Cost competitiveness and German export surges

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Abstract

Explanations for German export success remain an intensely debated topic. While there seems to be a general agreement that demand developments in German export destination countries play a relevant role, next to the specific composition of German export products, the relevance of cost competitiveness of German exports is more controversial. Some extreme positions identify one component of it, low unit labour cost developments, as the main factor behind German export success (Flassbeck/Lapavitsas 2013, Dustmann et al. 2014). Others judge the influence of cost competitiveness as negligible (Storm/Naastepad 2015) compared to world demand for German export products and export composition. Yet, most econometric approaches find a statistically significant role for the effect of cost competitiveness on exports (see e.g. Deutsche Bundesbank 2016).

Econometric approaches may even underrate the role of cost competitiveness as they assume a linear relationship. Our approach tries to show that periods of competitive real exchange rates are important for increasing export market shares, leading to a lasting positive effect on exports. We follow an approach by Palazzo and Rapetti (2017), originally developed by Freund and Pierola (2012), that relates export surges to periods of stable and competitive real effective exchange rates. Surges are periods of several years where exports of an industry increase at higher rates than world demand for the industry and at higher rates than in the past, excluding simple recoveries from former troughs. Using this approach, we can show that German exports developed better than demand from the rest of the world would justify. We find several episodes of export surges that relate to periods with a stable real competitive exchange rate, stressing the role of cost competitiveness.

Key Words

Export success, price competitiveness, Germany, REER

JEL classification

F14, F16

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Outline

1. Introduction

Export growth depends on several factors like the structure of export products, growth in export destination countries, price (or cost) competitiveness, and non-price competitiveness (see Altomonte et al. 2013, Karadeloglou/Benkovskis 2015 for overviews). According to Altomonte et al., non-price competitiveness comprises the size of firms and technological capacities, taxation, access to finance, public support for research and development, and the location of the country that can explain geographical as well as product specialization (Altomonte et al. 2013).

Cost (or price) competitiveness relates to relative cost (or price) developments in a country in relation to its trading partners. The standard indicator is the real effective exchange rate (REER): the nominal effective exchange rate (NEER), a weighted index of bilateral exchange rates for the most important trading partners, weighted by trade volumes, and corrected for relative cost (or price) developments in the respective countries. Yet, alternative indicators for price or cost competitiveness lead to different conclusions about the development of competitiveness, even differing over countries (see Bayoumi et al. 2011). The most prevailing indicators offered by international institutions like the IMF are REER based on a CPI correction or based on a ULC correction.

A recent study by Deutsche Bundesbank (2016) suggests using broad price (e.g. GDP deflator instead of CPI) or cost aggregates (total unit labour costs) for REER correction in order to judge competitiveness of German exports. Similarly, Leigh et al. (2017: 5 and appendix B) consider REER based on CPI as misleading for a large sample of countries. We will therefore concentrate on indicators based on total unit labour costs, and rather call it cost competitiveness instead of price competitiveness, even though price competitiveness is also commonly used in the literature. We consider ULC developments as more telling for Germany, as we assume that a relevant share of German companies are not price takers, yet, price setters. Studies analysing the degree of pricing to market strategies (see e.g. Krugman 1986 for the theoretical considerations) of German exporters are not conclusive: While Stahn (2006) finds evidence that pricing to market strategies of German companies have increased since the 1990s,[4] Stephan (2005) finds evidence that German exporters allow for a full pass-through of currency movements, not in line with pricing to market strategies.

Most empirical studies find a statistically significant effect of cost competitiveness on export success, yet, at the same time, point to higher income elasticities of exports compared to cost elasticity in absolute terms, see Leigh et al. (2017) for a general overview for a large country panel and Danninger/Joutz (2007) for Germany. Both studies use REER based on unit labour costs. The findings of Leigh et al. are in line with Bayoumi et al. (2011), Deutsche Bundesbank (2016), Cerra et al. (2003), and Neary (2006), at least for manufacturing exports. Results mainly differ in the magnitude of the effect.

Most findings for German export success attribute an important role to the growth in export destination countries, especially regarding the period from 2003 up to the financial crisis (see e.g. Allard et al. 2005, Horn et al. 2017), next to the specific composition of German export products (Storm/Naastepad 2015). In addition, an important driver of high growth rates in world trade in recent decades has been a global trend towards greater world trade integration via global and regional value chains, export processing, and other forms of trade integration that also affect

[4] Yet, Stahn's (2006) approach cannot directly be linked to unit labour costs, as she concentrates on the question if exporters pass-through production costs measured by commodity and producer prices to final export markets.

