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Abstract

The U.S. share of world merchandise exports has declined sharply over the last decade. Using data at the level of detailed industries, this paper analyzes the decline in U.S. share against the backdrop of alternative measures of the competitiveness of the U.S. economy. We document the following facts: (i) only a few industries contributed to the decline in any meaningful way, (ii) a large part of the drop was driven by the changing size of U.S. export industries and not the size of U.S. sales within those industries, (iii) in a gravity framework, the majority of the decline in the U.S. export share within industries was due to the declining U.S. share of world income, and (iv) in a computed structural measure of firm productivity, average U.S. export productivity has generally maintained its high level versus other countries over time. Overall, our analysis suggests that the dismal performance of the U.S. market share is not a sufficient statistic for competitiveness.

Keywords: Trade competitiveness, gravity model, firm productivity

JEL classification: F14, F17

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1 Introduction

The U.S. share of world merchandise exports has declined sharply over the last decade. Using data at the level of detailed industries, this paper analyzes the decline in U.S. share against the backdrop of alternative measures of the competitiveness of the U.S. economy.

Usual suspects for a given country's decline in export share might include: unfavorable relative price movements, crowding out from the proliferation of low-cost exporters from developing countries, uneven reductions in trade costs and barriers around the world, or possibly the deterioriating productivity of exporting firms compared to foreign rivals. Disentangling these factors presents several complications. First, relative prices are only weakly correlated with U.S. market share, and are thus not very helpful in explaining its recent dynamics. This is evidenced by the accelerating drop in share during the 2000's amidst a decline in the value of the broad real dollar. Second, in many instances, and particularly for international comparisons, trade costs and firm productivity are difficult to measure directly.[1] And third, export shares may additionally reflect the idiosyncratic composition of the U.S. export bundle, which may have little to do with the ability of U.S. exporters within a given industry to compete.

To tackle these issues, Section 2 begins by decomposing the decline in share into detailed industry groups; we find that only a few of these industries contributed to the decline in any meaningful way. Moreover, a large part of the drop was driven by the changing size of U.S. export industries and not the size of U.S. sales within those industries. This means that U.S. exporters are specialized in industries that happen to have been growing relatively slowly as a share of world trade. These observations offer our first suggestion that the fall in aggregate U.S. share has little to do with the underlying productivity of U.S. exporting firms.

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[1] Measures of aggregate tfp, comparable across countries, are usually obtained as the residual component of GDP growth that cannot be explained by the growth of production inputs. One of the drawbacks of the growth accounting approach is that the role of the sectoral composition of output is ruled out by assumption. By assuming that GDP is produced by a single sector, one cannot disentangle tfp differences (across countries) due to sectoral specialization from tfp differences due to other factors.

We then present two measures of trade competitiveness which, insofar as they are inferred from actual trade flows, we refer to as *revealed* competitiveness. The first measure, in Section 3, is derived as a residual from a standard gravity equation. The objective of the exercise is to purge bilateral trade flows of the effect of national income and geography, wherein the residual contains information about the relative productivity and unmeasured trade costs of exporters. We find that the majority of the decline in the U.S. export share is in fact due to the declining share of U.S. income in the world. The residual, which we view as a 'purer' measure of competitiveness, is declining but not as dramatically.

Our second approach, in Section 4, is derived from a structural model and builds on the multi-country, multi-sector version of Melitz-Ottaviano (2008).[2] In that framework, the *overall* competitiveness of a country in a given sector is the outcome of a process of firm selection driven by: (1) the degree of 'accessibility' (i.e. trade costs) of the country and the size of its domestic market, as well as (2) the exogenous ability of the country to generate low cost firms, which depends on structural and technological factors. We extend previous empirical applications of that model by using richer product level detail, and additionally employ an innovative approach by Novy (2009) to compute competitiveness indicators which are comparable over time. Consistent with our gravity residual exercise we find that, notwithstanding significant heterogeneity across sectors, U.S. export productivity has generally maintained its high level versus other countries over time. Overall, our analysis suggests that the dismal performance of the U.S. market share is not a sufficient statistic for competitiveness.

2 The state of U.S. export share

From 1980 to 2009 the U.S. share of world exports fell by almost one third, declining from about 11 percent to just over 8 percent of world exports. In this section we examine the decline in the U.S. share using NBER-UN bilateral trade data from Feenstra, Lipsey, Deng, Ma and Mo (2005).

As shown in Figure 1, the United States' share of world merchandise exports rose slightly from 1986 to 1999, increasing from about $10\frac{1}{2}$ to $12\frac{1}{2}$ percent of world exports, before falling 4 percentage points between 1999 and 2009. The bilateral trade data run through 2004 and, in Figure 2, we observe that every industry group at SITC 1-digit aggregation registered a decrease over the period from 1984 to 2004, with many of the larger changes occuring in the early 2000's. The largest declines in share were recorded among the basic materials categories (SITC 0 through 4), which account for approximately 25 percent of U.S. exports, and in machinery and transportation equipment (SITC 7), which account for almost half of U.S. export sales. It is interesting to note that the timing of the decline in U.S. share differs over SITC categories. The fall in basic material shares is gradual and persistent, while decline in machinery & transportation equipment is abrupt, primarily occurring after 1999.

The decline in market share is machinery and transportation equipment is particular notable given the importance of this sector for overall U.S. exports. The fall in the U.S. share of machinery and transportation equipment is examined further in Table 1, which breaks the category into SITC 2-digit subcategories. Although the decline in U.S. share is apparent across most 2-digit machinery categories, the fall in the U.S. share of office machine and computer exports is particularly striking, with U.S. share of world exports falling from a third of the total to just under one tenth. As with overall exports, there is some dispersion in the timing of the decline in shares across subcategories. Whereas the fall in computers is steep and steady over the entire period, in most other categories of machinery the U.S. was able to maintain or expand export share through 1999 before shares plummeted sharply.

[2] That model was first brought to the data by Del Gatto, Mion and Ottaviano (2006) and further developed by Ottaviano, Taglioni and di Mauro (2009).

A more meaningful way of decomposing the decline in the aggregate export share is to compute the appropriately weighted contribution from disaggregate categories of goods. The change in aggregate export share can be expressed as the sum of changes across product categories (i) as a ratio of the change in world exports:

$$\frac{\Delta X_{US}}{\Delta X_{WORLD}} = \sum_i \frac{\Delta X^i_{US}}{\Delta X_{WORLD}}$$

Figure 3 depicts the contributions to the change in aggregate export share for each 1 digit SITC code over the period from 1984 to 2004. Food & live animals provided the largest contribution to the decline in share, accounting for almost one fourth of the aggregate decline. Almost as large were the contributions of machinery & transportation and crude materials, also each contributing about one fourth to the overall decline in share. The importance of raw materials for the decline in U.S. share raises a note of caution in interpreting aggregate export share statistics. Commodity prices fell over most the period under consideration, and since the exports of the United States are relatively commodity intensive, so did the U.S. share of world exports.

The importance of commodities is further illustrated in Figure 4, which depicts the top 10 contributors to the aggregate decline among 4-digit SITC codes. Corn and soybeans contribute a combined one sixth of the overall decline. However, the 4-digit data also reveals that a number of categories of manufactured goods also contributed to the decline, including motor vehicle parts and digital processing units (computers). The take away message is that a true measure of developments in U.S. competitiveness is more likely to be found by looking at U.S. export performance within relatively narrowly defined categories.

The importance of foods for the explaining the overall decline in U.S. share is somewhat surprising given foods relatively small share in U.S. exports and, as shown in Figure 2, the lack of an abnormally large fall in the U.S. share of food specific exports. However, it is important to note that the contribution of each individual category to the fall in the U.S. aggregate share occurs along both an intensive and an extensive margin. The decline in the U.S. aggregate share reflects both an intensive decline in market share within each category, as well as an extensive decline stemming from changes in the size of each category in world exports. For instance, corn (SITC 0440) contributes to the decline in U.S. aggregate share both as the U.S. captures a smaller proportion of the corn-specific export market and also as corn's share of overall world exports declines.

One established method of assessing the importance of composition for changes in trade shares is constant market share analysis (see ECB (2005) for a detailed description).[3] Constant market share analysis separates changes in aggregate market share into two components, a commodity effect and competitiveness effect defined as follows:[4]

$$\frac{\Delta X^i_{US}}{\Delta X_{WORLD}} = \underbrace{\sum_i \frac{X^i_{US}}{X^i_{WORLD}} \cdot \left(\Delta \frac{X^i_{WORLD}}{X_{WORLD}}\right)}_{\textit{Commodity Effect}} + \underbrace{\sum_i \left(\Delta \frac{X^i_{US}}{X^i_{WORLD}}\right) \cdot \frac{X^i_{WORLD}}{X_{WORLD}}}_{\textit{Competitiveness Effect}}$$

The commodity effect measures the effect of composition on the change in the aggregate export share, by weighting the change in the composition of world exports by the initial composition of

[3] Constant market share analysis is beset by a number of well documented theoretical problems (see Richardson (1971) for an overview). However, the approach remains illustrative and simple to implement even if interpretation is complicated by relative price changes and other issues.

[4] The constant market share approach often includes an additional "market effect" related to the geographical pattern of trade. For ease of exposition we have focused only on the commodity effect, in a sense wrapping the market effect into our measurement of the competitiveness effect. With declining trade costs it is likely that the market effect has become a less pronounced determinate of aggregate share in any case.

the U.S. export bundle. The competitiveness effect measures the portion of the change in the aggregate share that is due to changes in the within category share of U.S. exports.

Figure 5 decomposes the contribution of each 1-digit SITC export category to the change in the aggregate export share (the blue bars) into components due to commodity (the green bars) and competitiveness (the red bars) effects over the 1984 to 2006 period. The large negative contributions of food and live animals and crude materials largely reflect the declining importance of these goods in world exports (signified by negative commodity effects), although U.S. exports also suffered a negative competitiveness effect in each case. In contrast the negative contribution to the aggregate recorded by the machinery and transportation sector is completely due to a decline in U.S. competitiveness, as the sector has greatly increased its weight in the world exports over the time frame under consideration.

In summary, interpreting the decline in the U.S. export share is complicated by compositional effects. The primary drivers of the decline in aggregate U.S. share were raw commodities, with negative contributions that largely derived from their declining weight in the world export basket. That said, the U.S. did experience a large decline in the share in the machinery and transportation sector, which was not reflected in the composition of U.S. exports but rather declines within detailed sub-categories. Here the evidence of a fall in U.S. competitiveness is more compelling. Against this background, the following sections focus on U.S. export performance within industries and attmept to identify its drivers. We suggest two alternative empirical methodologies to parse out a narrower definition of competitiveness: exporter productivity purged of geographical and relative market size considerations. This strategy is termed, "revealed competitiveness," which derives from the fact that it is inferred from observable trade flows.

3 Reduced Form Revealed Competitiveness

One possible explanation for the decline in U.S. export share is simply that the U.S. now accounts for a smaller share of global output. As China and other emerging economies expand rapidly and become more integrated into the global economy, it is natural that the U.S. share of world exports would fall without necessarily indicating any decline in the productivity of U.S. exporters. As shown in Figure 6, the fall in the U.S. share of global exports of about 4 percentage points over the past decade corresponds to a decrease in the U.S. share of global output of about 3 1/2 percentage points on a PPP basis. The relatively tight correlation between export share and income holds true for many other countries as well. Across the G7, France, Italy, and Japan have experienced declines in export share that broadly match their declining share of world output. On the other hand, Germany has more less maintained export share even as its share of world income has declined, while Canada and the UK have suffered much steeper falloffs in exports than income. In percentage terms, the export share growth of China has outpaced its income share, and the same holds for India.

Figure 6 strongly suggests that changes in market share may be conflating competitiveness effects with income dynamics. Specifically, country characteristics such as size may be influencing market share but have little to do with the underlying ability of a country's exporters to compete. To control for such characteristics, our first approach is to non-parametrically estimate trade flows minus the contribution of country size, geography and certain trade costs. A derivative of the gravity equation is a natural candidate to do so. Previous studies such as Baier and Bergstrand (2001), and more recently Whalley and Xin (2009) and Novy (2009), use gravity to decompose the levels of bilateral trade flows into contributions from income, trade costs or otherwise. Each finds that exporter and importer income plays a substantial, even dominant, role in explaining trade. Our approach extends this logic to the case of relative trade performance, where the gravity equation is 'folded' by dividing through by a reference exporter. In the particular case where the reference country is the entire world, the gravity equation converts neatly into an expression for market share in terms of relative exporter size, relative geographic characteristics and relative productivity.

Our approach to 'decomposing' the share into factors that have to do with competitiveness and those that don't involves simply looking at the time variation in the residual of a panel gravity estimation. The intuition is that if a country is increasingly outperforming the average exporter's performance (i.e., a country exports more relative to its own size and more to distant countries over time) then its residual will grow over time. We posit that this residual contains information about changes in the underlying productivity of exporters. In this section, we do not apply a structural interpretation to that productivity, it is merely contained in the residual. In the section that follows, we apply a structure that allows for more specific interpretation of the residual and, moreover, is consistent with the reduced form gravity equation herein.

To be concrete, define T_s^{lh} as country l's exports to country h in sector s in a given period t:

$$T_{st}^{lh} = D_t^l D_t^h r_{st}^l r_{st}^h \rho_s^{lh} \phi_t \tag{1}$$

Equation (1) corresponds to a generic gravity model, where bilateral trade is a function of country size (D), latent country-specific multilateral resistance (r), geographic characteristics (ρ) and global shocks (ϕ). Exploiting the multiplicative form of the equation, we cancel out importer-specific terms by dividing through by total exports to country h in industry s.

$$\frac{T_{st}^{lh}}{\sum_l T_{st}^{lh}} = \frac{D_t^l r_{st}^l \rho_s^{lh}}{\sum_l D_t^l r_{st}^l \rho_s^{lh}} \tag{2}$$

The intuition for this reduced form is that the change in a given importer's income or multilateral resistance will affect the level of that country's imports but not how the new imports are allocated across exporters. Moreover, a global shock affecting all exporters will not affect their relative performance and hence the ϕ terms cancel out as well. The method of taking ratios of the gravity equation has three ostensible benefits. First, for our purpose of relating the share of U.S. exports to underlying productivity measures, equation (2) is expressed in the correct units of share owing to income, trade costs and productivity. Second, the size of the data matrix used in the estimation is reduced by folding in the importer-specific terms. Third, multilateral resistance terms (as defined in Anderson and van Wincoop (2003)) associated with importers cancel out, sparing the need to approximate them using fixed effects.[5]

Denoting the geometric mean of a given variable by $\overline{X} = \prod_l X^{\frac{1}{n}}$, taking logs, and allowing for a mean-zero perturbation (ε), we can rewrite the above expression as:[6]

$$\ln \frac{T_{st}^{lh}}{\sum_l T_{st}^{lh}} = \ln \frac{1}{n_s} + \ln \frac{D_t^l}{\overline{D}_t} + \ln \frac{\rho_s^{lh}}{\overline{\rho}_s^h} + \ln \frac{r_{st}^l}{\overline{r}_{st}} + \varepsilon_{st}^{lh} \tag{3}$$

The log of country l's market share in destination market h is a positive function of its relative income, its geographic proximity and its relative productivity. Again, this specification is isomorphic to a standard gravity model, though specified in relative terms. With the additional assumptions that ρ and n are constant over time, variation in exporter multilateral resistance and productivity is identified as the residual of a model with exporter relative income and country-pair fixed effects on the right-hand side. That is, the actual market share changes over time relative to the changes in the gravity model prediction contains information about the evolution of relative

[5] Other examples of cancelling out the importer fixed effects in a gravity framework include: Head and Mayer (2000), Martin, Mayer and Thoenig (2008) and Head, Mayer and Ries (2010).

