product exported to a particular country only. The aggregate adjusted relative export price index can be defined as a weighted average of specific market indices, where weights are given by shares of those markets in a country's exports.²

² Here we limit the analysis of competitiveness to stable exports markets (those, where exports are nonzero in both periods t and $t-1$). Thus, the paper limits the analysis to the intensive margin of exports. Although we miss some information on emerging countries' performance by ignoring the extensive margin, this does little damage to our conclusions. Empirical evidence shows that the extensive margin has a small contribution to total export growth. For instance, Amiti and Freund (2010) find that export growth of China was mainly accounted for by high growth of existing products rather than in new varieties. Also Besedes and Prusa (2011) point to the fact that the majority of the growth of trade is due to the intensive rather than the extensive margin. They also stress that export survival for developing countries is shorter than for advanced economies, thus the extensive margin generates less export growth for emerging countries.

4 DESCRIPTION OF THE DATABASE

For the empirical analysis in this paper we use trade data from UN Comtrade. Although the data reported in UN Comtrade have a lower level of disaggregation and longer publication lag than Eurostat's COMEXT, the worldwide coverage of the UN database is a significant advantage. We use the most detailed level reported by UN Comtrade, which is the six-digit level of the Harmonized System (HS) introduced in 1996. This gives us 5,132 products, i.e. enough to ensure a reasonable level of disaggregation. While this is lower than the 8-digit CN (Combined Nomenclature) level available through Eurostat's COMEXT (which covers over 10,000 products), the UN Comtrade data are quite sufficient for calculating unit values.

Although our ultimate goal is to evaluate competitiveness of exports from emerging countries, we start with the import data of partner countries in the analysis. The argument for focusing on partner imports rather than the emerging country's exports is driven by the theoretical framework on which our evaluation of price and non-price competitiveness is based. Recall that our methodology starts with the consumer's utility maximization problem. Thus, import data are clearly preferred as imports are reported in CIF (cost, insurance, freight) prices, giving us the cost of the product at the point it arrives at the importer country's border. From the consumer's point of view, import data provide a better comparison of prices. On the other hand, import data come with certain drawbacks. Obviously, the data on imports from emerging countries do not necessarily coincide with the country's reported exports due to differences in valuation, timing, sources of information and incentives to report. That said, and especially with respect to emerging economies, which are still subject to import tariffs for a considerable range of their products, import data are as a rule fairly well reported as national authorities have an interest in the proper recording of imports on which they collect a tariff revenue.

Our import dataset contains annual data on imports of 188 countries at the six-digit HS level between 1996 and 2011.³ UN Comtrade database contains information on 236 partner countries (exporters), therefore we obtain complete and detailed information on world trade from the importers' point of view.

We use unit value indices (dollars per kilogram or other measure of quantity) as a proxy for prices and trade volume (mainly in kg, although other measures of quantity are used for certain products) as a proxy for quantities. If data are missing for values or volumes, or data on volumes is not observed directly but estimated by statistical authorities, a unit value index cannot be calculated. Moreover, estimating unit values is complicated for many reporting countries. Even the world's top importer, the US, only publishes import data that would allow calculation of unit values for about 75% of imports in 2011 (in value terms). The situation is better for the EU countries, China, Japan, while several countries (e.g. Canada, Portugal) provide coverage around 50%. Coverage is also generally worse for the first half of the sample

³ The data for some reporting countries are not available in the early years. The major world importers with missing data are Brazil, Chile, Russia and Singapore (1996), Thailand and Saudi Arabia (1996-1998).

period. This problem makes the analysis of non-price competitiveness more challenging and our results should be taken with a grain of salt. However, the sometimes low coverage of available unit values in several countries is rather homogenous across different product groups, so we argue this problem is unlikely to affect our results significantly. The other adjustment we made to the database is related to structural changes within the categories of goods. Although we use the most detailed classification available, it is still possible that we may be comparing apples and oranges within a particular category. One indication of such a problem is given by large price level differences within a product code. Consequently, all observations with outlying unit value indices were excluded from the database.⁴

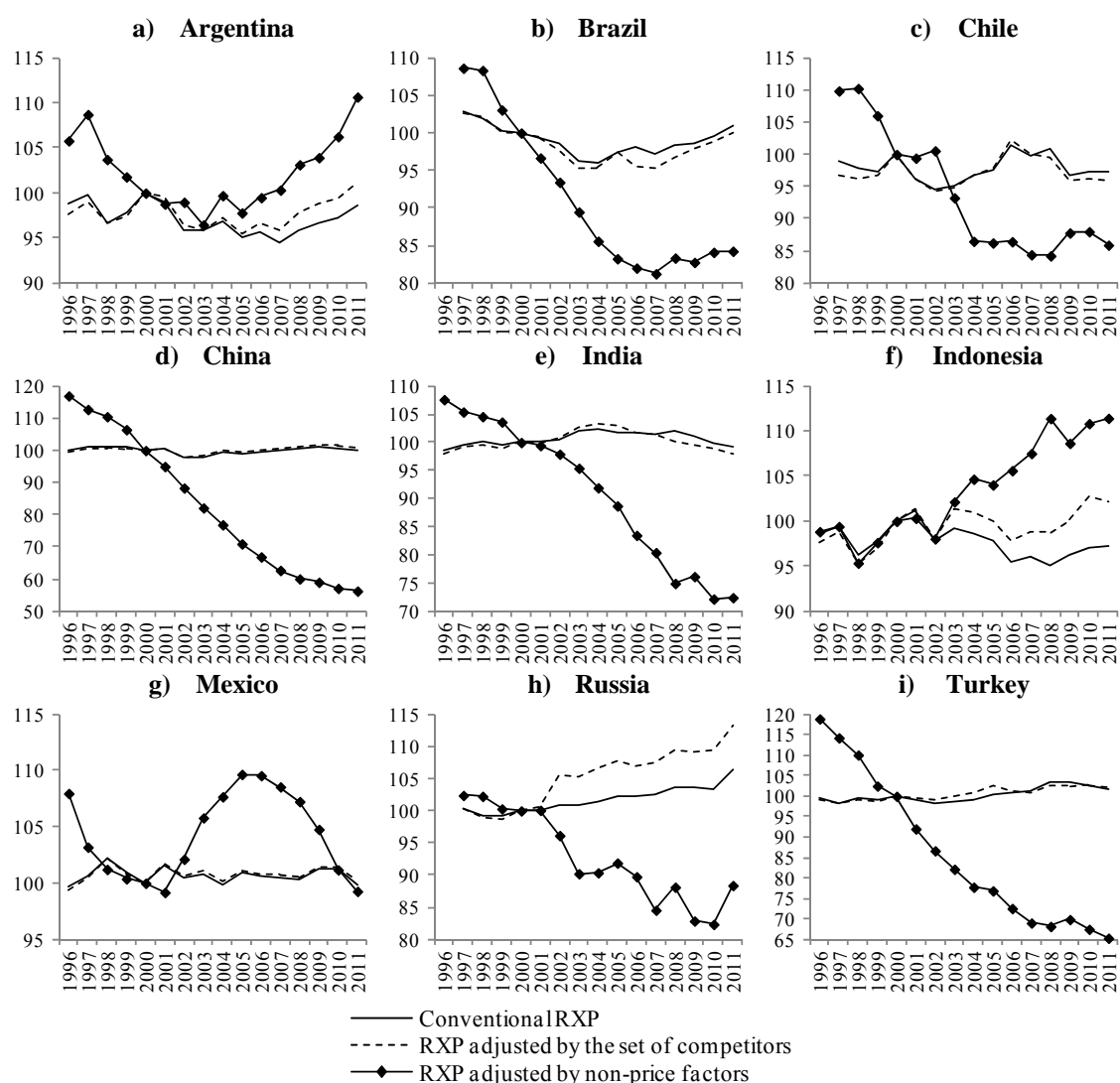
Finally, we use export data of our nine emerging countries to construct aggregated relative export price index. For the export data to reflect the structure of exports adequately, the export dataset contains annual value data on exports to 236 importer (partner) countries at the six-digit HS level between 1996 and 2011.