German exports. Consequently, the contribution of imported inputs to value added of exports and imports for re-exports increased from 30% in 1995 to about 44% in 2006 (Loschky/Ritter 2007: 485).

Yet, the role of cost competitiveness remains more controversial. Estimates for the cost elasticity of German exports find a significant effect (Deutsche Bundesbank 2016), but calculate lower values than for exports of other European (Monetary) Union countries, and generally lower cost sensitivity for high tech exports (Carlin et al. 2001). Since the introduction of the euro in 1999, the focus regarding cost competitiveness has shifted from exchange rate developments to unit labour costs developments as the element in cost competitiveness that remains under national influence. Some extreme positions identify low and decreasing unit labour cost developments in the exporting manufacturing sector as the main factor behind the German export success (see e.g. Flassbeck/Lapavitsas 2013, Dustmann et al. 2014). Others judge their influence as negligible compared to factors like non-cost competitiveness and world demand for German export products (Storm/Naastepad 2015).[5]

The starting point of this paper is the idea that prevailing approaches may underestimate the importance of cost competitiveness, as they calculate cost elasticities based on an (vector) error-correction model or VAR approaches, implicitly assuming a linear relationship between cost competitiveness and exports. Instead, temporary, but sufficiently long periods with a competitive real exchange rate may be relevant for gaining export market shares. The effect of increased competitiveness may take time to materialize, but may have long-run effects for manufacturing exports due to high levels of sunk costs in technologically advanced products. In addition, the effect may vary over industries. We therefore try to analyse the effect of periods of a competitive real effective exchange rate for different sectors of German exports.

In order to analyse the relationship between periods of competitive real exchange rates and export market shares, we follow an approach used by Palazzo and Rapetti (2017) that was originally developed by Freund and Pierola (2012). The approach relates export surges to periods of stable and competitive real exchange rates. The authors define export surges as periods of six years where exports of an industry increase at higher rates than world demand for the industry and at higher rates than in the past, excluding simple recoveries from former troughs.

Palazzo and Rapetti (2017) have applied this approach to Argentina, a commodity exporting country where most firms are price-takers. They stress the role of a stable and competitive real exchange rate for labour intensive exports. For the German case, we will show that the approach also leads to interesting results for German high technology exports, albeit for probably different reasons. For German manufacturing exports, cost competitiveness is a relevant factor, even for high technology goods. Underlying mechanisms might be that the need to establish new transport and trade relations for entering new markets or for entering old markets with new products may imply high fix costs. Firms may only engage in these activities when they trust that the competitive cost advantage will continue. Additionally, higher profit margins during periods of a competitive real exchange rate may allow for increased research and development. As research and development are difficult to cover by bank credits, companies mainly rely on profits for financing it. The increase of profits during times of a stable competitive exchange rate might support increasing export market shares and stabilize them even in times of decreasing cost competitiveness, leading to long-lasting effects on export levels.

[5] Publications focussing on net exports like Schröder (2011) neither find a role for relative cost developments, yet, this might be due to the problem that unit labour costs enter as a positive factor for imports but as a negative one for exports, thus, potentially cancelling out.

We will not provide a theoretical model for the mentioned links, as the focus of this paper is on empirical findings for the role of cost competitiveness on export developments. Using this approach, we can show that cost competitiveness seems to play an important role for German export developments, as we find several episodes of export surges that relate to periods with a stable real competitive exchange rate. We think that this approach can clarify some discussions about the role of cost competitiveness.

Before explaining the approach, we will first provide an overview on cost competitiveness developments of German exports since 1995. We will then explain method and data used, and provide the main results followed by robustness checks regarding the period length, export destination country sample, and different industries. The pre-last section discusses the findings. The last section concludes.