[6] Expression (3) imposes separability across right-hand side ratios with the assumption that $\ln \sum T = \sum \ln T$. In practice, this may have the effect of overestimating the share of each exporter (i.e., since the shares as decomposed on the right-hand side will add up to more than 1), but little impact on the relative size of the shares.

exporter productivity. This is what we will refer to as the share-to-model ratio, or simply the growth in the model residual by exporting country, averaged across industries:

$$\triangle \ln \frac{r_t^l}{\overline{r}_t} = \overline{\left(\triangle \ln \frac{T_{st}^{lh}}{\sum_l T_{st}^{lh}} - \triangle \ln \frac{\widehat{T_{st}^{lh}}}{\sum_l T_{st}^{lh}} \right)} \tag{4}$$

The assumption of a time-invariant ρ is similar to standard gravity approaches using variables such as distance, common border and common language that don't tend to change much. The implication of this assumption, however, is that decreases in trade costs due to changing trade policy will also be captured in the residual term. In our implementation we add dummies for significant shifts in policy (e.g., NAFTA, EMU) as well as over the course of our sample to try to control for changing trade costs, but nonetheless the residual likely captures elements of falling trade costs in addition to relative productivity. As such, in this section we jointly estimate relative performance due to these factors, both of which fit into a reasonable, if broad, definition of export competitiveness; in the following section we use a structural model to parse the residual more finely.

The assumption of a constant number of trading partners per importer (n) may be less benign. Due to the seminal work of Feenstra (1994), there has been much study of the increase in product variety within even narrowly defined product categories. We address this empirically in two ways. First, every specification below contains time fixed effects which would soak up a secular trend in varieties. Secondly, most specifications contain country-pair fixed effects or exporter-time fixed effects which would pick up at least a portion of the level differences in n by country. We note that a disproportionate rise in relative product variety to certain countries over time would decrease the term $ln(1/n)$ and hence work against the finding of rising productivity in the residual. For the most prolific traders in terms of their number of trading partners, which includes the U.S., we thus take our estimates of the rising residual as an underestimate of the true change in productivity and trade costs.

3.1 Reduced form revealed competitiveness: data & specification

The data used in the estimation are bilateral trade flows as described in the previous section, nominal GDP data from the Penn World Table which are converted into international dollars at PPP exchange rates, dummy variables for NAFTA, EU and EMI trade flows, the distance between capital cities, as well as common border and common language dummies. We follow previous studies by truncating the data at $10,000 per annual bilateral flow to avoid potential distortions from errors of units in the data and implausibly small trade values. We run each gravity regression at the SITC 4-digit level and constrain ourselves to products with over 1,000 exporter-importer-year observations. The amount of data lost due to concordance issues for income and distance data will vary by specification since the use of fixed effects often obviates the use of those variables, but the most punitive cut of the data still accounts for over 83 percent of global trade value between 1980 and 2004.

Our estimator is OLS on the log-linear specification of (3). Cognizant of the fact that there are many different ways to specify that equation, we try an array of five different panel specifications with varying degrees of control for multilateral resistance terms. Again, our objective is to compute various indexes of the change in the residual (4) which will be informative of the portion of U.S. share decline not explained by gravity controls such as income and geography. The differences among these five regressions are the treatment of the ρ terms (which in some cases are country-pair fixed effects and in others are the standard distance, border and language controls), the measure of country-specific variables D, as well as the subset of data used for the estimation.

The specifications are described in Table 2. In specification (i), we regress the exporter's share of global sales in each SITC product on the exporter's relative nominal income (recall that the importer-specific terms cancel by dividing by a reference exporter), exporter-importer fixed effects, year fixed effects, and dummies for NAFTA and EMU. An actual measure of income is used to control for the trends described in the previous section. The exporter-importer FE is a static measure of trade costs which wipes out variation in border, distance and language, and arguably includes many more unmeasured (and unchanging) barriers to trade. To control for some large policy changes during our sample which we do not view as endogenous to competitiveness, dummies for post-NAFTA and post Euro years are included for the appropriate countries. Finally, year fixed effects soak up secular trends in n.

Specification (ii) uses the same regressors as (i), but on a subset of the data that has observations for at least 20 of the 25 years in the sample (i.e., within each exporter-importer-SITC cell). It is informative to constrain ourselves to the subset of bilateral trade flows that are balanced over the course of the sample for at least two reasons. First, the average results statistics reported across products may be skewed by compositional changes over time in the unbalanced panel. Secondly, our linear-in-logs specification potentially introduces selection bias by dropping the observations with zero trade flows. One possible way to assess the sensitivity of the results to loosening the data truncation at zero would be to tighten it further; that is, any selection bias caused by dropping zero values would be enhanced by dropping sporadic ones.

Specification (iii) uses exporter-year fixed effects in the place of GDP. Since these fixed effects also approximate changes to the multilateral resistance terms of the exporter, they may in fact be soaking up some of the information on competitiveness intended to be measured. As such, the robustness of the result consists of a similar profile of residual changes in specifications (i) through (iii), due to the following trade-off: in the first two there is likely some omitted variable bias since implicit indexes of multilateral resistance (as defined in Anderson and van Wincoop (2003)) are themselves a function of geographic variables included in the regression. On the other hand, the appropriate control for multilateral resistance removes from the residual at least some information on the relative performance of exporters. Specifications (iv) and (v) check the robustness of the results to more standard gravity specifications, by unfolding (3) into levels and incorporating conventional measures of static trade costs. Specification (vi) uses a an alternative data source on bilateral international trade flows aggregated into broader ISIC 2-digit sectors.[7]

3.2 Reduced form revealed competitiveness: results

After controlling for model factors in several alternative formulations of the gravity model, we find that the U.S. export share is only in slight decline. In our benchmark specification (i), the majority of the roughly 20 percent decline in aggregate U.S. export share is explained by the model with about a 6 percent decline in the residual.[8]

Table 3 shows the estimates of control variables for (3) estimated across all products.[9] As expected, exporter GDP share is positively related to export share, with a 1 percent decrease in relative income decreasing export share by roughly 0.4-0.6 percent. These magnitudes are similar to the coefficients on GDP in the level regressions and slightly lower than those using the ISIC data. The effect of NAFTA and the introduction of the euro are both positive and significant, with coefficients ranging from 0.4-1.5 and 0.1-0.5, respectively. Measures of distance, language and border have the expected sign.

[7] Specification (vi) confirms the consistency of the reduced form results with the empirical exercise in the following section. While the reduced form regressions use the Feentra et al. (2005) data described above, the methodology in the next section additionally requires data on sectoral intra-national trade, which necessitates using an alternative data set. Those data are described below.

[8] Results for the remaining five specifications can be found in Appendix B.

[9] As mentioned, the gravity residuals are estimated at the SITC 4-digit level for specifications (i)-(v) and at the ISIC 2-digit level for specification (vi). In the table, due to computational constraints on such a large dataset, we present aggregate control variables estimated without product fixed effects. As such, the coefficients can be interpreted as simple averages across SITC products, or in the case of specification (vi), ISIC products.

An index of market share changes for the U.S., along with an index of model predicted values, are shown in Figure 7. The index in each year is a geometric mean of share changes across U.S. destination countries and products, where each change in share is weighted by the SITC-importer value in the year 2000.[10] Despite a widening of the gap between the two indices in the early period, the model prediction broadly follows the share trend. Since there are not many time-varying regressors in our gravity estimation, this result is closely related to the observation in Figure 6 that U.S. income share and trade share have similar dynamics.

To construct a statistic for the overall percent change in market share due to the gravity residual, the ratio of actual to predicted share is averaged across time periods in the early part of the sample (1980-1992) and the latter part (1993-2004) and the log-difference of these two ratios is taken for each exporter-importer-SITC group. The average of those statistics across destinations and 4-digit product groups is shown in Figure 8 for the G20 plus Singapore, Taiwan and Hong Kong.[11] Across all products, the U.S. is in the middle of the pack with decreases in its residual of 6 percent. This can be interpreted as a decrease in U.S. export market share of 6 percent that is not accounted for by the dynamics of income, and is notably smaller than the overall share decline of approximately 20 percent over that period. This suggests that U.S. relative productivity competitiveness, albeit in slight decline by this measure, did not decline by nearly as much as its fall in share might suggest. This result is consistent across product categories, shown in Table 4, even for SITC 7 (machinery and transportation) where U.S. share performance was particularly grave, as well as for other specifications shown in Appendix B. For other exporters, clear winners and losers emerge. Indonesia, China, India and Mexico had among the highest increases in their gravity residual by a large margin, as their export growth far outpaced the increase in their income shares. On the other hand, certain large Asian exporters had dramatic falls in their residuals presumably due to the rise of China and large increases in Mexican exports to the U.S. over the sample period. European countries and Canada had more moderate changes in their export performance and, with a few exceptions, tended to lag behind the rest of the world.

In summary, this reduced form exercise strongly supports the story that exporter income shares are an important determinant of trade shares. Beyond that, however, it is difficult to know whether the gravity residual reflects the actual evolution in the underlying productivity of exporters rather than other factors, such as evolving trade costs. In the following section we take a different approach to identifying relative cost competitiveness across countries by modelling the micro-foundations of trade shares explicitly.

4 Structural Revealed Competitiveness

In this section we build on a multi-country multi-sector version of the Melitz-Ottaviano (2008) model to obtain a (computable) structural equation for the relative competitiveness of a country. A full description of the reference model is reported in Corcos et al. (FEEM, 2010), although its main properties are summarized in Appendix A.

The model yields the following expression for aggregate bilateral trade from country l to country

[10] For the sake of comparability, the predicted and actual market share changes are aggregated over exactly the same SITC-destination pairs. The index of share change does not exactly match that in Figure 1, since: (a) it is a geometric index, whereas simply adding up share across products as in Figure 1 is analogous to an arithmetic mean, and (ii) because the index is matched in each period (i.e., the trade flow had to occur in both time t and t-1 for it to be included), the composition of items in the Figure 2 index will be a subset of those in Figure 1. Overall, the magnitude of the drop of the geometric index seems reasonably close to the aggregate drop and the dynamics of contractions in the early 1980's and 2000's parallel one another.

[11] This list corresponds well with the top twenty exporters by size in 1980. In the table, the category 'Other EU' includes: Austria, Belguim, Denmark, Finland, Ireland, Netherlands, Portugal and Sweden.

h in a given sector s[12]:

$$T_s^{lh} = \Upsilon_s \; \rho_s^{lh} \; E_s^l \; [max(m)_s^l]^{-\gamma_s} \; D^h \; [m_s^{hh}]^{\gamma_s+2} \tag{5}$$

where γ_s is the shape parameter of the (Pareto) marginal cost distribution in sector s; $\Upsilon_s \equiv \frac{1}{2\upsilon_s(\gamma_s+2)}$ is a bundling sectoral parameter playing no role in subsequent analysis; E_s^l is the number of entrants in country l - sector s; $max(m)_s^l$ is the upper bound of the exogenous marginal cost distribution in country l - sector s (exogenous cost cutoff); $\rho_s^{lh} \in (0,1]$ is a measure of trade freeness between country l and country h in sector s; D^h is country size (i.e population and, by extension, GDP); m_s^{hh} is the endogenous maximum possible marginal cost for a generic domestic firm producing and selling in country h - sector s (endogenous cost cutoff).

Equation (5) expresses exports from l to h in a given sector as a function of bilateral trade freeness $[\rho_s^{lh}]$ and a set of country characteristics specific to the exporting $[max(m)_s^l,\ E_s^l]$ or the importing $[D^h,\ m_s^{hh}]$ country.[13]

It is worth noting how, bearing in mind equations (13) and (14), the vector of inverse endogenous cutoffs ${M_s}^{-1}$ (with generic element $1/m_s^{hh}$) can be interpreted, once ordered, as a country ranking in terms of actual competitiveness. On the other hand, the vector of inverse exogenous cutoffs Ψ_S^{-1}, with generic element $1/\psi_s^h \equiv \left[\omega_s^h f_s^h \left(max(m)_s^h\right)^{\gamma_s}\right]^{-1}$, can be thought of, once ordered, as a country ranking in terms of the exogenous ability to generate low cost firms. Given Ψ_S^{-1}, a country's position in ${M_s}^{-1}$ is an inverse function of home market size (D) and trade freeness (P_S). As explained in Appendix A, to stress this relationship between $1/max(m)_s^h$ and $1/m_s^{hh}$, we refer to the former as the *Producer (Marginal Cost) Competitiveness* of country h and to the latter as its *Overall (Marginal Cost) Competitiveness* (henceforth OC and PC respectively).

Equation (5) provides us with the chance to derive an analytical expression that can be used to infer the vector ${M_s}^{-1}$ of the OC of the countries from observed bilateral trade flows. To this aim, we start by noting that only T_s^{lh} and D^h are observable. Thus we first of all need to purge (5) of the unobservable terms. However, consider that the terms in (5) are specific to both the origin and the destination country [i.e. ρ_s^{lh}], or either to the former (i.e. $[max(m)_s^l]^{-\gamma_s}\ E_s^l$) or the latter (i.e. $[m_s^{hh}]^{\gamma_s+2} D^h$) only. To isolate OC, we can therefore use country l's exports to a reference country f (UK in the application), to transform equation (5) into a prediction of relative (instead of absolute) trade flows:

$$\frac{T_s^{lh}/D^h}{T_s^{lf}/D^f} = \frac{\rho_s^{lh}}{\rho_s^{lf}} \left[\frac{m_s^{hh}}{m_s^{ff}}\right]^{\gamma_s+2} \tag{6}$$

This expression, in which measurable terms are grouped on the left hand side, expresses measurable (relative) trade flows as a function of trade freeness and OC, both in relative terms.