⁴ The observation is treated as an outlier if the absolute difference between the unit value and the median unit value of the product category in the particular year exceeds three median absolute deviations. The exclusion of outliers does not significantly reduce the coverage of the database. In the majority of cases, less than 4-5% of total import value was treated as an outlier.

5 EMPIRICAL RESULTS FOR EXPORTS OF EMERGING COUNTRIES

We start by calculating a rather conventional export price index that ignores changes in both, the set of competitors and in the taste or quality factors. This index is obtained from the first term of (1) and is shown as the solid line in Figure 2 below. We next augment this index by taking into account exit and entry of competitors in each narrowly defined goods market (adding the second term of (1), dashed line). Finally, we adjust the export price index for non-price competitiveness to include quality and consumer tastes (using all terms of equation (1), line plotted in diamonds).

Figure 2 Export prices of emerging countries relative to competitor export prices (2000=100)



Sources: *UN Comtrade*, authors' calculations.

Notes: Relative export prices are calculated by cumulating RXP changes from equations (1), (A10) and (A11). Increase denotes losses in competitiveness. RXP starts from 1997 for Brazil, Chile and Russia due to missing of export data in 1996.

Compared to the findings based on real effective exchange rates, we observe no strong gains or losses in price competitiveness for these countries using the conventional export price index. Most countries experience no significant gains or losses in international price competitiveness. The conventional RXP line in Figure 2 is almost flat for most emerging countries and fluctuates narrowly around its initial level. China shows almost no changes in price competitiveness, although we would have expected to see stronger evidence of rising price competitiveness in China, given the often-repeated claims of its trade partners that it undervalues its currency.⁵

As all our emerging economies are catching up with their advanced counterparts, we would expect the convergence in income levels to be accompanied by convergence in price levels as observed for emerging economies in Central and Eastern Europe (Benkovskis and Wörz, 2012; Oomes, 2005). However, we observe the trend of falling price competitiveness only for Russia, which can largely be attributed to Russia's oil income. For example, Égert (2005) finds evidence of a clear "Dutch Disease" pattern for Russia that explains the real appreciation trend. Égert (2003) also points out exchange rate pass-through, oil price shocks and cyclical factors as determinants of inflation in Russia. As an observation from our data, when oil prices collapsed at the beginning of the global economic crisis, prices for Russian exports fell considerably.⁶

The stability of our price competitiveness measure for most of emerging countries can be partially attributed to the fact that markets are also weighted by the elasticity of substitution (see equation (1)), giving more weight to the products with high degree of substitution. This may imply that emerging countries losses in price competitiveness are concentrated in sectors that function under monopolistic competition (e.g. machinery and electrical equipments), while price competitiveness in raw materials remains roughly unchanged. Adjusting the index for changes in the set of competitors produces no notable changes – the two lines are almost identical for most countries.

However, as soon as we adjust for non-price factors such as quality improvements, the results become more differentiated. The majority of countries in our sample show clear improvements in non-price competitiveness (as reflected in a falling double-adjusted export price index).

⁵ Coudert and Couharde (2007) relate this undervaluation to the absence of the Balassa-Samuelson effect in China which can be inferred from the limited degree of currency appreciation despite its strong catching-up performance. The issue of China's currency undervaluation is not only a hot topic because of large trade imbalances with some advanced countries (most prominently the US) but also within the context of competition among emerging markets. Pontimes and Siregar (2012) note the great concern in East Asian countries over relative appreciation against the renminbi and to a lesser extent against the US dollar that points to strong intra-regional price competition. Gallagher et al. (2008) mention Chinese undervaluation as a potential detrimental effect on Mexico's export performance beyond purely domestic factors.

⁶ Given the relatively inelastic demand for oil products in normal times, this deterioration in Russian price competitiveness up to 2008 did not impact notably on Russia's global market share, a fact well documented in the empirical literature (e.g. Ahrend, 2006; Cooper, 2007; Porter, 2007; Robinson, 2009 and 2011) and discussed below.

China, in particular, stands out. Prices of Chinese goods on international markets fell by more than 40% since 2000 after correcting for quality improvements and other non-price factors. Among countries in our sample only Turkey comes close to realizing such a large gain in competitiveness. Indeed, just a few small, highly open transition countries in Central, Eastern and Southeastern Europe display comparable improvements in non-price adjusted competitiveness over the same period (Benkovskis and Wörz, 2012). This suggests that China's inexorable rise as a trading power – we see China overtake Germany to become the world's largest exporter in 2009 – is based on a combination of non-price factors and an abundance of relatively cheap labour. Our finding here corroborates the earlier results of Fu et al. (2012), who observe weakening price competition and rising importance of non-price factors such as quality and variety for China over the period 1989–2006. They analyse unit prices of imports into the EU, Japan and the US (a smaller and more homogenous market than in our analysis) and conclude that this trend, if sustained, poses a serious threat to high-income countries. Pula and Santabábara (2011) come to similar conclusions and state that China's exports climb up the quality ladder. Our findings also support the view that a revaluation of the exchange rate would only have a limited impact on China's competitiveness (Mazier et al., 2008; Coudert and Couharde, 2007).