2. Developments of cost competitiveness of German exports

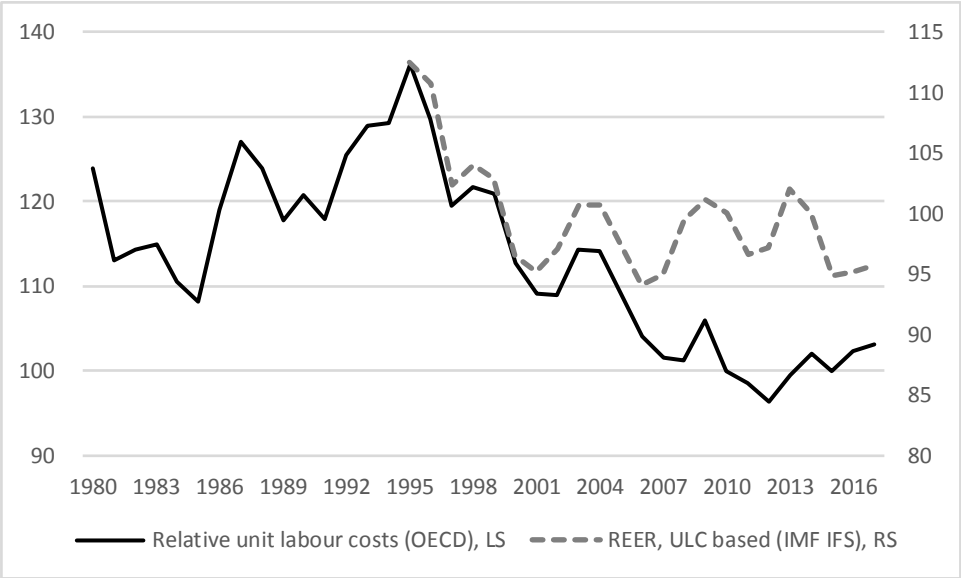
Figure 1 shows the development of cost competitiveness of German exports. The presented indicators for cost competitiveness follow recommendations of Deutsche Bundesbank (2016): Even though Dustmann et al. suggest concentrating on the cost of the exporting manufacturing sector for German exports (Dustmann et al. 2014), Deutsche Bundesbank shows that NEER corrected for broad based cost (or price) indicators perform better in explaining and forecasting export developments (Deutsche Bundesbank 2016). The better performance of broad indicators can be explained by outsourcing activities of the manufacturing sector to other sectors (Albu et al. 2018). The REER based on CPI, even though conveniently available, is outperformed by broad aggregates like the GDP deflator or the one based on unit labour costs (Deutsche Bundesbank 2016). In the following, we will stick to the more common ULC corrections, a cost competitiveness indicator. Yet, we will likewise use the word price competitiveness for this indicator.

According to figure 1, relative cost competitiveness of German exports improved until the mid-1980s and worsened markedly from then on until the mid-1990s, bottoming out in 1995 and indicating increasing competitiveness problems for German exporters. After the mid-1990s, competitiveness improved strongly up to the start of the 2000s, fluctuating since then.

Behind the strong deterioration in competitiveness during the mid-1990s is a combination of effects related to German re-unification. Re-unification supported a boom in West Germany that provoked interest rate hikes by the German Bundesbank. As other countries in Europe suffered from a bust during this time, the European Monetary System (EMS) of fixed exchange rates suffered from speculative attacks. The resulting crisis in the EMS in 1992/3 led to an appreciation of the D-Mark against the other European currencies. In addition, German unification resulted in an increase in wage and non-wage labour costs: First, trade unions tried to align wage levels in East Germany with those in West Germany. Second, rising social security contributions, owing to jumps in unemployment and massive recourse to early retirement schemes, increased non-wage labour costs (Meinhardt/Zwiener 2005, Albu et al. 2018). The combination of the nominal appreciation of the German Mark, no-longer counteracting wage developments and non-wage labour cost increases, brought about a soaring real effective exchange rate (figure 1).

Debates about increased unemployment rates, excessive labour costs, and the disadvantages of producing in Germany in the mid-1990s encouraged several labour market reforms. Coupled with (the thread of) outsourcing activities to Eastern Europe (Baccaro 2018), this provoked decreasing unit labour costs. Due to the introduction of the euro in 1999, and already fixed exchange rates for accession countries from 1997 onwards, this directly translated into increasing competitiveness as reflected in a lower REER.

Figure 1: REER based on ULC (bold) and relative unit labour costs (dotted) for Germany