Using a tilde to indicate that a variable is expressed in relative terms ($\tilde{\rho}_s^{lh} = \rho_s^{lh}/\rho_s^{lf}$; $\tilde{D}^h = D^h/D^f$; $\tilde{m}_s^{hh} \equiv \frac{m_s^{hh}}{m_s^{ff}}$), relative average marginal costs in a given country-sector can be written as

$$\tilde{\overline{m}}_s^{hh} \equiv \left(\frac{\tilde{T}_s^{lh}}{\tilde{D}^h} \frac{1}{\tilde{\rho}_s^{lh}}\right)^{\frac{1}{\gamma_s+2}} \tag{7}$$

where we also used the fact that, under the Pareto assumption, $\overline{m}_s^h = \frac{\gamma_s}{\gamma_s+1} m_s^{hh}$, and thus $\tilde{\overline{m}}_s^{hh} \equiv \frac{m_s^{hh}}{m_s^{ff}}$.

[12] The number of exporters from l to h amounts to $E_s^l \left[\frac{m_s^l}{max(m)_s^{lh}}\right]^{\gamma_s}$. Each exporter from l to h generates f.o.b. export sales equal to $p^{lh}(c)q^{lh}(c)$. Aggregating over all exporters yields equation (5).

[13] Note that the adjustment of T_s^{lh} takes place along both the 'extensive margin' (number of exporters) and the 'intensive margin' (per capita exports).

Bilateral trade costs - or more precisely the degree of trade freeness $\tilde{\rho}_s^{lh}$ - are however unknown. To deal with this issue, we derive - as suggested by Novy (2009) - a very simple form for bilateral trade freeness, which exploits the structure of the reference model without the need to estimate a gravity equation. From (6), bilateral trade freeness between country l and country h can be in fact expressed as

$$\tilde{\Omega}_s^{lh} \equiv \frac{\tilde{T}_s^{lh}\ \tilde{T}_s^{hl}}{\tilde{T}_s^{ll}\ \tilde{T}_s^{hh}} = \frac{\tilde{\rho}_s^{lh}\ \tilde{\rho}_s^{hl}}{\tilde{\rho}_s^{ll}\ \tilde{\rho}_s^{hh}}. \tag{8}$$

The intuition behind (8) is (Novy, 2009) straightforward. If bilateral trade flows between two countries increase relative to domestic trade flows, it must have become relatively easier for the two countries to trade with each other. This is captured by an increase in $\widetilde{\Omega}_s^{lh}$, and vice versa.

Assuming $\tilde{\rho}_s^{lh} = \tilde{\rho}_s^{lh}$, (8) can be plugged into (7) in order to obtain the following measure of Revealed Overall Competitiveness (henceforth ROC)[14]:

$$ROC \equiv (\tilde{\bar{m}}_s^{hh})^{-1} = \frac{\tilde{D}^h\ \widetilde{\Omega}_s^{lh}}{\tilde{T}_s^{lh}}. \tag{9}$$

Equation (9) does not require econometrics. The advantage over gravity estimates[15] is that $\widetilde{\Omega}_s^{lh}$ can be calculated not only for cross-sectional data but also for time series and panel data. Thus, the evolution of the resulting country rankings can in this case be trusted. Note also that, although $\widetilde{\Omega}_s^{lh} = \widetilde{\Omega}_s^{hl}$, $\tilde{T}_s^{lh}$ normally differs from $\tilde{T}_s^{hl}$. Thus, what equation (9) suggests is that the difference in $\tilde{T}_s^{lh}$ respect to $\tilde{T}_s^{hl}$ has to be traced back to differences in relative costs $(\tilde{\bar{m}}_s^{hh}/\tilde{\bar{m}}_s^{ll})$ and market size $(\tilde{D}^h/\tilde{D}^l)$.

Finally, it is worth noting that the idea of "revealed" competitiveness associated with (7) is more general than more conventional measures of aggregate total factor productivity (tfp). To see this, consider equation (12): our measure of "overall competitiveness" is a composition of "inverse tfp" (c) and input costs ($w_{x,s}^l$), as well as input shares ($\beta_{x,s}^l$). Although a country could have high tfp (i.e. low c) in sector s, that may not be sufficient to be competitive in international markets. It could be that international differences in input costs (such as capital, labour and intermediates) are a disadvantage to that country.

Moreover, a country's domestic value added (DVA) content of exports might be low, which would dampen the link between a country's tfp and its export performance. The importance of tfp in determining the international competitiveness of a country decreases with the degree of international fragmentation of the production process in the country. By definition, tfp is meant to measure the output differences which are not explained by different input choices and occurs, instead, through marginal product increases. Due to this *physical* nature, firms' tfp (and thus a country's tfp) is invariant to different choices concerning whether to outsource phases of the

[14] Since the exponent $\frac{1}{\gamma_s+2}$ plays no role in determining the country rankings, as it only entails a re-scaling by sector, it will be omitted hereinafter.

[15] Equation (6) could be interpreted as a gravity equation and estimated as

$$ln\left(\frac{\tilde{T}_s^{lh}}{\tilde{D}^h}\right) = imp_s\ - \beta_s ln\tilde{X}_s^{lh} \tag{10}$$

where vector $\tilde{X}_s^{lh}$ includes bilateral distances, as well as a number of dummies controlling for the presence of border effects (contiguity, language indicators, etc.), and imp_s is a (destination) country-sector dummy capturing the ROC. Estimation of (10) provides us with information on trade costs, through $\hat{\beta}s$, and, at the same time, with information on ROC. More precisely, the fixed effects in (10) can be estimated (see Fadinger and Fleiss, 2008) as

$$\tilde{\bar{m}}_s^{hh} = exp\left[ln\left(\frac{\tilde{T}_s^{lh}}{\tilde{D}^h}\right) - \hat{\beta}_s ln\bar{\tilde{X}}_s^{lh}\right] \tag{11}$$

where the bar refers to the mean across exporting countries.

production process and whether to buy intermediates domestically or abroad. Whilst tfp is not affected by these choices, marginal costs are. For given quantities of intermediate inputs used in production, the possibility to import them from abroad offers a chance to reduce marginal costs (see equation (12)). In the aggregate, this results in an improved capacity to target the international consumers of the final good s at relatively low prices. Since it is expressed in units of marginal costs, ROC is a measure of competitiveness which is "naturally" linked to the concept of DVA.

Moreover, since the international structure of ROC (vector M_s) results from a combination of forces (such as trade costs and market size) affecting the degree of international competition for final goods, ROC is informative of a given country's ability to sell good s at low prices to the international market; in contrast, tfp is informative of that country's ability to sell good s at low prices domestically.

4.1 Structural revealed competitiveness: data & specification

As equation (9) derives country h's ROC from its bilateral trade flows with a given country l, for each country h (and industry s) we compute $\tilde{\tilde{m}}_s^{hh}$ as many times as the number of its commercial partners. In other words, our reported ROCs are obtained considering, for each country, all the country pairs for which bilateral trade flows are available. A single value for $\tilde{\tilde{m}}_s^{hh}$ is then obtained as a weighted average in which each country is assigned its share on country h's total imports as weight.[16]

As in section 3, we focus on two periods (1980-1991 and 1992-2004). Data on bilateral flows are obtained from the CEPII *TradeProd* database. The choice is driven by the fact that, in contrast to the bilateral trade data used above, *TradeProd* reports reliable internal trade flows. Trade flows are provided in nominal dollars at the 3-digit level of the ISIC Rev.2 classification. Again, we truncate the data at \$10,000 per annual bilateral flow; this has no remarkable effects on the results. As above, data on country GDP from the Penn World Tables are converted into international dollars at PPP exchange rates. We use United Kingdom as our reference country since it has the highest number of observations as importer or exporter. Consistent with the reducted form exercise, results are presented for the G20 country group with the exception of Saudi Arabia, for which information on internal trade flows is unavailable.

4.2 Structural revealed competitiveness: results

In this section we focus on average percentage changes in ROC from the early to the late period. Our main results are synthesized in Figure 9, though readers are directed to Appendix B for additional detail on countries and industries.

Figure 9 reports the average ROC percentage change for those G20 countries for which ROC is available for at least 23 out of our 28 sectors. For each country, the sectors are weighted using the product's average share in the country's export bundle during the late period. Standardization is by sector and with respect to the whole G20. A slight decline (-5.58%) characterizes the evolution of the average ROC variation in the U.S. Overall, Figure 9 confirms the exceptional competitiveness growth of certain emerging market competitors such as China and Mexico but also that of other, more traditional, competitors such as Canada and Australia. Among EU countries, only UK, Spain and Austria show a positive variation in ROC. In particular, Italy is the worst performing G20 country, followed by Portugal and traditional U.S. competitors like France and Germany.

Throughout the paper we have interpreted the gravity residual and structural cost estimates as largely reflecting latent exporter productivity. However, other factors likely contribute to export performance in excess of what might be predicted by these frameworks. As mentioned in

[16] With this specification, zeros-missings in bilateral trade do not translate one-to-one into zeros in $\tilde{\tilde{m}}_s^{hh}$. The latter can instead be due to missing information on GDP and/or internal trade in country h.

the model description, the structure of production within certain regions of the global economy could be playing an important role. For example, regions that are relatively intensive in cross-border production sharing would record higher exports for a given unit of output independent of exporter productivity. Indeed, this may be behind some of the high measures of performance that we estimate for China and Mexico over the sample period. In principle, though, the dynamic trade cost measure in the structural analysis (which compares international to intranational trade flows) captures some of the increasing incidence of production sharing. The fact that East Asian countries, excluding China, had competitiveness losses in the reduced form estimates and competitiveness gains in the structural estimates is consistent with the reality of large flows of goods passing through China for final assembly.

5 Conclusion

The U.S. share of global exports has fallen by roughly 20 percent over the last decade. This paper aims to deconstruct the drivers of the decline in share. First, we document that the distribution of the decline is quite uneven, with a minority of categories contributing disproportionately. Second, when controlling for the relative decline in the U.S. share of global output, driven by a large extent by rapid growth in emerging market economies, the fall in share is far less pronounced. We formalize this notion within a gravity framework and assess changes in competitiveness through the evolution of the estimation residuals in an array of empirical specifications. We find that, accounting for income share and other controls, the decline in U.S. export share is largely explained by model factors.

We then take a more structural approach to examining the evolution of U.S. competitiveness, deriving an expression for U.S. export share from a heterogeneous firms model in the style of Melitz-Ottaviano (2005). This approach confirms the outcome of our gravity model exercise, that the U.S. has generally maintained its level of competitiveness within detailed product categories, despite the fall in the overall share. All together this analysis points to the inadequacy of the aggregate export share as an indicator of country export competitiveness.

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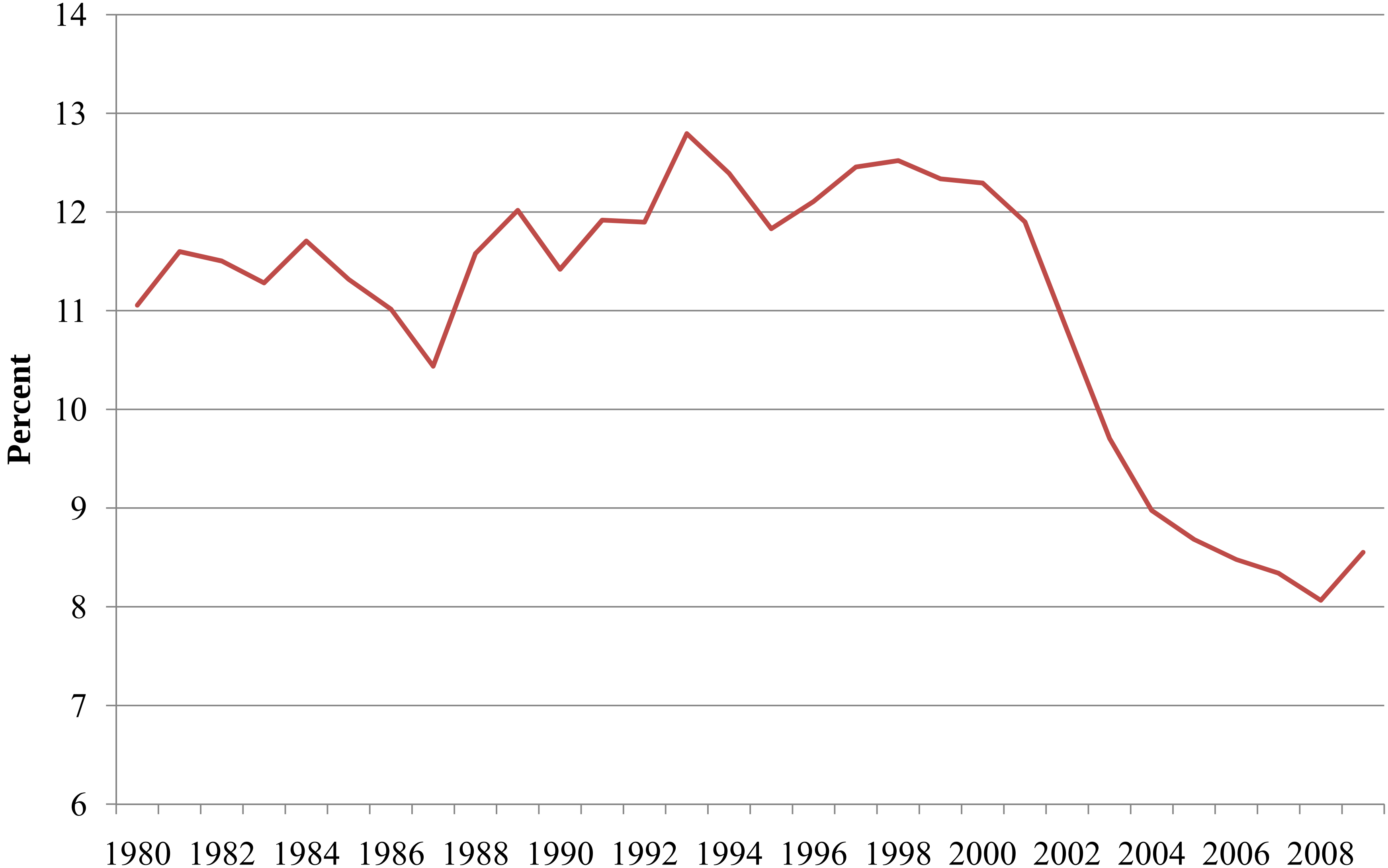