The implications of the enormous gains in China's international non-price competitiveness have been noted in several recent discussions. For example, Kaplinsky and Morris (2008) assert that the dominance of China in sectors such as textiles and clothing that serve traditionally as early sectors for industrialization not only precludes gains by other emerging countries but shuts down opportunities for less-developed countries even thinking about embarking on an export-led growth strategy in these sectors. Indeed, our results show that China's dominance in textiles (now a fifth of total Chinese exports) is due in large part to the contribution of non-price factors.⁷

The substantial improvement in Russia's non-price competitiveness observed in our non-price adjusted index post-Russian crisis tracks exports of oil, Russia's prime export good.⁸ When oil is excluded from the analysis, a small deterioration in non-price competitiveness is observed for Russia (see Figure A1 in the Appendix). The global financial crisis along with falling demand for oil interrupts this trend in 2008, but the trend re-emerges again in 2009-2010. This finding comports with the empirical literature on Russia's competitiveness. Ahrend (2006) finds that Russia has experienced great increases in labour productivity in its major export sectors, but qualifies this with the observation that these increases in competitiveness are largely limited to a small number of primary commodity and energy-intensive sectors. Robinson (2009) points out Russia's dependence on oil exports carry a persisting risk of Dutch Disease problems. Subsequently, he argues that political reform is needed to abate this risk (Robinson, 2011).

⁷ Detailed results by sector and trading partner are not reported here, but are available from the authors upon request.

⁸ Mineral products, which include gas & oil, accounted for 67% of Russia's total exports in 2011.

Finally, Ferdinand (2007) observes similarities between Russia and China in their orientation towards building on and promoting national industrial champions and the tendency of this approach to foster specialization.

Brazil, Chile, and India also show sizable improvements in their non-price adjusted competitiveness, a finding which is robust when oil products are excluded from the analysis. In line with our results, Brunner and Cali (2006) also observe rising unit values for South Asia in their analysis of technology upgrading in this regions. However, they report a closing of the technology gap by the South Asian countries only with respect to Southeast Asia and not with respect to OECD countries. Interestingly, our detailed results for India by trading partners⁹ show the same pattern only for the first half of our observation period; the picture becomes more differentiated in more recent years with an increase in non-price competitiveness on the US market accelerating from 2005 onwards. We also observe strong rises in price competitiveness vis-à-vis France and the UK. The results for Turkey suggest significant improvements in non-price factors, a finding which is again robust when oil exports are excluded. These competitiveness improvements were most pronounced in 2001, the year of a major currency and banking crisis in Turkey.

We also observe some apparent losses in non-price competitiveness in Argentina and Indonesia. In both cases, the finding is not robust to excluding oil exports.¹⁰ Figure A1 in the Appendix shows that when oil is excluded, both countries show no apparent positive or negative trend. Finally, Mexico shows some clear signs of weakening export non-price competitiveness before 2006, the results are invariant whether oil products are excluded or not. Gallagher et al. (2008) mention factors that can explain these losses such as the decline in public and infrastructure investment in Mexico, limited access to bank credit for export purposes and the lack of a government policy to spur technological innovation. However, we observe gradual improvements in non-price competitiveness of Mexico since 2006.

In contrast to the findings based on real effective exchange rates, the crisis in 2009 is less visible in these indices. This is to be expected; changes in non-price factors are driven more strongly by structural (i.e. longer-term) factors than exchange rates and consumer prices, which react quickly to changes in global demand conditions. However, there is some evidence of a temporary drop in non-price competitiveness during the crisis. One can observe worsening of non-price competitiveness for Chile, India, Turkey, and to a lesser extent Brazil in 2009-2010. This could be both, supply and demand driven. On one hand, emerging countries' enterprises could have postponed some of their investment projects because of financial crisis, thus slowing down the process of quality-upgrading in their production. On the other hand, the drop in consumers' disposable income could have shifted demand towards less-qualitative and cheaper products from emerging countries.

⁹ These results are available from the authors on request.

¹⁰ Mineral products are the most important export category for Indonesia, representing 34% of total exports in 2011. In contrast, mineral products only accounted for 6% of Argentina's total exports that year.

6 CONCLUSIONS

This paper highlights an often-overlooked aspect of international competitiveness in the literature on emerging economies, where the emphasis is on price competitiveness. The effects of sharp or forced devaluations are frequently discussed (hardly surprising given the long history of currency crises in such economies) and generally follows a narrative that the abundance of relatively cheap labour in these markets provides them with considerable cost advantages. To our knowledge, however, there is no study that explicitly analyses non-price competitiveness in emerging economies within the narrowly defined concept of competitiveness as “a country’s ability to sell goods internationally.”

To fill this gap and go beyond pure price competitiveness, we measure the evolution of competitiveness by relative export prices, allowing for entry and exit of competitors in narrowly defined goods markets and controlling for changes in non-price aspects (e.g. quality or consumer tastes) of exported goods over time. Drawing on our earlier work (Benkovskis and Wörz, 2011, 2012) that extends the approach developed by Feenstra (1994), Broda and Weinstein (2006), we consider a highly disaggregated dataset of mostly global imports and exports at the detailed 6-digit HS level (yielding more than 5,000 products) over the period 1996–2011. The sample consists of nine emerging economies (Argentina, Brazil, Chile, China, India, Indonesia, Mexico, Russia and Turkey) that together represent roughly one-fifth of total world exports.

While we also observe some losses in price competitiveness for several countries in our sample when we base our conclusions on the traditional export unit values, these losses are far less pronounced compared to the conclusions from the CPI-based real effective exchange rate. Taking changes in the global set of competitors into account does not alter the picture, which shows that the set of competitors is fairly stable in any given year. However, as soon as we allow for non-price factors such as changes in the (physical or perceived) quality of exported products, we observe more pronounced trends for individual emerging markets.