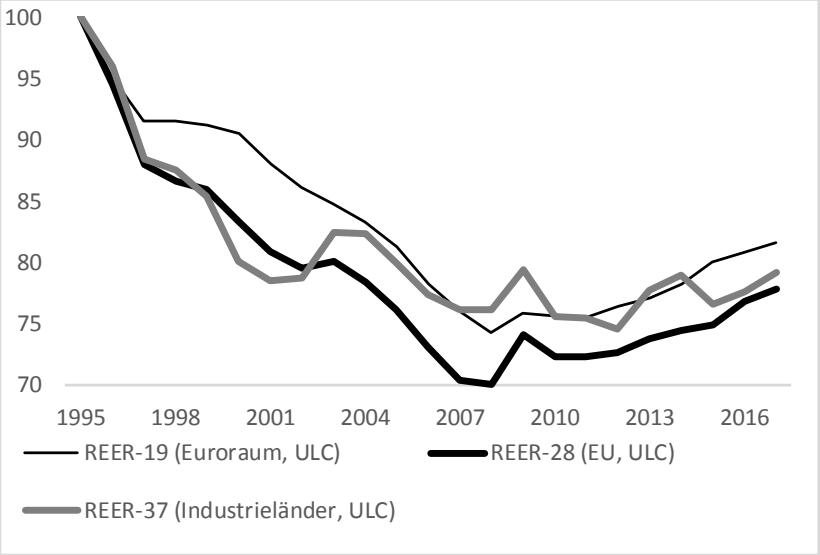
Notes: The bold line represents competitiveness-weighted relative unit labour costs for the overall economy in dollar terms, an OECD indicator. Competitiveness weights take into account the structure of competition in both export and import markets of the goods sector of 49 countries. An increase in the index indicates a real effective appreciation and a corresponding deterioration of the competitive position.
The dotted line represents REER based on ULC from IMF IFS.

Based on figure 1, we identify an important improvement in cost competitiveness since the year 1997[6] onwards. Even though improvements have been interrupted during 2002 to 2003, 2008 to 2009, and 2012 to 2013, cost competitiveness continued to improve according to the OECD measure or stayed at rather stable levels according to IMF IFS data[7] According to the approach, the period since 1997 should generally support export success.

Figure 2 shows that developments in price competitiveness from the year 2000 onwards depend on the group of export target countries. While price competitiveness increased relative to the group of industrial countries until 2008, and, similarly, but with a brief interruption between 1997 and 2000, relative to euro area countries, the effect against EU countries already stopped in 2001 and fluctuated afterwards. Since 2008, the indicators signal a general deterioration in price competitiveness, whatever the country aggregate. Consequently, the main push for exports should generally happen after 1995, yet, with some delay, as the improvements were first only correcting formerly excessive losses, and as exporters needed to learn that improvements would last.

[6] Even though price competitiveness improves from 1995 onwards, we only start in 1997 in order to exclude the correction from the unusual high level of REER.
[7] The one starting 2014 cannot be used for our surge indicator, due being too close to the end of the sample.

Figure 2: Real effective exchange rate (REER) based on ULC for different country groups



Notes: An increase of the REER implies decreasing competitiveness, and vice versa. REER-19: for euro area countries, REER-28: for EU countries, REER-37: for industrial countries.
Source: Eurostat.

3. Measuring export surges

Our goal is to evaluate whether the improvement in price competitiveness of German exports measured by REER based on unit labour costs after the mid-1990s has caused a significant number of export surges, i.e. temporary episodes of export accelerations that are higher than in the past and not just due to world demand growth. To study the behaviour of exports of goods, we follow the methodology used by Palazzo and Rapetti (2017). This methodology builds on the one developed by Freund and Pierola (2012). The authors construct an algorithm to detect episodes of significant increases of export growth by sectors that continue for at least six years. As a check for robustness, we also use 4, 5, and 7 year periods (see robustness checks below).

As in Palazzo and Rapetti (2017) we use COMTRADE data for exports, organized by the 4-digit Standard International Trade Classification (SITC), Revision 2. We have converted the nominal export goods data in COMTRADE from US dollar values to euro-values and deflated it. We follow the definition of export surges in Palazzo/Rapetti (2017: 9-10):

1) **Export growth is higher than average growth of this product over a rolling windows of 20 years growth.** This request that German exports of product j in period "T" (T=[t;t+5]), for example 2003-2008, grew at an annual rate at least 33% higher than the long-term rate of growth of world exports of product j. The latter, in this example, is defined as the average rate of growth during the 20-year period from 1996 to 2015.
2) **Export growth accelerates during the selected compared to the previous period.** This requires, for example, that the rate of growth of exports of product j between 2003 and 2008 accelerated if its annual growth rate was at least 33% higher and was at least 3 percentage points (pp) higher than the rate of growth during the previous comparable six-year period (i.e., 1997-2002). The requirement of a difference of at least 3pp is in order to avoid cases of acceleration from very low or negative growth.
3) **The export surge is not a recovery.** This requires that the peak of exports of product j at the end of the period is at least x% higher than the preceding peak from the comparable period. The x% threshold represents the accumulated real growth of world exports of goods

between the last year of the previous period and the end of the current period. This threshold indicates the level that exports of product j would have reached, had they grown without interruption at the same rate as world trade grew during the period.