Figure 1: U.S. share of world merchandise exports

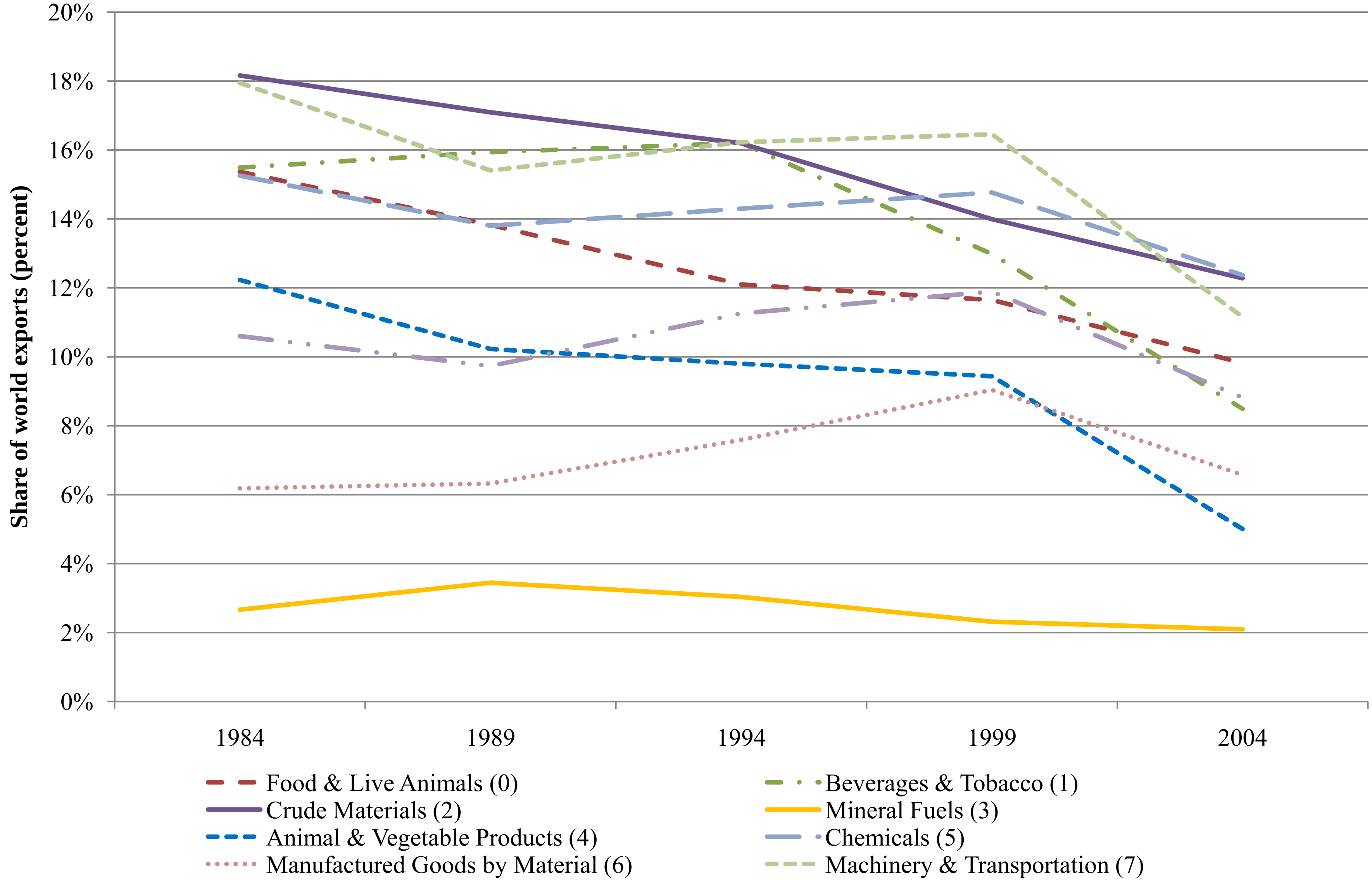


Figure 2: U.S. share of world merchandise exports, by SITC 1-digit sector

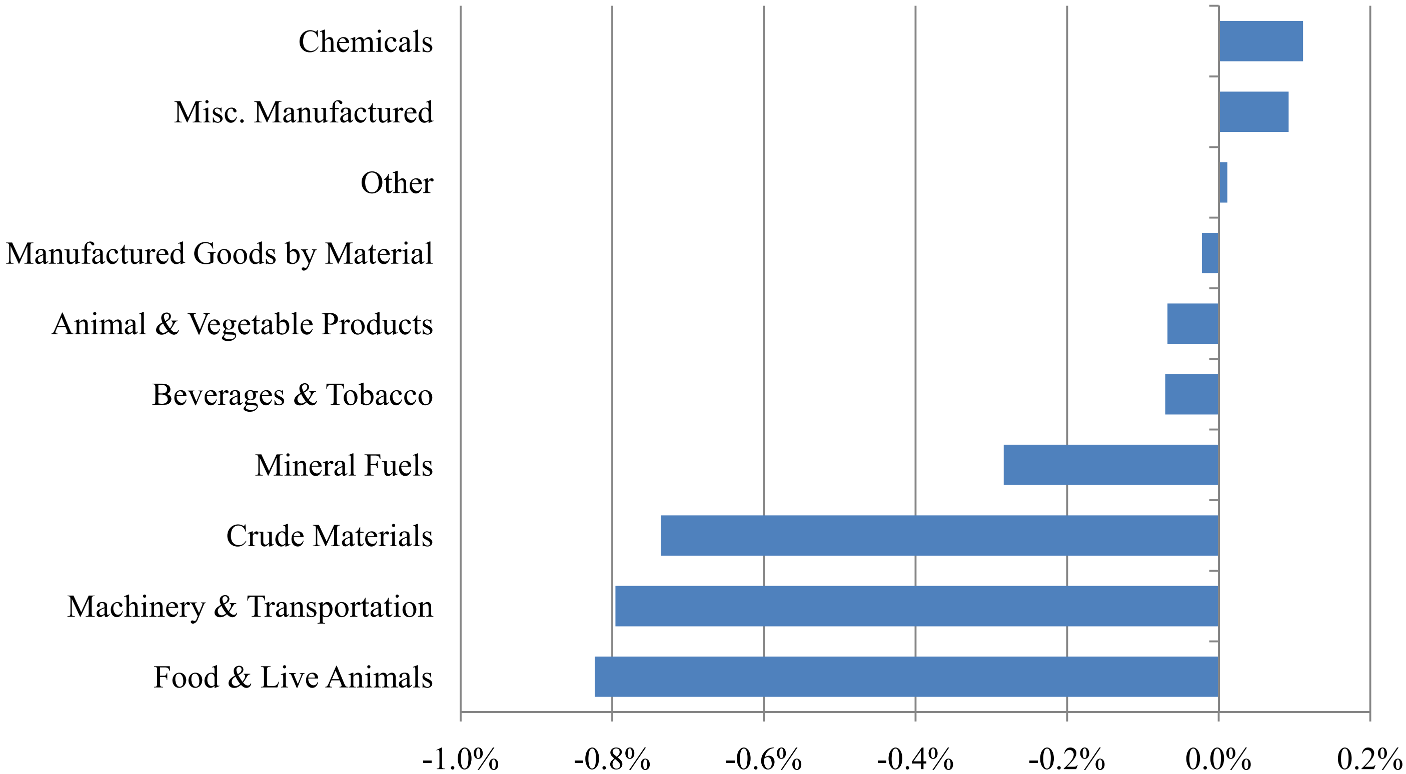


Figure 3: SITC 1-digit contributions to the aggregate share decline (percentage points)

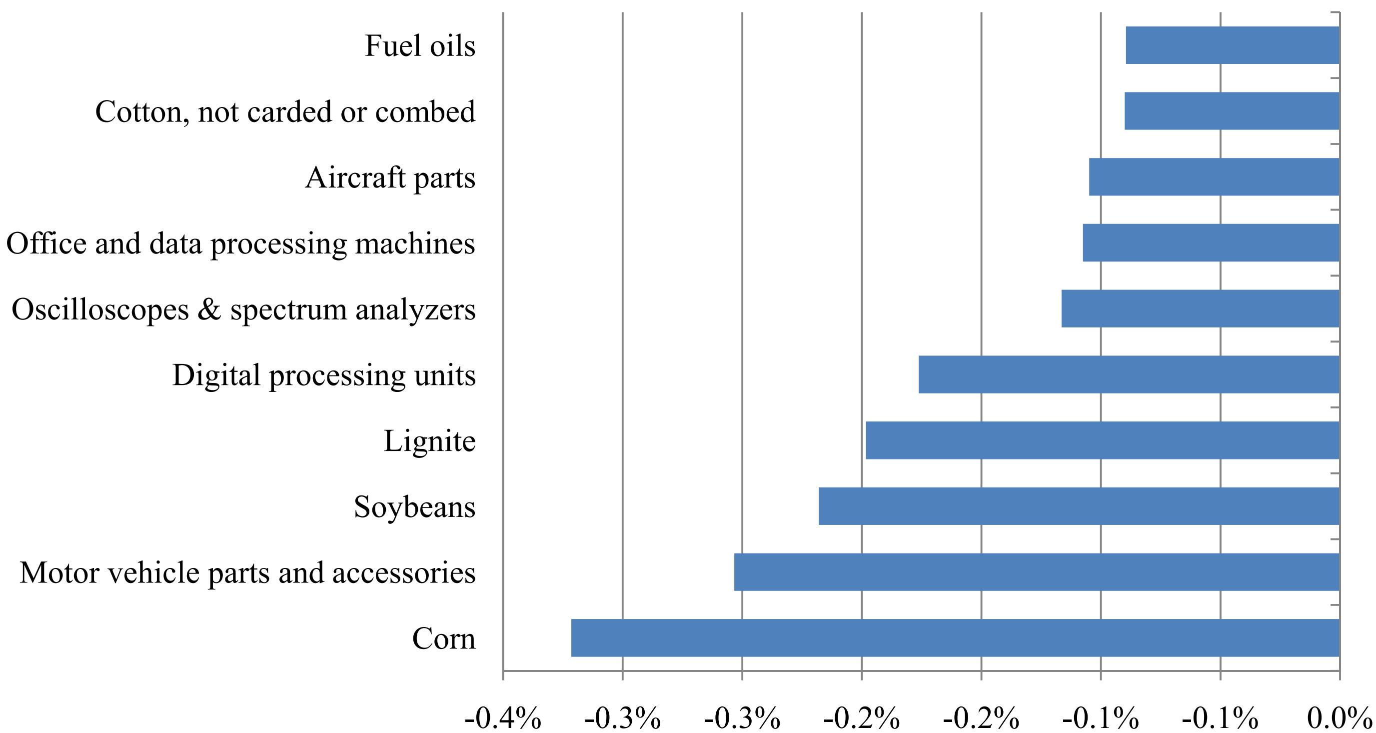


Figure 4: Top 10 4-digit contributions to the aggregate share decline (percentage points)

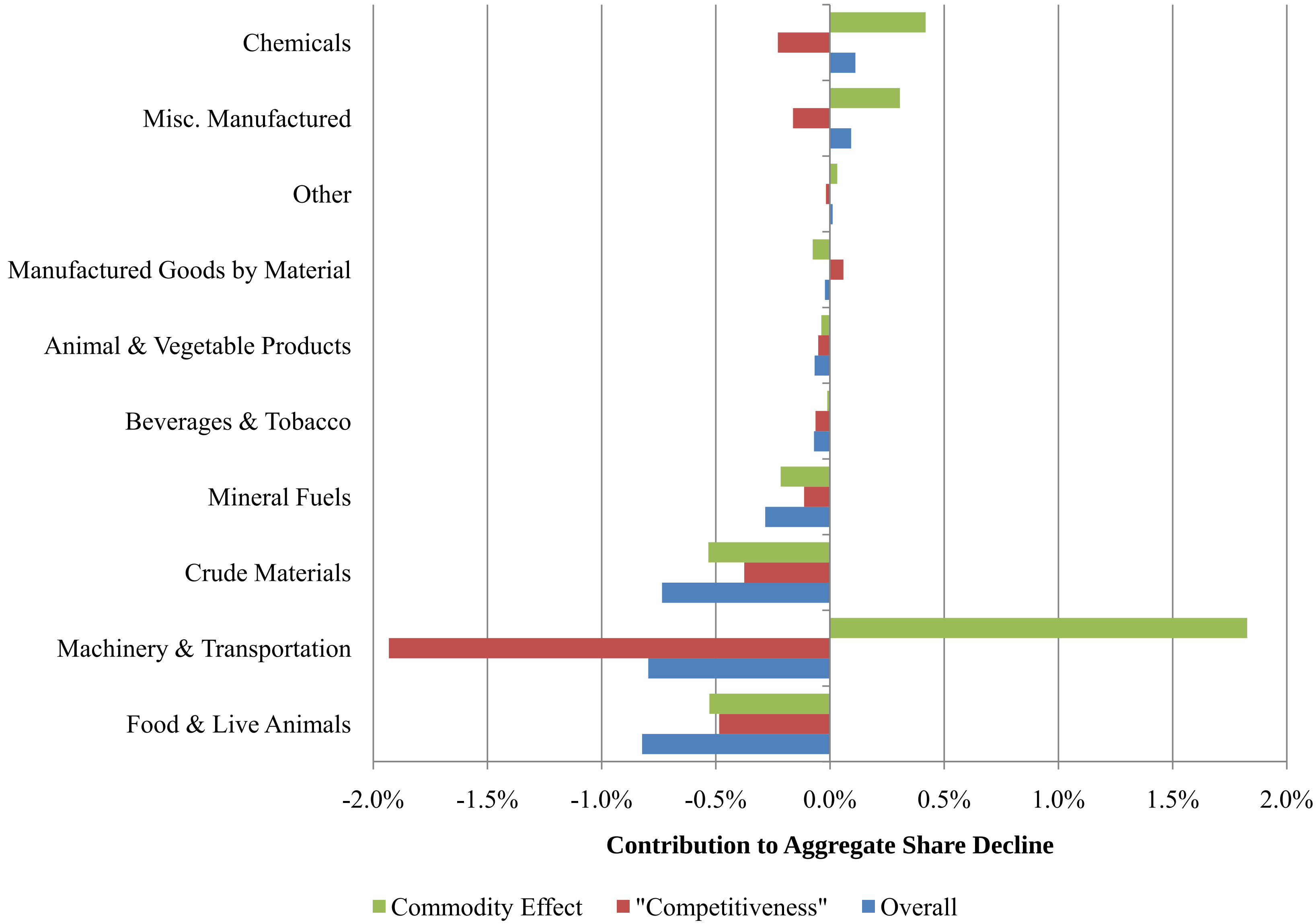


Figure 5: Commodity and competitiveness contributions to the aggregate share decline (percentage points)