Perhaps our foremost finding is that non-price factors have contributed strongly to China’s gains in international competitiveness. Thus, we conclude that China has assumed its dominant role in the global market through non-price factors, as well as other factors such as the size and structure of its labour force. Our results suggest that the role of the exchange rate in explaining China’s competitive position may have been overstressed by some of China’s critics. Further, Brazil, Chile, India and Turkey show discernible improvements in their competitive position. The surprisingly strong non-price related improvement of Russia’s export position is entirely related to developments in the oil sector, which accounted for roughly two thirds of Russian exports in 2011. The rather pronounced losses in non-price competitiveness for Argentina and Indonesia were fully due to developments in the oil sector, whereby oil exports are far less important for these countries than for Russia (34% for Indonesia and 6% for Argentina). Finally,

we observe a loss in Mexican non-price competitiveness before 2006, confirming earlier findings in the literature; the non-price competitiveness of Mexico restores afterwards, however.

Although our analysis is based on highly disaggregated data and separates price from non-price effects, it still does not yield a comprehensive picture of competitiveness. Competitiveness continues to be a vague concept, and therefore multiple approaches have to be combined before drawing firmer conclusions. However, our analysis points towards important factors often ignored, mostly because data sources are missing. Our methodology offers a simple, yet theoretically sound, way to look explicitly at price versus quality adjustments in international competitiveness. Bearing all methodological and data-related caveats in mind, the results have to be interpreted with care.

Another important issue that emerges is the increasing global integration of production and shifts in geographic patterns of production chains. Internationalization of production implies a diminishing domestic component of exports, so data on gross trade flows are no more an adequate representative of a country's competitiveness. Combining trade data with information from input-output tables is a potential solution pointing the direction for further research on the value-added content of exports.

BIBLIOGRAPHY

Ahrend, R. (2006). "Russian Industrial Restructuring: Trends in Productivity, Competitiveness and Comparative Advantage," *Post-Communist Economies*, 18(3), 277-295.

Amiti, M. and C. Freund (2010). "An Anatomy of China's Export Growth," in *China's Growing Role in World Trade*, Feenstra, R.C. and S.J. Wei (eds.), The University of Chicago Press, 35-56.

Armington, P.S. (1969). "A Theory of Demand for Products Distinguished by Place of Production," *International Monetary Fund Staff Papers*, 16(1), 159-178.

Benkovskis, K. and J. Wörz (2012). "Non-Price Competitiveness Gains of Central, Eastern and Southeastern European Countries in the EU Market," *Focus on European Economic Integration*, 3, 27-47.

Benkovskis, K. and J. Wörz (2011). "How Does Quality Impact on Import Prices?" OeNB Working Paper No. 175.

Besedes, T. and T.J. Prusa (2011). "The Role of Extensive and Intensive Margins and Export Growth," *Journal of Development Economics*, 96(6), 371-379.

Bloningen, B.A. and A. Soderbery (2010). "Measuring the Benefits of Foreign Product Variety with an Accurate Variety Set," *Journal of International Economics*, 82(2), 168-180.

Broda, C. and D.E. Weinstein (2006). "Globalization and the Gains from Variety," *Quarterly Journal of Economics*, 121(2), 541-585.

Brunner, H.P. and M. Cali, M. (2006). "The dynamics of manufacturing competitiveness in South Asia: An analysis through export data," *Journal of Asian Economics* 17(4), 557-582.

Cooper, J. (2007). "Can Russia Compete in the Global Economy?" *Eurasian Geography and Economics* 47(4), 407-425.

Coudert, V. and C. Couhard (2007). "Real equilibrium exchange rate in China: Is the renminbi undervalued?" *Journal of Asian Economics* 18(4), 568-594.

Darvas, Z. (2012). "Real effective exchange rates for 178 countries: a new database," Bruegel Working Paper, 2012/06.

Diewert, W.E. (1993a). "Index Numbers" in *Essays in Index Number Theory, Volume I*, Diewert, W.E. and A.O. Nakamura (eds.), Chapter 5, Elsevier Science Publishers B.V., 71-108.

Diewert, W.E. (1993b). "The Economic Theory of Index Numbers: A Survey" in *Essays in Index Number Theory, Volume I*, Diewert, W.E. and A.O. Nakamura (eds.), Chapter 7, Elsevier Science Publishers B.V., 177-228.

Égert, B. (2005). "Equilibrium exchange rates in South Eastern Europe, Russia, Ukraine and Turkey: Healthy or (Dutch) diseased?" *Economic Systems*, 29(2), 205-241.

Égert, B. (2003). "The Balassa-Samuelson effect in Central and Eastern Europe: Myth or reality?" *Journal of Comparative Economics*, 31(3), 552-572.

- Feenstra, R.C. (1994). "New Product Varieties and the Measurement of International Prices," *American Economic Review*, 84(1), 157-177.
- Ferdinand, P. (2007). "Russia and China: Converging responses to globalization," *International Affairs*, 83(4), 655-680.
- Flam, H. and E. Helpman (1987). "Vertical Product Differentiation and North-South Trade," *American Economic Review*, 77(5), December, 810-822.
- Fu, X., R. Kaplinsky and J. Zhang (2012). "The Impact of China on Low and Middle Income Countries, Export Prices in Industrial-Country Markets," *World Development*, 40(8), 1483-1496.
- Gallagher, K.P., J.C. Moreno-Brid and R. Porzecanski (2008). "The Dynamism of Mexican Exports: Lost in (Chinese) Translation?" *World Development*, 36(8), 1365-1380.
- Hallak, J.C. and P.K. Schott (2011). "Estimating Cross-Country Differences in Product Quality," *Quarterly Journal of Economics*, 126(1), 417-474.
- Hummels, D. and P.J. Klenow (2005). "The Variety and Quality of a Nation's Exports," *American Economic Review*, 95(3), 704-723.
- Kaplinsky, R. and M. Morris (2008). "Do the Asian Drivers Undermine Export-oriented Industrialization in SSA?" *World Development*, 36(2), 254-273.
- Khandelwal, A. (2010). "The Long and Short (of) Quality Ladders," *Review of Economic Studies*, 77(4), 1450-1476.
- Leamer, E.E. (1981). "Is it a Demand Curve, or is it a Supply Curve? Partial Identification through Inequality Constraints," *Review of Economics and Statistics*, 63(3), 319-327.
- Mazier, J., Y. Oh and S. Saglio (2008). "Exchange rates, global imbalances, and interdependence in East Asia," *Journal of Asian Economics*, 19(1), 53-73.
- McGuirk, A.K. (1987). "Measuring Price Competitiveness for Industrial Country Trade in Manufactures," IMF Working Paper No. 87/34, March.
- Mohler, L. (2009). "On the Sensitivity of Estimated Elasticities of Substitution," FREIT Working Paper No. 38, March.
- Oomes, N. (2005). "Maintaining competitiveness under equilibrium real appreciation: The case of Slovakia," *Economic Systems*, 29(2), 187-204.
- Pontines, V. and R.Y. Siregar (2012). "Fear of appreciation in East and Southeast Asia: The role of the Chinese renminbi," *Journal of Asian Economics*, 23(4), 324-334.
- Porter, M.E., C. Ketels, M. Delgado and M. Bryden (2007). "Competitiveness at the Crossroads: Choosing the Future Direction of the Russian Economy," study commissioned by Center for Strategic Research (CSR), Moscow.

Pula, G. and D. Santabárbara (2011). "Is China Climbing up the Quality Ladder? Estimating Cross Country Differences in Product Quality using Eurostat's COMEXT Trade Database," ECB Working Paper No. 1310, March.

Reinsdorf, M.B. and A.H. Dorfman (1999). "The Sato-Vartia Index and the Monotonicity Axiom," *Journal of Econometrics*, 90(1), 45-61.

Robinson, N. (2011). "Political barriers to economic development in Russia: Obstacles to modernization under Yeltsin and Putin," *International Journal of Development Issues*, 10(1), 5-19.

Robinson, N. (2009). "August 1998 and the development of Russia's post-communist political economy," *Review of International Political Economy*, 16(3), 433-455.

Soderbery, A. (2013). "Estimating Import Supply and Demand Elasticities: Analysis and Implications," Unpublished results, Department of Economics, Krannert School of Management, Purdue University, August. Available at SSRN: <http://dx.doi.org/10.2139/ssrn.2272749>

APPENDIX

AI IMPORT PRICE INDEX

We closely follow Broda and Weinstein (2006) and define a constant elasticity of substitution (CES) utility function for a representative household consisting of three nests. At the topmost level, a composite import good and domestic good are consumed:

$$U_t = \left(D_t^{\frac{\kappa-1}{\kappa}} + M_t^{\frac{\kappa-1}{\kappa}} \right)^{\frac{\kappa}{\kappa-1}}; \quad \kappa > 1, \quad (\text{A1})$$

where D_t is the domestic good, M_t is composite imports and κ is the elasticity of substitution between domestic and foreign good. At the middle level of the utility function, the composite imported good consists of individual imported products:

$$M_t = \left(\sum_{g \in G} M_{g,t}^{\frac{\gamma-1}{\gamma}} \right)^{\frac{\gamma}{\gamma-1}}; \quad \gamma > 1, \quad (\text{A2})$$

where $M_{g,t}$ is the subutility from consumption of imported good g , γ is elasticity of substitution among import goods and G denotes the set of imported goods.

The bottom-level utility function introduces variety and quality into the model. Each imported good consists of varieties (i.e. goods have different countries of origins, so product variety indicates the set of competitors in a particular market). A taste or quality parameter denotes the subjective or objective quality consumers attach to a given product. $M_{g,t}$ is defined by a non-symmetric CES function:

$$M_{g,t} = \left(\sum_{c \in C} d_{gc,t}^{\frac{1}{\sigma_g}} m_{gc,t}^{\frac{\sigma_g-1}{\sigma_g}} \right)^{\frac{\sigma_g}{\sigma_g-1}}; \quad \sigma_g > 1 \quad \forall \quad g \in G, \quad (\text{A3})$$

where $m_{gc,t}$ denotes quantity of imports g from country c , C is a set of all partner countries, $d_{gc,t}$ is the taste or quality parameter, and σ_g is elasticity of substitution among varieties of good g .

After solving the utility maximization problem subject to the budget constraint, the minimum unit-cost function of import good g is represented by

$$\phi_{g,t} = \left(\sum_{c \in C} d_{gc,t} p_{gc,t}^{1-\sigma_g} \right)^{\frac{1}{1-\sigma_g}}, \quad (\text{A4})$$

where $\phi_{g,t}$ denotes minimum unit-cost of import good g , $p_{gc,t}$ is the price of good g imported from country c .

The price indices for good g could be defined as a ratio of minimum unit-costs in the current period to minimum unit-costs in the previous period ($P_g = \phi_{g,t} / \phi_{g,t-1}$). The conventional assumption is that quality or taste parameters are constant over time for all varieties and products, ($d_{g,c,t} = d_{g,c,t-1}$), while the set of varieties is unchanged. The price index is calculated over the set of product varieties $C_g = C_{g,t} \cap C_{g,t-1}$ available both in periods t and $t-1$, where $C_{g,t} \subset C$ is the subset of all varieties of goods consumed in period t . Sato (1976) and Vartia (1976) show that, for a CES function, the exact price index will be given by the log-change price index

$$P_g^{conv} = \prod_{c \in C_g} \left(\frac{P_{gc,t}}{P_{gc,t-1}} \right)^{w_{gc,t}}, \quad (A5)$$

whereby weights $w_{gc,t}$ are computed using cost shares $s_{gc,t}$ in the two periods as follows:

$$w_{gc,t} = \frac{(s_{gc,t} - s_{gc,t-1}) / (\ln s_{gc,t} - \ln s_{gc,t-1})}{\sum_{c \in C_g} ((s_{gc,t} - s_{gc,t-1}) / (\ln s_{gc,t} - \ln s_{gc,t-1}))}; \quad s_{gc,t} = \frac{P_{gc,t} x_{gc,t}}{\sum_{c \in C_g} P_{gc,t} x_{gc,t}}$$

and $x_{gc,t}$ is the cost-minimizing quantity of good g imported from country c .