Figure 6: Export and GDP Shares

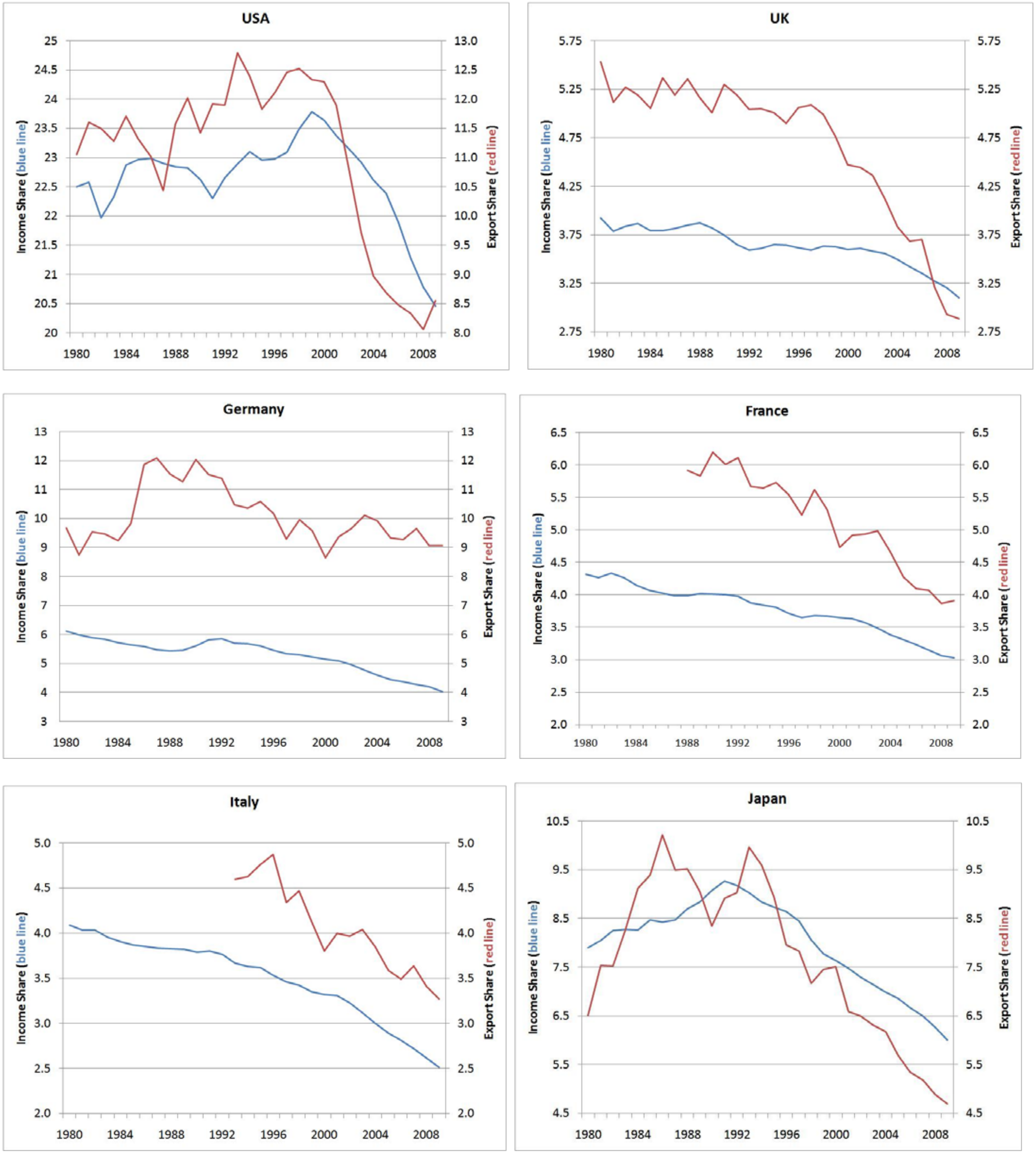


Figure 6: Export and GDP Shares

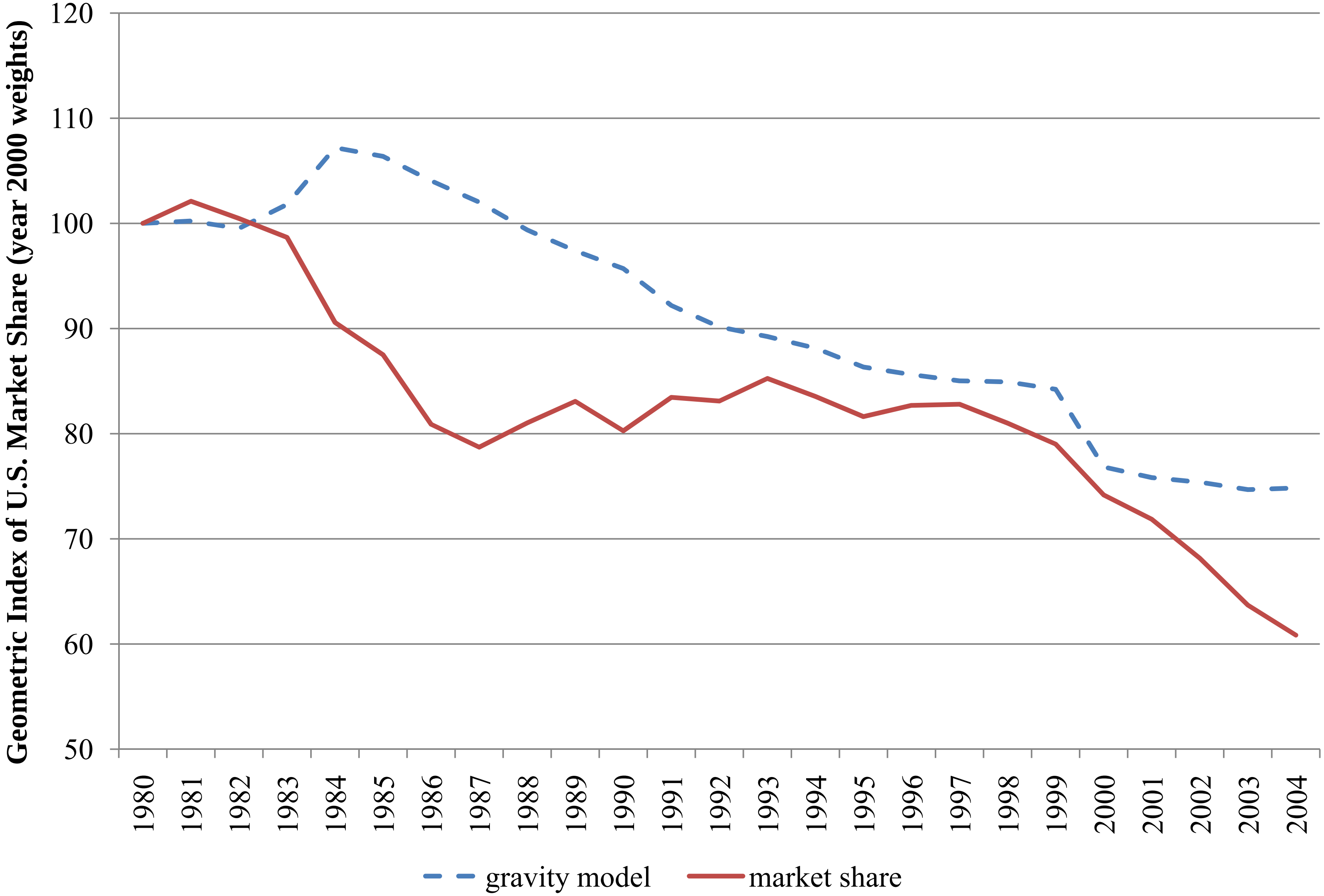
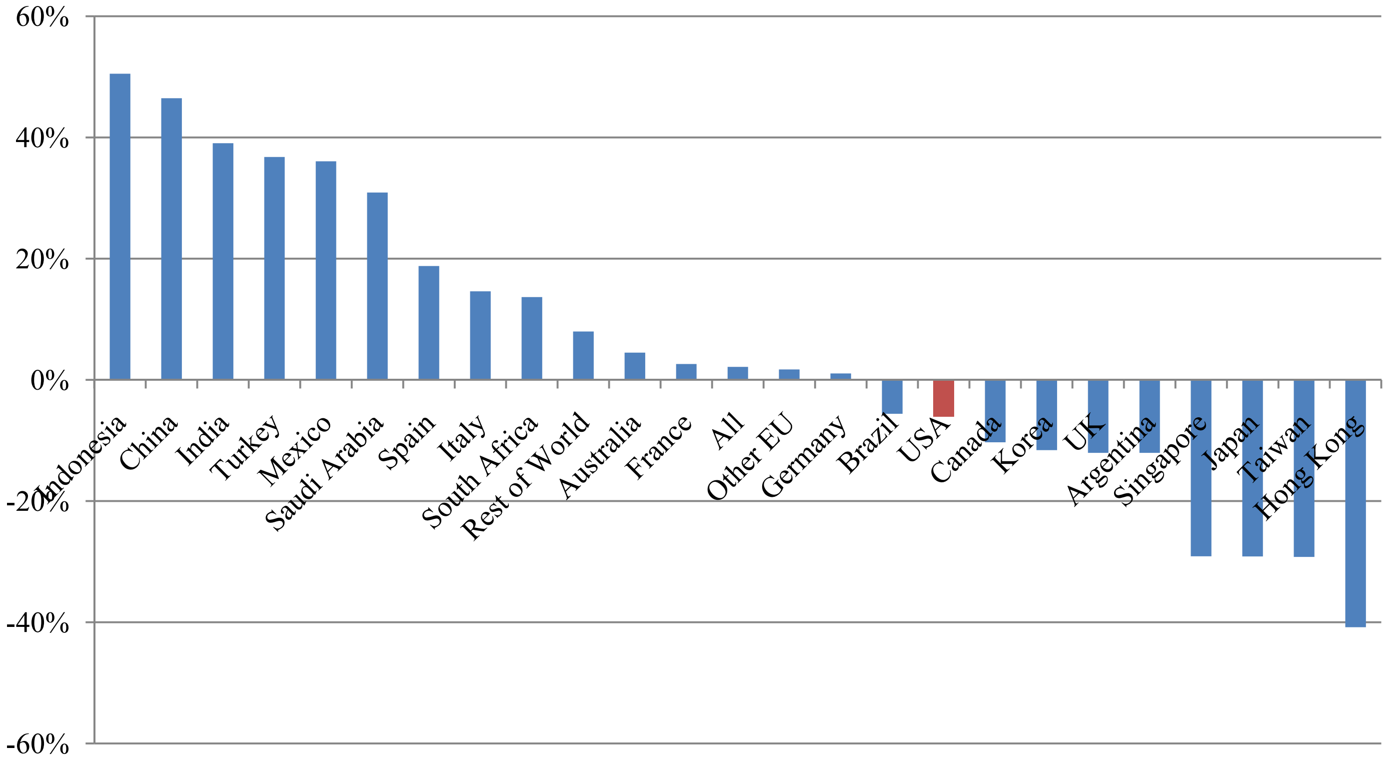
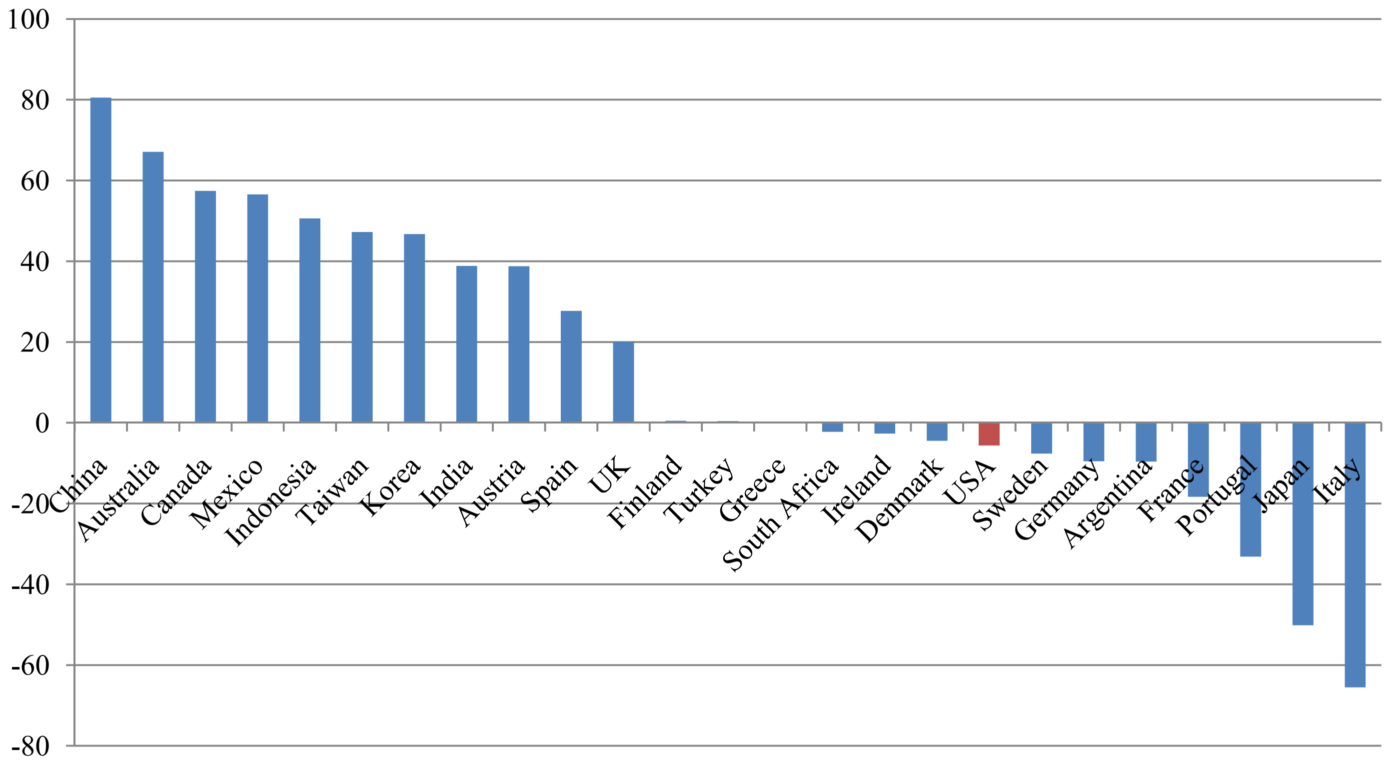


Figure 7: Predicted and actual market share indices



<u>Figure 8</u>: Reduced form measure of competitiveness, change between early and late sample (percentage points)



<u>Figure 9</u>: Structural measure of competitiveness, change between early and late sample (index)

SITC	Description	U.S. Export Share				
		1984	1989	1994	1999	2004
71	POWER GENERATING MACHINERY AND EQUIPMENT	0.25	0.23	0.23	0.26	0.20
72	MACHINERY SPECIALIZED FOR PARTICULAR INDUSTRIES	0.16	0.12	0.14	0.16	0.13
73	METALWORKING MACHINERY	0.10	0.10	0.13	0.14	0.12
74	GENERAL INDUSTRIAL MACHINERY AND MACHINE PARTS	0.17	0.15	0.17	0.18	0.12
75	MACHINES	0.33	0.24	0.20	0.14	0.09
76	TELECOMMUNICATIONS AND SOUND EQUIPMENT	0.08	0.08	0.11	0.13	0.06
77	ELECTRICAL MACHINERY AND ELECTRICAL PARTS THEREOF	0.20	0.16	0.17	0.18	0.12
78	ROAD VEHICLES	0.14	0.10	0.11	0.10	0.08
79	TRANSPORT EQUIPMENT	0.21	0.30	0.29	0.32	0.24

Table 1: U.S. export share in machinery and equipment categories

	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Dependent	Export share	Export share	Export share	Export sales	Export sales	Export share
D	Exporter GDP share	Exporter GDP share	Exporter-year FE	Exporter GDP, Importer GDP	Exporter GDP, Importer GDP	Exporter GDP share
ρ	Country-pair FE, NAFTA, EMU	Country-pair FE, NAFTA, EMU	Country-pair FE, NAFTA, EMU	Country-pair FE, NAFTA, EMU	Distance, language, border, NAFTA, EMU	Country-pair FE, NAFTA, EMU
n	Year FE	Year FE	Year FE	Year FE	Year FE	Year FE
Sample	Full	Balanced	Full	Full	Full	Full
Data	SITC-4	SITC-4	SITC-4	SITC-4	SITC-4	ISIC-2

Table 2: Gravity regression specifications.