The import price index in (A5) ignores possible changes in quality and variety (set of partner countries). Feenstra (1994) relaxes the underlying assumption that variety is constant. He posits that if $d_{g,c,t} = d_{g,c,t-1}$ for $c \in C_g = (C_{g,t} \cap C_{g,t-1})$, $C_g \neq \emptyset$, then the exact price index for good g is given by

$$P_g^f = \prod_{c \in C_g} \left(\frac{P_{gc,t}}{P_{gc,t-1}} \right)^{w_{gc,t}} \left(\frac{\lambda_{g,t}}{\lambda_{g,t-1}} \right)^{\frac{1}{\sigma_g - 1}} = P_g^{conv} \left(\frac{\lambda_{g,t}}{\lambda_{g,t-1}} \right)^{\frac{1}{\sigma_g - 1}}, \quad (A6)$$

$$\text{where } \lambda_{g,t} = \frac{\sum_{c \in C_g} P_{gc,t} x_{gc,t}}{\sum_{c \in C_{g,t}} P_{gc,t} x_{gc,t}} \text{ and } \lambda_{g,t-1} = \frac{\sum_{c \in C_g} P_{gc,t-1} x_{gc,t-1}}{\sum_{c \in C_{g,t-1}} P_{gc,t-1} x_{gc,t-1}}.$$

Therefore, the price index derived in (A5) is multiplied by an additional term to capture the role of new and disappearing varieties.

Feenstra 1994) assumes that taste or quality parameters are unchanged for all varieties of all goods ($d_{g,c,t} = d_{g,c,t-1}$). Benkovskis and Wörz (2011) further introduce an import price index that allows for changes in taste or quality:

$$\begin{aligned}
P_g^q &= \left(\frac{\sum_{c \in C_{g,t}} d_{gc,t} p_{gc,t}^{1-\sigma_g}}{\sum_{c \in C_{g,t-1}} d_{gc,t-1} p_{gc,t-1}^{1-\sigma_g}} \right)^{\frac{1}{1-\sigma_g}} = \prod_{c \in C_g} \left(\left(\frac{d_{gc,t}}{d_{gc,t-1}} \right)^{\frac{1}{1-\sigma_g}} \frac{p_{gc,t}}{p_{gc,t-1}} \right)^{w_{gc,t}} \left(\frac{\lambda_{g,t}}{\lambda_{g,t-1}} \right)^{\frac{1}{\sigma_g-1}} = \\
&= P_g^{conv} \left(\frac{\lambda_{g,t}}{\lambda_{g,t-1}} \right)^{\frac{1}{\sigma_g-1}} \prod_{c \in C_g} \left(\frac{d_{gc,t}}{d_{gc,t-1}} \right)^{\frac{w_{gc,t}}{1-\sigma_g}}
\end{aligned} \tag{A7}$$

Equation (A7) can therefore be seen as a modified version of equation (A6) with an additional term that captures changes in the quality or taste parameter.¹¹

A2 RELATIVE EXPORT PRICE INDEX

Equation (A7) gives us a formula for a variety- and quality-adjusted import price index. We can easily interpret $x_{gc,t}$ (imports of product g originating from country c) as country's c exports of a product g to the importing market (assuming for the moment that there exists only one destination of exports for all exporting countries – the importing country where the representative household resides). From equation (A4) it follows that the market share of an emerging country k is equal to

$$S_{gk,t} = \frac{p_{gk,t} x_{gk,t}}{\sum_{c \in C} p_{gc,t} x_{gc,t}} = \frac{p_{gk,t} x_{gk,t}}{\phi_{g,t} M_{g,t}} = \frac{p_{gk,t}^{1-\sigma_g} d_{gk,t}}{\phi_{g,t}^{1-\sigma_g}}. \tag{A8}$$

We use (A8) to derive changes in adjusted relative export price as inverse growth of country k 's export market share:

$$RXP_{gk,t} = \frac{S_{gk,t-1}}{S_{gk,t}} = \frac{\left(p_{gk,t} / p_{gk,t-1} \right)^{\sigma_g-1}}{\left(\phi_{g,t} / \phi_{g,t-1} \right)^{\sigma_g-1} \left(d_{gk,t} / d_{gk,t-1} \right)}, \tag{A9}$$

where $RXP_{gk,t}$ represents changes in the adjusted relative export price index for an emerging country k , when defined for a single market (exports of good g to a single destination country). We use the inverse growth of the market share in order to keep the usual interpretation of the

¹¹ Actually, Feenstra's (1994) approach also may take into account taste or quality parameter changes, as "...change in the number of varieties within a country acts in the same manner as a change in the taste or quality parameter for that country's imports." Therefore, one can interpret increasing quality as replacement of a low-quality variety by a high-quality variety. Although both approaches lead to the same import price index, the decomposition and interpretation differs in (A6) and (A7). In order to account for changes in taste or quality, the first term of (A6) should be limited to varieties with unchanged taste or quality that were imported in both periods, thus representing "pure" or "quality-adjusted" price changes. However, the set of such stable varieties may be rather small (especially if we interpret $d_{gc,t}$ as taste). In contrast, the first term of equation (A7) captures price changes for the wider set of varieties (i.e. the full set of varieties imported in both periods), although the price changes now include the effect of taste or quality. In addition, (A7) allows to differentiate changes in variety from changes in taste or quality.

relative price indicator – an increasing index denotes losses in competitiveness. Combining (A7) and (A9), we obtain

$$RXP_{gk,t} = \prod_{c \in C_g} \left(\frac{P_{gk,t}}{P_{gc,t}} \frac{P_{gct-1}}{P_{gk,t-1}} \right)^{(\sigma_g - 1)w_{gc,t}} \left(\frac{\lambda_{g,t-1}}{\lambda_{g,t}} \right) \prod_{c \in C_g} \left(\frac{d_{gk,t}}{d_{gc,t}} \frac{d_{gct-1}}{d_{gk,t-1}} \right)^{-w_{gc,t}}, \quad (1)$$

Finally, we need to design an aggregate relative export price; the index in (1) only describes relative export prices for a specific product exported to a particular market. The assumption of a single destination for exports is relaxed to allow for multiple importing countries. In all these countries, consumers are assumed to be maximizing their utility. All parameters and variables entering the three-layered utility function can differ across countries. If we denote the export price, export volume and relative export price index of a product g exported by emerging country k to country i as $p(i)_{gk,t}$, $x(i)_{gk,t}$ and $RXP(i)_{gk,t}$ accordingly, the aggregate adjusted relative export price index can be defined as

$$RXP_{k,t} = \prod_{i \in I} \prod_{g \in G} RXP(i)_{gk,t}^{W_{ig,t}}, \quad (A10)$$

$$\text{where } W_{ig,t} = \frac{S_{ig,t} + S_{ig,t-1}}{2}; \quad S_{ig,t} = \frac{p(i)_{gk,t} x(i)_{gk,t}}{\sum_{i \in I} \sum_{g \in G} p(i)_{gk,t} x(i)_{gk,t}}.$$

Equation (A10) reveals that the aggregate index ($RXP_{k,t}$) is just the Tornqvist index. Its weights are computed using the share of product g exports to country i out of total exports by country k .

A3 EVALUATION OF RELATIVE QUALITY

The calculation of the adjusted relative export price index in (1) is challenging as relative taste or quality is unobservable. Following Hummels and Klenow (2005), we evaluate unobserved taste or quality from the utility optimization problem, i.e. after taking first-order conditions and transformation into log-ratios, we express relative taste or quality in terms of relative prices, volumes and the elasticity of substitution between varieties as

$$\ln \left(\frac{d_{gc,t}}{d_{gk,t}} \right) = \sigma_g \ln \left(\frac{p_{gc,t}}{p_{gk,t}} \right) + \ln \left(\frac{x_{gc,t}}{x_{gk,t}} \right), \quad (A11)$$

where k denotes a particular emerging country.

Relative taste or quality, as any relative measure, is highly sensitive to the choice of a benchmark country. The emerging country of interest serves as a benchmark in our analysis. This choice is driven by the design of the RXP index, which compares export prices and quality of an emerging country to weighted world export prices and quality.

A4 ESTIMATION OF ELASTICITIES

According to Feenstra (1994), we need to specify both, demand and supply, equations in order to derive the elasticity of substitution between varieties. The demand equation is defined by rearranging the minimum unit-cost function in terms of market share, taking first differences and ratios to a reference country:

$$\Delta \ln \frac{S_{gc,t}}{S_{gl,t}} = -(\sigma_g - 1) \Delta \ln \frac{P_{gc,t}}{P_{gl,t}} + \varepsilon_{gc,t}, \quad (\text{A12})$$

where $\varepsilon_{gc,t} = \Delta \ln d_{gc,t}$. We can thus assume that the log of quality is a random-walk process.

The export supply equation relative to a benchmark country l is given by:

$$\Delta \ln \frac{P_{gc,t}}{P_{gl,t}} = \frac{\omega_g}{1 + \omega_g} \Delta \ln \frac{S_{gc,t}}{S_{gl,t}} + \delta_{gc,t}, \quad (\text{A13})$$

where $\omega_g \geq 0$ is the inverse supply elasticity assumed to be the same across partner countries. In line with Mohler (2009), we choose the dominant supplier as our benchmark l (i.e. the country exporting the respective product in most time periods), as it increases the stability of estimates.

An unpleasant feature of the system of (A12) and (A13) is the absence of exogenous variables that would be needed to identify and estimate elasticities. To get these estimates, we transform the system of two equations into a single equation by exploiting the insight of Leamer (1981) and the independence of errors $\varepsilon_{gc,t}$ and $\delta_{gc,t}$.¹² This is done by multiplying both sides of the equations. After transformation, the following equation is obtained:

$$\left(\Delta \ln \frac{P_{gc,t}}{P_{gl,t}} \right)^2 = \theta_1 \left(\Delta \ln \frac{S_{gc,t}}{S_{gl,t}} \right)^2 + \theta_2 \left(\Delta \ln \frac{P_{gc,t}}{P_{gl,t}} \right) \left(\Delta \ln \frac{S_{gc,t}}{S_{gl,t}} \right) + u_{gc,t}, \quad (\text{A14})$$

where

$$\theta_1 = \frac{\omega_g}{(1 + \omega_g)(\sigma_g - 1)}; \theta_2 = \frac{1 - \omega_g(\sigma_g - 2)}{(1 + \omega_g)(\sigma_g - 1)}; u_{gc,t} = \varepsilon_{gc,t} \delta_{gc,t}$$

Relative price and relative market share are correlated with the error $u_{gc,t}$, which lead to inconsistent estimates of θ_1 and θ_2 . Broda and Weinstein (2006) exploit the panel nature of data and obtain consistent estimates by defining a set of moment conditions for each good g . A grid search procedure is implemented when elasticities have the wrong sign or appear to be imaginary. Broda and Weinstein (2006) also address the problem of measurement error and

¹² The independence assumption implies that taste and quality does not enter the residual of the relative supply equation, $\delta_{gc,t}$. If this does not hold, then errors are not independent, since changes in taste and quality enter $\varepsilon_{gc,t}$. The assumption of the irrelevance for the supply function seems realistic for taste. But it is difficult to argue that changes in physical quality of a product should not affect the $\delta_{gc,t}$. The empirical literature did not address this issue until now and the size of the induced bias is thus unclear.

heteroskedasticity. However, a recent paper by Soderbery (2012) reports that their methodology generates severely biased estimates (the median elasticity of substitution is overestimated by 35%). Soderbery (2012) proposes to use the Limited Information Maximum Likelihood (LIML) estimator instead. Nonlinear constrained LIML is implemented in cases when estimates of elasticities are not feasible ($\hat{\theta}_1 < 0$). According to Monte Carlo analysis, this hybrid estimator corrects small sample biases and constraint search inefficiencies. In this paper we follow the Soderbery (2012) approach.