Dependent var. →	Export Share						Export Volume				Memo:	
	(i)		(ii)		(iii)		(iv)		(v)		ISIC industries	
Exporter GDP share	0.430	**	0.644	**							0.890	**
	(0.001)		(0.005)								0.008	
Exporter GDP							0.682	**	0.345	**		
							(0.005)		(0.001)			
Importer GDP							0.522	**	0.478	**		
							(0.004)		(0.001)			
NAFTA	0.484	**	0.424	**	1.486	**	0.922	**	1.281	**	1.192	**
	(0.011)		(0.011)		(0.010)		(0.012)		(0.009)		0.055	
EMU	0.417	**	0.305	**	0.074	**	0.332	**	0.461	**	0.191	**
	(0.004)		(0.005)		(0.005)		(0.005)		(0.004)		0.011	
Distance									-0.263	**		
									(0.001)			
Common Language									0.142	**		
									(0.002)			
Common Border									0.409	**		
									(0.002)			
Exporter-Importer FE	Yes		Yes		No		Yes		No		Yes	
Exporter-Year FE	No		No		Yes		No		No		No	
Year-FE	Yes		Yes		Yes		Yes		Yes		Yes	
Balanced panel	No		Yes		No		No		No		No	
N	11,638,401		4,526,163		12,672,551		11,253,727		10,101,064		2,998,339	
R-squared	0.40		0.44		0.20		0.25		0.20		0.60	
RMSE	1.65		1.37		1.89		1.67		1.74		1.69	

Table 3: Estimates of control variables in the gravity regression

	All SITC	0	1	2	3	4	5	6	7	8
Indonesia	50%	29%	9%	17%	36%	71%	36%	57%	91%	48%
China	46%	26%	5%	27%	7%	9%	21%	45%	65%	64%
India	39%	33%	18%	16%	41%	49%	66%	49%	9%	44%
Turkey	37%	7%	10%	7%	-19%	5%	-4%	57%	48%	56%
Mexico	36%	22%	62%	6%	-17%	0%	24%	37%	53%	47%
Saudi Arabia	31%	54%	29%	5%	5%	30%	46%	66%	-16%	13%
Spain	19%	13%	6%	22%	17%	31%	20%	15%	21%	24%
Italy	15%	5%	10%	13%	-21%	19%	10%	22%	12%	17%
South Africa	14%	3%	40%	8%	50%	4%	11%	8%	31%	11%
Rest of World	8%	-2%	6%	4%	22%	2%	4%	11%	11%	11%
Australia	5%	5%	27%	3%	2%	-7%	3%	2%	4%	10%
France	3%	2%	-10%	2%	15%	3%	2%	-2%	7%	2%
Other EU	2%	0%	3%	5%	1%	7%	4%	-4%	5%	2%
Germany	1%	6%	6%	17%	-1%	-1%	-8%	-2%	7%	-4%
Brazil	-6%	-7%	-6%	18%	-40%	-20%	-5%	-3%	-9%	-13%
USA	-6%	-9%	-6%	-4%	-16%	2%	-2%	-9%	-6%	-4%
Canada	-10%	-12%	2%	-4%	-4%	7%	-23%	-19%	-9%	5%
Korea	-12%	-27%	-23%	-2%	50%	-35%	17%	-18%	13%	-58%
UK	-12%	-8%	-1%	-1%	-19%	17%	-21%	-13%	-11%	-11%
Argentina	-12%	1%	27%	-7%	16%	11%	8%	-17%	-48%	-20%
Singapore	-29%	-37%	-3%	-42%	-33%	-47%	-6%	-42%	-22%	-34%
Japan	-29%	-49%	-23%	-31%	-10%	-53%	-9%	-44%	-20%	-42%
Taiwan	-29%	-100%	-15%	-25%	-32%	-29%	-10%	-23%	-14%	-57%
Hong Kong	-41%	-52%	-26%	-63%	-19%	-61%	-46%	-42%	-28%	-46%

Table 4: Evolution of the gravity residual (early sample to late sample)

A Appendix A: Short description of the reference model

The theoretical background is the framework developed by Del Gatto et al. (2006), also used in Ottaviano et al. (2009). While the reader is redirected to those papers, and in particular to Corcos-DelGatto-Mion-Ottaviano (FEEM, 2010)[17] for an extensive exposition, here we report a short description of the logic behind the model and the key equations for the application.

The model is a multi-country multi-sector version of Melitz and Ottaviano (2008) encompassing S industries (with no inter-industry linkages)[18] active in N countries, indexed $l = 1, ...h.., N$. Each country-industry is endowed with given amounts of labor L^l and capital K^l (factors are geographically immobile) and the output of each industry is horizontally differentiated in a large set of varieties.

Consumers maximize a quasi-linear utility function with quadratic sub-utility, as in Ottaviano et al. (2002). Under this hypothesis, the demand of a generic variety in a given country is positive only provided that its selling price is lower than a certain (cutoff) level $max(p)^l_s$. This level is higher when: consumers like the differentiated good a lot, varieties are very differentiated, the average price is high, the number of competing varieties is small.

Firms compete in a monopolistic market and each variety is supplied by one and only one firm. Each firm is negligible to the market and does not compete directly with the other firms. However, given the demand structure, firms interact indirectly through an aggregate demand effect, as the total output of the industry has an influence on firms' profit.

Firms in a given sector share the same (Cobb-Douglas) technology but are heterogeneous in terms of Unit Input Requirement (UIR) c, defined as inverse 'total factor productivity' (tfp) (i.e. $c = \frac{1}{tfp}$). c is used to identify the firm. Accordingly, the marginal cost faced by a generic firm c active in country l and sector s is:

$$m^l_s \equiv m(c)^l_s = c\ \omega^l_s \tag{12}$$

where $\omega^l_s = B \prod_{x \in X} \left(w^l_{x,s}/\beta_{x,s}\right)^{\beta_{x,s}}$, with $w^l_{x,s}$ and $\beta_{x,s}$ denoting input x's cost and share (in country l - sector s) respectively, and $X = \{k, l, m\}$ (i.e. capital, labour, and intermediates) and $\sum_{x \in X} \beta_{x,s} = 1$. B is the bundle of parameters associated with the Cobb-Douglas.[19]

National markets are segmented but firms can export and, as production faces constant returns to scale, they independently maximize the profits earned in different destination countries. Exporting firms incur a per-unit trade cost, encompassing not only carriage in a strict sense, but all those "impediments to trade" whose amount is related to the quantity exported. For each delivered unit from country l to country h, $\tau^{lh}_s > 1$ units have to be shipped. Moreover, we also allow for costly trade within a country with $\tau^{lh}_s > \tau^{ll}_s \geq 1$.

Firm heterogeneity is modeled as follows. In order to enter the market, each firm has to make an irreversible investment in terms of labor and capital. This "sunk cost of entry" amounts to $\omega^l_s f^l_s$. Only once this cost has been payed, and production started, a firm is allowed to observe its own marginal cost m^l_s. This is modeled as the outcome of a draw from a common and known Pareto distribution $\left[\frac{m^l_s}{max(m)^l_s}\right]^{\gamma_s}$, with support $[0, max(m)^l_s]$ varying across countries.[20]

[17]The paper is downloadable at http://www.feem.it/userfiles/attach/2009121116814115-09.pdf.

[18]As inter-industry linkages are ruled out, the s index could be omitted and the model presented as an "industry-model", with all the equations referring to a generic industry. However, the s index will reveal useful in subsequent analysis, as country, industry, and country-industry specific variables (parameters) coexist in the model.

[19]Equation (12) expresses the marginal cost associated with a standard Cobb-Douglas production function

$$Q(c)^l_s = c^{-1} \prod_{x \in X} (M_x)^{\beta_{x,s}}$$

where M_x denotes the amount of input x utilized.

[20]In a strict sense, the Pareto assumption refers to c (i.e. the UIR). However, as evident from (12), $\left[\frac{m^l_s}{max(m)^l_s}\right]^{\gamma_s} \equiv$

Only those firms whose cost draw is good enough to enable them to sell to market h at a price below the price cutoff $max(p)_s^h$ earn non-negative profits and can afford to serve that market. Let m_s^{hh} denote the marginal cost inclusive of trade frictions faced by a producer in country h-industry s that is just indifferent between serving its local market or not. Then, by definition $m_s^{hh} = max(p)_s^{hh}$. A firm, wherever located, can serve market h only provided that its delivered cost does not exceed m_s^{hh}. In other words: firm c producing in country l is able to target market h when $\tau_s^{lh} m_s^l < m_s^{hh}$, it is not able to target market h when $\tau_s^{lh} m_s^l > m_s^{hh}$, it is indifferent between serving or not market h when $\tau_s^{lh} m_s^l = m_s^{hh}$. Thus, m_s^{hh} measures the 'cutoff cost' in country h-industry s.

The analytical solution in terms of the $N \times S$ equilibrium cost cutoffs is:

$$\begin{array}{ccccccc} {M_1}^{\gamma_1+2} & = & \Phi_1 & {P_1}^{-1} & D^{-1} & \Psi_1 \\ \vdots & & \vdots & \vdots & \vdots & \vdots \\ {M_s}^{\gamma_s+2} & = & \Phi_s & {P_s}^{-1} & D^{-1} & \Psi_s \\ \vdots & & \vdots & \vdots & \vdots & \vdots \\ {M_S}^{\gamma_S+2} & = & \Phi_S & {P_S}^{-1} & D^{-1} & \Psi_S \end{array} \tag{13}$$

where:

- M_s is the $N \times 1$ vector of the equilibrium cost cutoffs in industry s, whose h-th element $m_s^{hh} = \omega_s^h \ max(c)_s^h$ denotes the maximum possible marginal cost for a generic (domestic) firm active in industry s, producing and selling in country h;
- $\Phi_s \equiv 2\upsilon_s(\gamma_s + 1)(\gamma_s + 2) \equiv \frac{\gamma_s+1}{\Upsilon_s}$ is a (scalar) positive bundling parameter[21];
- P_s is a $N \times N$ 'trade freeness matrix' whose element in row l and column h is $\rho_s^{lh} \equiv \left(\tau_s^{lh}\right)^{-\gamma_s} \in (0, 1]$. ρ_s^{lh} denotes the degree of trade freeness between country l and country h, ;
- D is a $N \times N$ diagonal matrix with population along its diagonal and zero elsewhere. In a wide sense, population can be thought of as a measure for the size of the domestic market;
- Ψ_s is a $N \times 1$ vector with h-th generic element $\psi_s^h \equiv \omega_s^h f_s^h \left(max(m)_s^h\right)^{\gamma_s}$, where f_s^h and $max(m)_s^h$ denote respectively the fixed cost of entry and the upper bound of the (exogenous) marginal cost distribution in country h-industry s (exogenous cost cutoff). As presently discussed, ψ_s^h is an inverse measure for the 'exogenous competitiveness' of country h in a given industry s;
- γ_s is the shape parameter of the marginal cost distribution in sector s, with higher values denoting a distribution which is more skewed towards high cost (less productive) firms.

Each row of (13) states, for each country in a given sector, the marginal cost above which a firm is not productive enough to serve the domestic market from therein and, since $max(m)_s^{lh} = m_s^{hh}/\tau_s^{lh}$, from anywhere.[22]

$\left[\frac{c}{max(c)_s^l}\right]^{\gamma_s}$ for $[0, max\,(c)_s^l]$. Thus, there is no loss of generality in thinking (and solving) the model in terms of marginal costs.

[21]Parameter υ_s comes from the utility function and measures the degree of product differentiation between different varieties of good s. When $\upsilon_s = 0$, consumers only care about their total consumption level over the varieties of good s.

[22]Since there are no inter-industry linkages, rows in (13) are independent one another.

Overall ($1/m_s^{hh}$) and producer ($1/\psi_s^h$) competitiveness. By Cramer's rule, the h-th generic element (i.e. the cutoff level in country h-industry s) of M_s can be expressed as

$$m_s^{hh} = \left[\frac{\Phi_s}{D^h} \frac{\sum_{l=1}^{M} \left| R_s^{lh} \right| \psi_s^l}{|P_s|} \right]^{\frac{1}{\gamma_s+2}} \tag{14}$$

where $|P_s|$ is the determinant of the trade freeness matrix in sector s and $\left| R_s^{lh} \right|$ is the corresponding cofactor.

Equation (14) entails a relationship between m_s^{hh} and ψ_s^l, basically two measures for the "competitiveness" of a country. In this relationship:

- m_s^{hh} is *endogenously* determined by a selection process in which the degree of 'remoteness', through the term $\frac{\sum_{l=1}^{M} \left| R_s^{lh} \right| \psi_s^l}{|P_s|}$, and the size of the domestic market, through D^h, play a key role.
- ψ_s^h captures the *exogenous* ability of country h to generate low cost firms in industry s, abstracting from its market size and the degree of remoteness in that sector: low entry costs (low f_s^h), low factor prices [low $\left(w_{x,s}^h\right)^{\beta_{x,s}}$], and low probability of inefficient draws by entrants [i.e. low $max(m)_s^h$] foster the creation of low cost firms.

From a practical point of view, (14) can be used to see how much of the actual competitiveness of a country, measured in terms of marginal costs (i.e. $1/m_s^{hh}$), can be traced back to its exogenous competitiveness, expressed in terms of a mixture of "traditional" competitive advantages (i.e. factor prices and technology) and entry costs. To highlight this relationship, we refer, for each sector s, to $1/m_s^{hh}$ and $1/\psi_s^h$ as respectively "*overall*" and "*producer*" competitiveness of country h (OC and PC respectively), with ${M_s}^{-1}$ and ${\Psi_s}^{-1}$ denoting (once ordered) the corresponding country-rankings.

	All SITC	0	1	2	3	4	5	6	7	8
China	45%	24%	6%	19%	-30%	-5%	10%	41%	68%	83%
	4,803	*502*	*43*	*294*	*44*	*18*	*752*	*1,457*	*529*	*1,160*
India	39%	31%	35%	11%	3%	76%	48%	42%	12%	61%
	2,335	321	17	194	2	7	219	754	293	523
Turkey	38%	12%	37%	-13%	-10%	-7%	17%	51%	68%	78%
	1,228	337	25	121	2	8	68	330	70	265
Indonesia	38%	11%	16%	9%	-7%	69%	23%	51%	29%	77%
	1,010	227	23	141	18	34	76	246	21	221
Mexico	32%	12%	63%	6%	-45%	-30%	21%	31%	66%	34%
	1,227	144	32	106	15	6	232	252	265	173
Spain	27%	20%	2%	26%	5%	11%	34%	30%	27%	24%
	7,007	596	104	317	62	57	1,073	2,186	1,597	1,006
Italy	17%	4%	19%	6%	-15%	32%	14%	25%	16%	16%
	15,316	798	125	472	107	57	2,073	4,520	4,602	2,546
Australia	6%	3%	25%	10%	2%	-7%	-1%	1%	12%	12%
	3,180	656	55	336	49	32	331	692	623	393
South Africa	4%	-7%	91%	-4%	47%	-52%	-20%	-11%	57%	43%
	1,166	204	15	231	25	3	108	358	123	98
Other EU	4%	0%	-2%	2%	-3%	5%	8%	0%	6%	8%
	45,610	3,920	557	2,156	457	330	6,939	12,450	12,059	6,677
Saudi Arabia	4%	53%	92%	-16%	-23%	.	27%	74%	-27%	8%
	179	7	2	23	41	0	47	12	31	15
Rest of World	3%	-6%	0%	-2%	11%	1%	-3%	8%	8%	9%
	29,912	5,154	417	2,612	371	211	3,512	6,783	5,018	5,730
France	3%	7%	-16%	-3%	20%	1%	4%	0%	6%	3%
	17,937	1,476	303	709	152	101	2,878	4,755	4,762	2,791
Canada	2%	-2%	-5%	3%	34%	11%	-10%	-9%	5%	27%
	3,773	448	37	420	34	18	433	840	1,044	480
Brazil	1%	-8%	-17%	23%	-30%	-7%	2%	2%	4%	-11%
	3,467	415	58	241	17	45	459	1,138	767	320
Argentina	-5%	-1%	46%	-13%	48%	6%	11%	-13%	-34%	-23%
	1,155	320	27	107	17	37	198	236	128	82
USA	-6%	-4%	3%	-8%	-5%	-5%	-3%	-7%	-11%	0%
	20,678	1,709	238	1,192	256	166	3,212	4,663	6,239	2,906
Germany	-7%	0%	0%	8%	-5%	-10%	-16%	-7%	-4%	-8%
	21,815	1,277	175	947	232	187	4,004	5,808	6,169	3,000
UK	-9%	-5%	2%	3%	-25%	28%	-17%	-9%	-10%	-6%
	18,277	1,187	291	675	207	76	3,045	4,828	5,113	2,834
Japan	-25%	-37%	-5%	-28%	6%	-33%	3%	-38%	-20%	-36%
	13,711	306	55	358	79	36	1,849	3,601	5,205	2,192
Singapore	-27%	-28%	-18%	-42%	-2%	-54%	-12%	-42%	-19%	-31%
	3,950	330	42	204	56	69	466	807	1,232	720
Korea	-28%	-39%	30%	-17%	55%	-144%	18%	-25%	-4%	-75%
	4,047	121	10	91	10	1	415	1,460	947	988
Taiwan	-38%	-95%	-14%	-20%	-2%	-3%	-22%	-30%	-22%	-65%
	4,961	193	13	137	10	4	409	1,521	1,466	1,204
Hong Kong	-41%	-44%	-34%	-57%	15%	-105%	-47%	-46%	-22%	-47%
	3,595	160	14	67	7	8	165	881	825	1,460

Table B1: Percent change of the gravity regression residual from the early period (1980-1992) to the late period (1993-2004) - Specification (ii)

	All SITC	0	1	2	3	4	5	6	7	8
South Africa	14%	12%	14%	8%	18%	13%	18%	16%	15%	8%
	7,179	*903*	*130*	*768*	*117*	*38*	*981*	*2,193*	*1,262*	*737*
Indonesia	9%	3%	8%	8%	19%	5%	7%	12%	19%	4%
	6,688	717	72	535	90	155	683	2,116	768	1,499
Mexico	9%	3%	15%	5%	3%	12%	11%	8%	11%	7%
	6,748	492	109	461	93	29	1,367	1,618	1,597	948
Saudi Arabia	8%	-8%	-28%	12%	-1%	22%	17%	12%	1%	7%
	2,156	194	11	161	165	18	527	520	329	205
Turkey	6%	-3%	1%	10%	11%	-6%	11%	8%	15%	-2%
	7,665	1,113	103	547	55	62	729	2,531	1,277	1,211
Rest of World	6%	3%	9%	6%	7%	8%	7%	5%	10%	5%
	181,193	21,917	2,353	13,804	3,044	1,485	22,931	44,440	38,135	31,393
Hong Kong	6%	1%	19%	5%	16%	10%	11%	6%	8%	2%
	11,992	557	64	396	42	41	1,023	3,273	2,982	3,537
India	6%	3%	7%	5%	10%	4%	8%	5%	12%	-2%
	11,476	1,018	110	739	36	82	1,597	3,679	2,255	1,885
Singapore	5%	-4%	16%	8%	-6%	-1%	5%	3%	8%	6%
	14,478	1,156	135	659	244	350	1,691	3,096	4,598	2,424
Argentina	4%	1%	6%	7%	-22%	1%	4%	3%	6%	7%
	5,515	1,081	108	455	90	186	827	1,228	970	529
Korea	4%	3%	-15%	5%	-5%	31%	-2%	-1%	8%	8%
	15,442	506	72	420	113	22	1,739	5,110	4,579	2,841
Australia	3%	-1%	-6%	1%	1%	-4%	5%	3%	5%	3%
	11,242	1,764	147	1,024	199	100	1,213	2,510	2,729	1,441
All	2%	-1%	4%	3%	2%	4%	2%	1%	4%	0%
	690,889	63,144	8,143	40,081	8,996	6,156	93,134	180,759	177,818	107,995
Other EU	1%	-2%	1%	2%	2%	2%	1%	-1%	3%	-1%
	127,706	10,737	1,550	6,073	1,520	1,282	18,771	33,177	36,519	17,294
Brazil	0%	0%	3%	-2%	-3%	4%	0%	-1%	2%	3%
	13,557	1,312	206	833	109	204	1,865	4,160	3,361	1,442
Taiwan	0%	-6%	6%	2%	-8%	1%	1%	-1%	1%	1%
	14,543	590	35	554	87	48	1,598	4,347	4,253	2,983
All	0%	-2%	1%	0%	-1%	0%	0%	0%	0%	0%
	230,339	20,808	2,678	12,151	2,270	1,511	32,963	60,578	59,128	37,784
Japan	0%	-4%	-10%	1%	-8%	7%	-5%	-1%	2%	1%
	29,191	887	130	990	245	133	3,913	7,772	10,635	4,320
USA	-1%	-3%	3%	3%	1%	6%	-2%	-1%	0%	-4%
	45,837	4,353	646	3,059	678	586	6,281	10,739	13,016	6,173
UK	-1%	-6%	-3%	-1%	-4%	2%	0%	-2%	1%	-2%
	40,583	2,850	621	1,887	530	337	6,332	10,534	11,376	5,902
Canada	-1%	-5%	-2%	-4%	-11%	4%	1%	0%	0%	-7%
	15,341	1,624	127	1,158	146	104	1,764	3,564	4,673	2,026
France	-3%	-9%	0%	2%	-4%	1%	-1%	-4%	-1%	-3%
	41,510	3,709	605	1,890	464	360	6,027	10,585	11,538	6,137
China	-3%	3%	0%	3%	18%	9%	4%	-3%	-1%	-14%
	20,356	1,469	153	1,100	242	97	2,697	6,126	4,377	4,030
Italy	-4%	-6%	-3%	2%	-10%	-6%	-3%	-6%	-4%	-5%
	37,678	2,292	366	1,522	396	241	5,139	10,702	11,002	5,851
Spain	-4%	-10%	1%	-1%	5%	6%	-6%	-9%	1%	-1%
	22,813	1,903	290	1,046	291	196	3,439	6,739	5,587	3,187

Table B2: Percent change of the gravity regression residual from the early period (1980-1992) to the late period (1993-2004) - Specification (iii)

	All SITC	0	1	2	3	4	5	6	7	8
China	48%	31%	7%	17%	18%	1%	26%	49%	58%	69%
	16,841	1,228	127	925	187	92	2,107	5,204	3,531	3,384
Mexico	31%	26%	53%	7%	-24%	-21%	15%	30%	48%	43%
	6,872	500	106	463	91	27	1,363	1,694	1,609	984
Spain	18%	21%	16%	16%	1%	12%	18%	14%	18%	27%
	23,001	1,881	287	1,057	275	190	3,384	6,888	5,621	3,284
Italy	17%	10%	29%	12%	-17%	-9%	8%	27%	12%	25%
	36,339	2,214	344	1,553	380	257	4,893	10,444	10,443	5,643
Belgium	12%	9%	38%	16%	2%	7%	21%	2%	15%	21%
	25,062	1,949	243	1,229	377	265	4,331	7,180	6,337	2,950
France	3%	1%	-4%	0%	0%	-9%	2%	1%	7%	3%
	39,142	3,408	525	1,912	442	357	5,651	10,183	10,626	5,845
Rest of World	3%	-1%	-2%	5%	12%	11%	0%	6%	2%	2%
	214,349	27,861	2,895	16,466	3,047	2,071	23,715	56,116	43,358	36,870
USA	2%	-4%	-12%	-3%	-7%	4%	1%	-3%	9%	5%
	41,024	3,859	592	2,771	571	585	5,456	9,836	11,444	5,658
All	0%	-3%	0%	1%	1%	0%	-1%	-1%	2%	-2%
	622,628	56,551	7,112	36,199	7,559	5,704	80,308	166,556	158,213	100,215
Netherlands	-1%	2%	0%	7%	-28%	-5%	-10%	-7%	6%	6%
	29,022	3,179	466	1,559	482	597	4,976	6,914	7,260	3,438
Sweden	-3%	8%	5%	-11%	28%	28%	0%	-9%	-5%	4%
	17,535	732	101	793	154	116	1,931	4,938	6,293	2,374
Austria	-11%	-10%	15%	-11%	4%	23%	-21%	-15%	-1%	-18%
	15,782	739	128	617	89	32	1,823	4,822	4,860	2,589
Korea	-11%	-28%	-48%	3%	59%	-35%	16%	-15%	12%	-57%
	14,841	478	64	436	107	22	1,634	4,947	4,320	2,798
Switzerland	-11%	-26%	-11%	-14%	9%	-43%	-19%	-16%	-3%	-6%
	19,748	964	213	639	123	50	3,578	4,872	5,971	3,245
UK	-13%	-10%	-3%	-6%	-15%	5%	-21%	-14%	-11%	-12%
	39,904	2,817	564	2,006	530	391	6,107	10,533	10,857	5,871
Canada	-19%	-14%	-16%	-8%	-4%	-5%	-36%	-32%	-14%	-10%
	15,718	1,569	125	1,131	148	103	1,772	3,773	4,782	2,169
Japan	-20%	-40%	-17%	-11%	0%	-29%	4%	-32%	-16%	-34%
	27,744	884	117	1,013	233	145	3,663	7,494	9,772	4,274
Singapore	-26%	-29%	-11%	-21%	-39%	-45%	-3%	-40%	-16%	-36%
	12,794	1,059	120	620	196	314	1,336	2,826	3,980	2,240
Hong Kong	-35%	-48%	-27%	-55%	-8%	-26%	-52%	-34%	-24%	-35%
	12,270	605	61	419	42	39	1,011	3,458	2,993	3,565
Taiwan	-37%	-95%	-49%	-26%	-20%	-10%	-21%	-31%	-24%	-62%
	14,640	625	34	590	85	51	1,577	4,434	4,156	3,034

Table B3: Percent change of the gravity regression residual from the early period (1980-1992) to the late period (1993-2004) - Specification (iv)

	All SITC	0	1	2	3	4	5	6	7	8
China	61%	48%	17%	11%	12%	6%	26%	63%	74%	93%
	18,461	1,313	133	1,055	217	98	2,428	5,594	3,989	3,566
Mexico	21%	31%	72%	-20%	-47%	-40%	15%	19%	28%	36%
	6,751	504	107	459	88	25	1,324	1,644	1,592	972
Spain	6%	30%	43%	2%	-12%	57%	4%	5%	-5%	16%
	22,178	1,805	275	1,039	267	183	3,270	6,629	5,439	3,140
Rest of World	1%	12%	26%	-6%	4%	26%	4%	4%	-8%	-3%
	207,430	26,969	2,697	16,052	2,880	2,037	23,261	54,220	42,659	34,740
Italy	1%	23%	52%	-2%	-30%	22%	-4%	12%	-15%	8%
	34,256	2,042	330	1,470	343	226	4,631	9,830	9,947	5,277
Belgium	-2%	19%	58%	0%	-15%	7%	9%	-11%	-9%	4%
	24,799	1,909	243	1,226	385	264	4,286	7,123	6,279	2,889
All	-5%	11%	29%	-9%	-11%	15%	-4%	-5%	-13%	-7%
	613,553	55,439	6,848	36,080	7,449	5,659	79,968	164,164	156,967	96,809
USA	-6%	9%	14%	-13%	-28%	16%	-2%	-8%	-12%	-1%
	43,270	4,084	591	3,060	645	618	5,909	10,462	11,924	5,717
Korea	-6%	-10%	-21%	-6%	48%	-16%	16%	-8%	18%	-53%
	14,608	470	69	434	108	22	1,613	4,855	4,270	2,730
Sweden	-8%	36%	44%	-18%	25%	43%	1%	-11%	-19%	-2%
	17,348	731	103	799	154	116	1,941	4,860	6,235	2,306
France	-10%	13%	27%	-11%	-14%	1%	-7%	-13%	-17%	-13%
	38,088	3,307	507	1,894	438	355	5,498	9,950	10,316	5,633
Netherlands	-11%	12%	29%	-2%	-39%	3%	-19%	-17%	-15%	-8%
	28,499	3,105	453	1,533	480	595	4,867	6,802	7,168	3,349
Switzerland	-16%	8%	33%	-21%	12%	-28%	-18%	-19%	-20%	-14%
	19,667	954	209	643	122	51	3,649	4,865	5,904	3,170
Singapore	-19%	-10%	23%	-30%	-61%	-24%	8%	-29%	-12%	-34%
	12,981	1,052	111	632	193	304	1,448	2,872	4,054	2,218
UK	-20%	13%	32%	-10%	-28%	23%	-29%	-19%	-31%	-20%
	39,476	2,810	561	2,005	518	396	6,028	10,482	10,742	5,703
Austria	-24%	-2%	54%	-23%	-10%	10%	-26%	-26%	-24%	-34%
	15,024	678	121	589	81	26	1,719	4,616	4,651	2,459
Canada	-26%	-1%	19%	-24%	-28%	-14%	-29%	-33%	-33%	-17%
	15,643	1,550	123	1,130	153	103	1,771	3,767	4,780	2,125
Taiwan	-28%	-74%	-18%	-34%	-42%	-3%	-17%	-18%	-20%	-50%
	15,017	636	36	601	91	54	1,619	4,575	4,280	3,071
Japan	-32%	-20%	13%	-18%	-8%	-19%	-1%	-41%	-36%	-45%
	27,598	909	122	1,017	239	146	3,654	7,496	9,689	4,180
Hong Kong	-34%	-28%	6%	-68%	-34%	-41%	-48%	-30%	-31%	-35%
	12,459	611	57	442	47	40	1,052	3,522	3,049	3,564