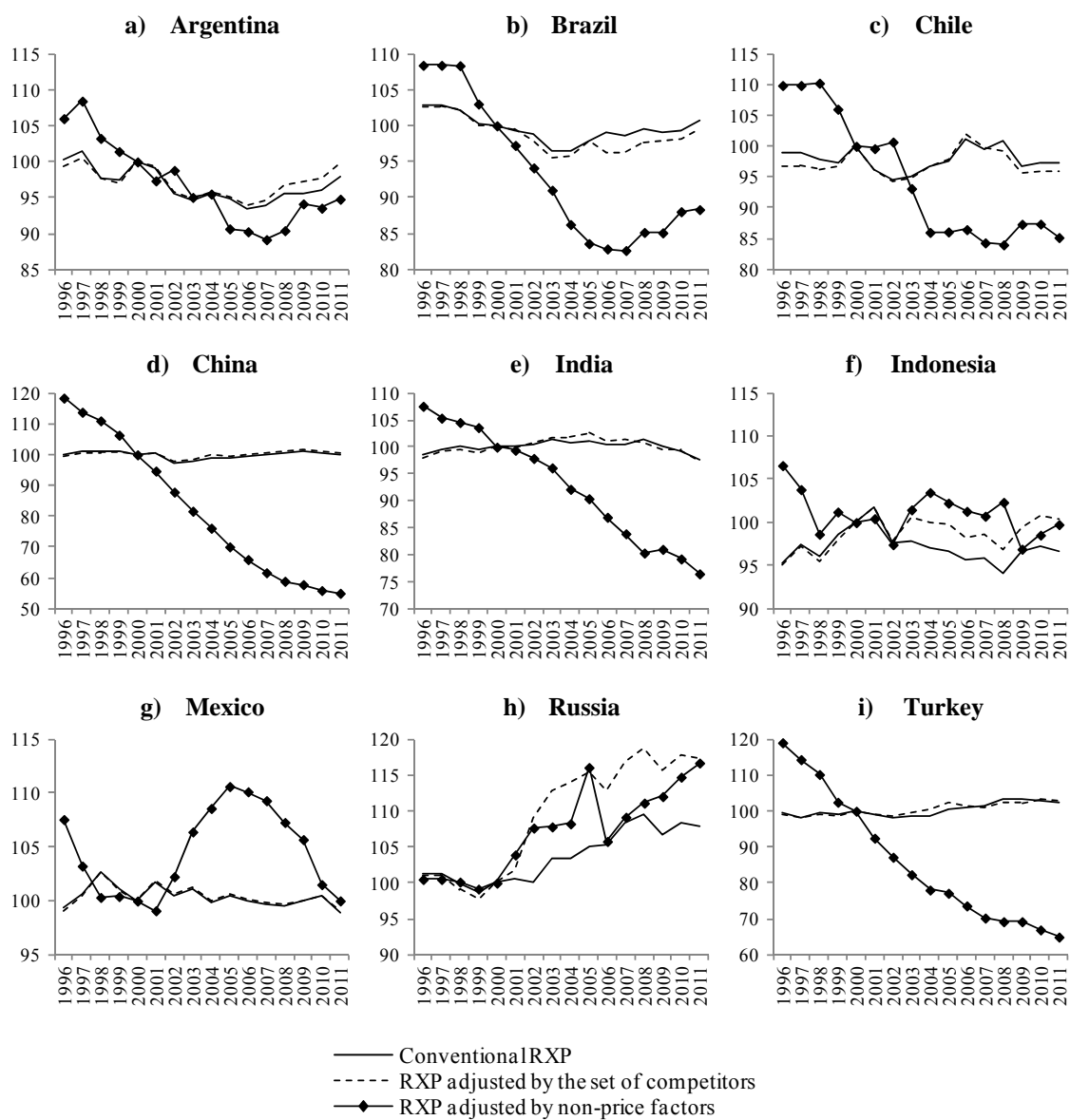
The elasticity of substitution among varieties is estimated using (A14) by LIML and nonlinear constraint LIML for all products where data on at least three countries of origin are available. Table A1 displays the main characteristics of estimated elasticities of substitution among varieties. We estimate elasticities of substitution separately for each destination country.

Table A1 **Elasticities of substitution between varieties (top 20 importers)**

| | No. of estimated elasticities | Mean | Minimum | Maximum | 25 th percentile | Median | 75 th percentile |
|-------------------|-------------------------------|-------|---------|---------|-----------------------------|---------------|-----------------------------|
| United States | 3725 | 19.97 | 1.0010 | 6442 | 1.64 | 2.00 | 3.13 |
| China | 3951 | 26.33 | 1.0021 | 46325 | 1.74 | 2.23 | 3.53 |
| Germany | 4708 | 13.39 | 1.0037 | 41612 | 1.68 | 2.01 | 2.83 |
| Japan | 4126 | 6.41 | 1.0015 | 3038 | 1.65 | 2.08 | 3.04 |
| France | 4899 | 4.75 | 1.0022 | 3698 | 1.68 | 2.03 | 2.84 |
| United Kingdom | 4846 | 7.70 | 1.0014 | 12862 | 1.63 | 1.95 | 2.74 |
| Italy | 4861 | 7.32 | 1.0029 | 7908 | 1.65 | 2.02 | 2.86 |
| Korea | 4260 | 17.55 | 1.0012 | 36421 | 1.69 | 2.22 | 3.35 |
| Hong Kong (China) | 3243 | 48.16 | 1.0016 | 75165 | 1.80 | 2.49 | 5.00 |
| Netherlands | 4126 | 24.31 | 1.0016 | 64064 | 1.69 | 2.15 | 3.25 |
| Belgium | 4679 | 10.24 | 1.0021 | 22747 | 1.73 | 2.20 | 3.41 |
| India | 3610 | 28.20 | 1.0032 | 21899 | 1.85 | 2.66 | 5.54 |
| Canada | 3308 | 29.33 | 1.0073 | 17279 | 1.83 | 2.51 | 4.91 |
| Singapore | 2823 | 45.70 | 1.0010 | 49488 | 1.79 | 2.55 | 5.76 |
| Spain | 4776 | 8.18 | 1.0011 | 16343 | 1.68 | 2.07 | 2.98 |
| Mexico | 3664 | 12.08 | 1.0010 | 1113 | 1.69 | 2.17 | 3.38 |
| Russia | 4070 | 5.84 | 1.0052 | 1617 | 1.68 | 2.11 | 3.10 |
| Turkey | 4000 | 18.15 | 1.0035 | 38896 | 1.69 | 2.21 | 3.46 |
| Australia | 2698 | 6.31 | 1.0014 | 1935 | 1.75 | 2.27 | 3.56 |
| Thailand | 3497 | 47.67 | 1.0020 | 68239 | 1.77 | 2.48 | 4.76 |

Note: Calculated using UN Comtrade data for disaggregated imports of 188 countries.

Figure A1 Export prices of emerging countries relative to competitors, excluding mineral fuels exports (2000=100)



Sources: *UN Comtrade*, authors' calculations.

Notes: Relative export prices are calculated by cumulating RXP changes from equations (1), (A10) and (A11). Increase denotes loss in competitiveness. RXP starts from 1997 for Brazil, Chile and Russia due to missing of export data in 1996.