Table B4: Percent change of the gravity regression residual from the early period (1980-1992) to the late period (1993-2004) - Specification (v)

COUNTRY	All Sectors	Food	Beverages	Tobacco	Textiles	Apparel	Leather	Footwear	Wood	Furniture	Paper	Printing	Industrial Chemicals	Other Chemicals	Petroleum
China	80.6	95.6	23.4	77.1	45.0	84.3	40.6	-	147.0	185.8	106.8	152.6	70.1	128.5	123.6
Australia	67.1	21.4	50.2	6.0	34.8	0.4	46.5	-9.7	-73.5	-56.8	-23.9	11.1	189.6	63.5	15.3
Canada	57.4	27.0	37.8	-3.9	17.5	19.7	-70.3	-6.9	114.6	-32.6	66.5	34.6	64.9	0.3	30.4
Mexico	56.6	-33.7	-33.0	-334.3	38.7	93.9	62.3	9.2	87.9	214.6	-152.2	-16.4	-68.8	-58.2	160.3
Indonesia	50.6	44.8	-86.7	-	31.4	9.7	-75.5	8.3	86.9	161.9	125.1	-132.3	43.9	5.5	-
Taiwan	47.2	56.0	13.4	126.7	61.2	61.0	-	-34.1	32.3	55.6	62.0	131.2	99.2	36.9	49.1
Korea	46.8	70.2	-26.0	52.2	36.0	-158.5	36.1	-438.6	88.7	55.4	99.1	113.3	82.0	53.5	94.7
India	38.9	24.1	-215.7	25.6	29.0	95.2	129.0	42.3	44.2	13.4	19.2	-42.2	14.5	28.8	-66.4
Austria	38.8	20.6	-78.9	-7.0	12.6	66.1	87.2	59.6	-58.1	-31.0	25.8	19.7	-3.2	78.0	26.8
Spain	27.7	25.1	55.9	2.5	11.9	14.4	-12.9	20.1	49.6	1.0	17.5	44.3	14.1	11.0	29.7
UK	20.1	9.6	53.3	13.0	2.5	15.8	20.2	43.0	38.4	-15.1	0.1	33.2	16.2	24.8	10.0
Finland	0.5	-6.2	-19.4	126.7	16.6	-249.0	87.2	0.4	45.8	-112.3	-29.5	-12.1	0.7	12.5	-18.3
Turkey	0.4	-15.1	55.7	108.1	17.0	34.5	-67.2	14.2	16.3	-180.4	-38.4	-240.1	-54.0	-44.5	-175.0
Greece	0.0	-0.4	-44.3	45.1	18.8	-	-81.5	14.3	47.3	-65.8	-44.2	-115.1	-142.8	-10.7	-21.7
South Africa	-2.3	-74.2	-157.8	-154.5	-494.7	21.2	14.2	-56.3	-221.6	-44.6	-105.0	-289.3	89.2	-150.8	-7.5
Ireland	-2.7	86.4	118.4	24.3	44.8	40.1	106.7	82.2	-206.2	-59.0	-66.9	82.6	-	140.8	-
Denmark	-4.5	24.2	31.9	-13.9	29.4	-	-	65.3	-7.6	203.2	-2.0	14.1	-106.5	78.9	-19.8
USA	-5.6	21.2	45.7	37.2	2.1	8.9	-8.6	42.4	50.0	1.5	5.7	51.2	-46.9	-13.4	42.1
Sweden	-7.6	2.5	-28.2	-3.7	25.0	84.0	-324.3	73.8	48.5	162.2	-32.3	-4.5	-30.5	82.4	99.3
Germany	-9.5	10.4	33.1	28.0	38.2	27.1	102.1	41.0	43.5	-27.6	23.5	12.4	-168.6	26.1	21.0
Argentina	-9.6	12.0	-12.6	-	37.4	-24.8	55.4	8.0	-203.6	-38.5	-53.5	-99.7	-52.4	-65.7	42.1
France	-18.3	1.2	17.9	21.9	2.9	12.6	79.2	27.8	30.4	-21.0	-5.9	19.0	-57.2	-21.6	11.6
Portugal	-33.2	13.4	-103.7	-19.1	7.1	-328.7	-39.4	-40.5	-18.6	-101.1	48.8	-42.8	6.3	-9.5	79.2
Japan	-50.2	-10.7	14.6	10.0	-12.8	-13.6	-69.9	25.1	21.3	-33.8	-47.7	15.4	-82.3	-53.5	17.3
Italy	-65.5	-8.1	5.8	-29.0	-11.9	-14.4	-117.2	-72.5	10.1	-113.5	-24.4	9.5	-24.1	-37.3	-18.0
Belgium	-	42.4	54.7	36.0	31.3	47.3	-	81.8	-67.8	-0.8	118.1	13.1	172.2	-	-34.5
Brazil	-	-281.3	-214.3	-224.7	-66.7	-23.1	-	-	-205.0	27.2	-356.9	-46.5	-204.4	-	-
Hong Kong	-	172.3	288.0	-	-	76.0	-	-	-	-	-	93.7	-	-	-
Netherlands	-	24.4	120.8	49.8	-5.2	-	-	-	59.1	-62.5	88.0	39.7	179.0	80.7	-156.9
Singapore	-	-375.0	-	-	-	-	-	-	-	-85.4	176.5	150.6	-	-387.1	-334.4

<u>Table B5</u>: Structural estimates of revealed overall competitiveness, change from early to late period.

COUNTRY	All Sectors	Fuels	Rubber	Plastic	Pottery	Glass	Non-metal Minerals	Iron & Steel	Other Metal	Fabricated Metal	Other Machinery	Electric Machinery	Transport	Scientific Equipment	Other Mnfg.
China	80.6	-	107.2	125.9	77.0	84.1	106.7	94.1	33.9	185.9	108.8	59.7	11.8	63.1	41.1
Australia	67.1	25.4	-33.6	-226.9	-10.6	-120.2	28.0	145.4	183.2	11.8	34.8	-27.5	-99.3	55.7	10.2
Canada	57.4	46.6	19.7	-63.3	27.1	32.1	-17.8	-13.6	133.8	20.1	49.2	30.9	55.8	42.6	30.1
Mexico	56.6	35.2	-24.3	-4.5	93.1	31.6	-40.9	-18.8	78.1	266.2	149.9	-	84.8	-	-
Indonesia	50.6	-	33.1	6.1	-26.0	90.6	-34.9	-208.3	-	-96.6	147.5	103.4	-131.1	56.8	41.7
Taiwan	47.2	3.3	111.2	51.5	-478.4	68.2	40.5	76.2	5.7	148.5	-	60.6	13.8	69.6	40.9
Korea	46.8	56.1	122.2	107.1	-11.7	55.5	81.1	48.0	92.5	76.5	48.1	55.9	44.7	51.9	31.4
India	38.9	-294.6	40.3	49.1	-11.3	-65.3	67.4	7.6	-28.8	107.6	23.5	-15.6	25.3	42.2	-
Austria	38.8	32.2	68.2	47.9	15.0	41.9	-3.2	36.6	-13.9	1.3	92.7	-21.1	121.0	-0.9	-
Spain	27.7	42.1	67.9	61.1	25.9	28.4	29.3	-2.3	-24.7	-9.7	-9.2	14.5	59.1	26.0	32.2
UK	20.1	85.7	3.6	37.5	24.2	9.3	15.9	11.9	0.6	-32.7	22.9	66.2	12.2	-55.8	37.1
Finland	0.5	-188.5	93.4	-37.7	9.5	4.5	-2.8	51.7	17.7	-35.3	-10.8	13.0	38.1	26.1	30.8
Turkey	0.4	64.5	-85.1	3.6	6.7	35.0	16.1	-20.3	-20.2	-128.0	16.1	10.2	-0.6	-25.7	38.1
Greece	0.0	-	-223.6	33.2	-72.5	22.9	166.0	-118.6	152.7	-22.6	36.3	-35.8	-19.2	61.9	36.7
South Africa	-2.3	-175.4	-133.9	-357.8	-13.4	-449.5	-441.1	114.8	78.9	-200.0	12.2	-176.9	-46.9	37.4	12.9
Ireland	-2.7	-	136.3	91.3	47.4	27.1	47.8	-205.9	-	74.2	-273.2	152.9	98.4	-22.7	-
Denmark	-4.5	66.6	33.5	-113.0	54.9	-27.3	3.7	150.5	-	-31.6	-74.8	56.2	57.7	-425.1	23.2
USA	-5.6	49.3	-10.8	55.8	16.1	25.6	24.0	-18.2	-50.4	0.1	-9.4	-19.9	-1.9	34.6	29.9
Sweden	-7.6	33.2	68.7	6.6	77.5	12.6	12.8	23.2	41.3	-43.8	-55.9	13.9	-28.6	-7.7	-378.9
Germany	-9.5	31.4	45.7	38.0	17.9	24.1	-0.2	12.9	-12.3	-28.0	5.8	-4.3	-6.5	30.8	39.6
Argentina	-9.6	-	-93.5	-138.8	10.0	-19.9	-61.5	-104.8	-58.3	-54.3	-29.0	-238.5	14.5	32.0	24.1
France	-18.3	40.8	-66.0	30.2	-	0.9	-4.3	3.5	-48.6	-59.0	-3.8	-26.0	-33.2	-0.1	30.7
Portugal	-33.2	-91.5	59.5	38.9	29.2	25.6	19.4	9.8	-81.9	10.4	-75.7	53.4	66.9	-149.7	16.5
Japan	-50.2	41.8	-62.2	21.3	-2.8	6.8	-7.0	-64.4	-82.6	-64.9	-49.9	-88.7	-32.7	29.0	25.6
Italy	-65.5	-	-21.4	9.6	47.5	-1.4	-58.4	-16.4	-102.4	-160.6	-149.5	-64.3	-0.3	22.2	-193.8
Belgium	-	51.8	-	52.0	4.7	-17.3	-97.6	-	-294.3	-6.7	172.1	126.7	-	-	-
Brazil	-	-	-256.2	-5.6	-14.4	-	-	-176.8	-	-	-178.6	-247.8	-413.5	5.7	-
Hong Kong	-	-	-	-	-	-	27.5	-	-	-	-	-	-	-	-
Netherlands	-	44.0	-	31.5	8.3	74.1	-2.3	182.4	-	-26.2	-	148.8	124.5	-	-
Singapore	-	-	-	49.4	48.8	-	86.0	-	-	97.2	-	-	-14.5	-	-

Table B5 cont'd.: Structural estimates of revealed overall competitiveness, change from early to late period.

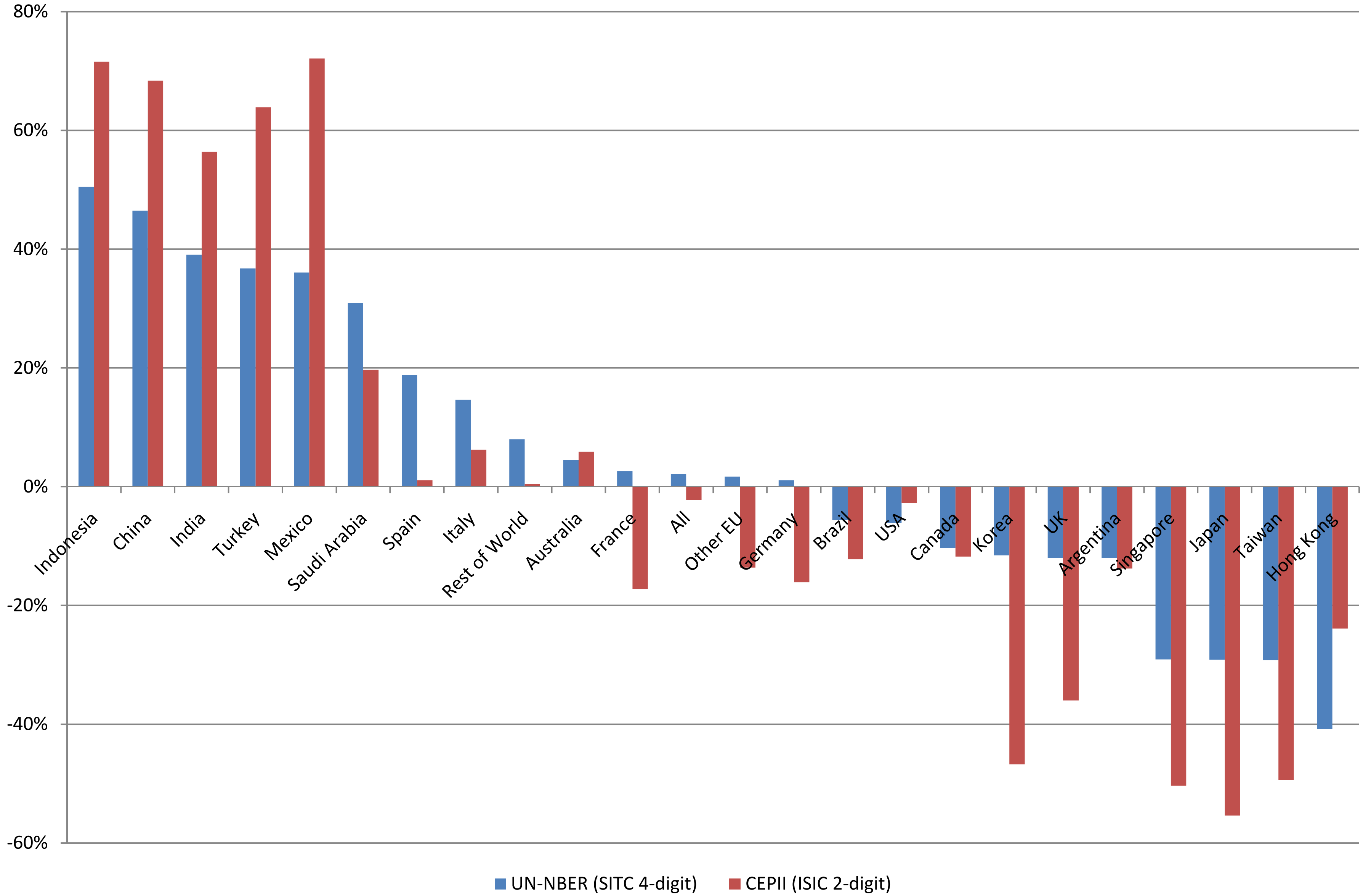


Figure B1: Comparison of gravity residual changes using UN-NBER and CEPII data