4) **Export growth is not demand-led.** This requirement establishes that German exports of product j between t and t+5 grew at an annual rate higher than the growth of world exports of product j during the same period. A higher growth rate than world exports of the same product implies an increase in the market share and guarantees that the export surge was neither due to faster growth of the export-market economies, nor due to changes of global demand in favour of product j.

The four requirements can be stated formally as follows:

1) $x_j^{D,T} \geq (1+\frac{1}{3})\, x_j^{W,T^*}$
2) $x_j^{D,T} \geq (1+\frac{1}{3})\, x_j^{D,T-1}$ and $x_j^{D,T} - x_j^{D,T-1} \geq 3\%$
3) $Max\left[X_j^{D,t-1}, X_j^{D,t-2}\right] \geq (1+x\%) Max\left[X_j^{D,t+5}, X_j^{D,t+4}\right]$
4) $x_j^{D,T} > x_j^{W,T}$

where j represents the export industry, x the rate of export growth, D stands for Germany and W for world, T represents the current period (i.e. 2003-2008), T-1 the previous period (i.e. 1996-2001), T^* the long term period (i.e. 1996-2015), t is the year of the beginning of period T, and X is the quantum of export.

We constructed an algorithm that demands the simultaneous fulfilment of requirements R1-R4 to detect episodes of export surges by sectors in Germany. We are interested in comparing the export performance for the entire sample period for which data is available (1981-2015). World exports are composed by a group of 37 countries for which we have reliable data for the whole sample. This sample may overstate German the relevance of German exports in world trade.[8] As a robustness check, we also use a bigger sample of countries for a shorter period, starting in 1987 (see robustness checks).

As in Palazzo and Rapetti (2017), we first present the findings of export surges for all industries, before showing the effects for subgroups of industries, following Lall's classification. Lall (2000) distinguishes between five groups of industries: 1) primary products, 2) resource-based manufactures, 3) low-technology manufactures, 4) medium-technology manufactures and 5) high-technology manufactures (see appendix 1 for details). We use Lall's classification because it is widely used and therefore makes our study comparable to others, but more importantly because is straightforward to argue that Germany has some technological advantage in the medium and high technology manufacturers.

We analyse an average of 771 sectors by year. Table 1 shows the euro amount traded in the five industry categories based on Lall's classification and the shares of these industry classifications in total exports for selected years over the sample period (for every five years). Table 2 calculates the same for the number of industries in one category, and the share in total exports of that category based on numbers, instead of basing it on the trade values in euros.

[8] See the table of countries in the appendix. In our database, during 2015, the export of Germany represents 16% of world exports. However, in an unrestricted sample of countries, Germany exports represent 8% of world exports (using World Bank database).

Table 1: Descriptive statistics of exports by Lall´s categories in millions of euros

Year	Commodities			RB manufacturers			Others		
	euros	in % of GER exports	in % of world exports	euros	in % of GER exports	in % of world exports	euros	in % of GER exports	in % of world exports
1981	8,269	5%	4%	24,771	16%	11%	5,244	3%	17%
1985	10,566	4%	4%	36,706	15%	11%	7,658	3%	16%
1990	10,209	3%	5%	42,720	14%	12%	8,161	3%	11%
1995	12,441	3%	5%	53,799	14%	12%	26,984	7%	22%
2000	16,114	3%	4%	72,250	12%	11%	49,596	8%	14%
2005	22,722	3%	5%	92,741	12%	13%	37,442	5%	10%
2010	31,026	3%	4%	116,910	12%	13%	106,542	11%	12%
2015	43,325	4%	5%	136,821	11%	12%	101,741	8%	9%

Year	LT manufacturers			MT manufacturers			HT manufacturers		
	euros	in % of GER exports	in % of world exports	euros	in % of GER exports	in % of world exports	euros	in % of GER exports	in % of world exports
1981	24,281	16%	15%	74,670	48%	19%	18,929	12%	14%
1985	37,254	15%	16%	116,756	48%	19%	32,153	13%	12%
1990	49,720	16%	17%	156,495	50%	22%	43,995	14%	13%
1995	55,048	14%	13%	184,650	47%	18%	61,411	16%	10%
2000	70,656	12%	11%	271,608	46%	17%	111,392	19%	9%
2005	97,266	13%	15%	370,215	48%	20%	151,892	20%	13%
2010	110,478	12%	15%	419,346	44%	20%	175,433	18%	14%
2015	136,850	11%	15%	548,758	46%	21%	230,403	19%	14%

Table 2: Descriptive statistics of number of industries by Lall´s categories

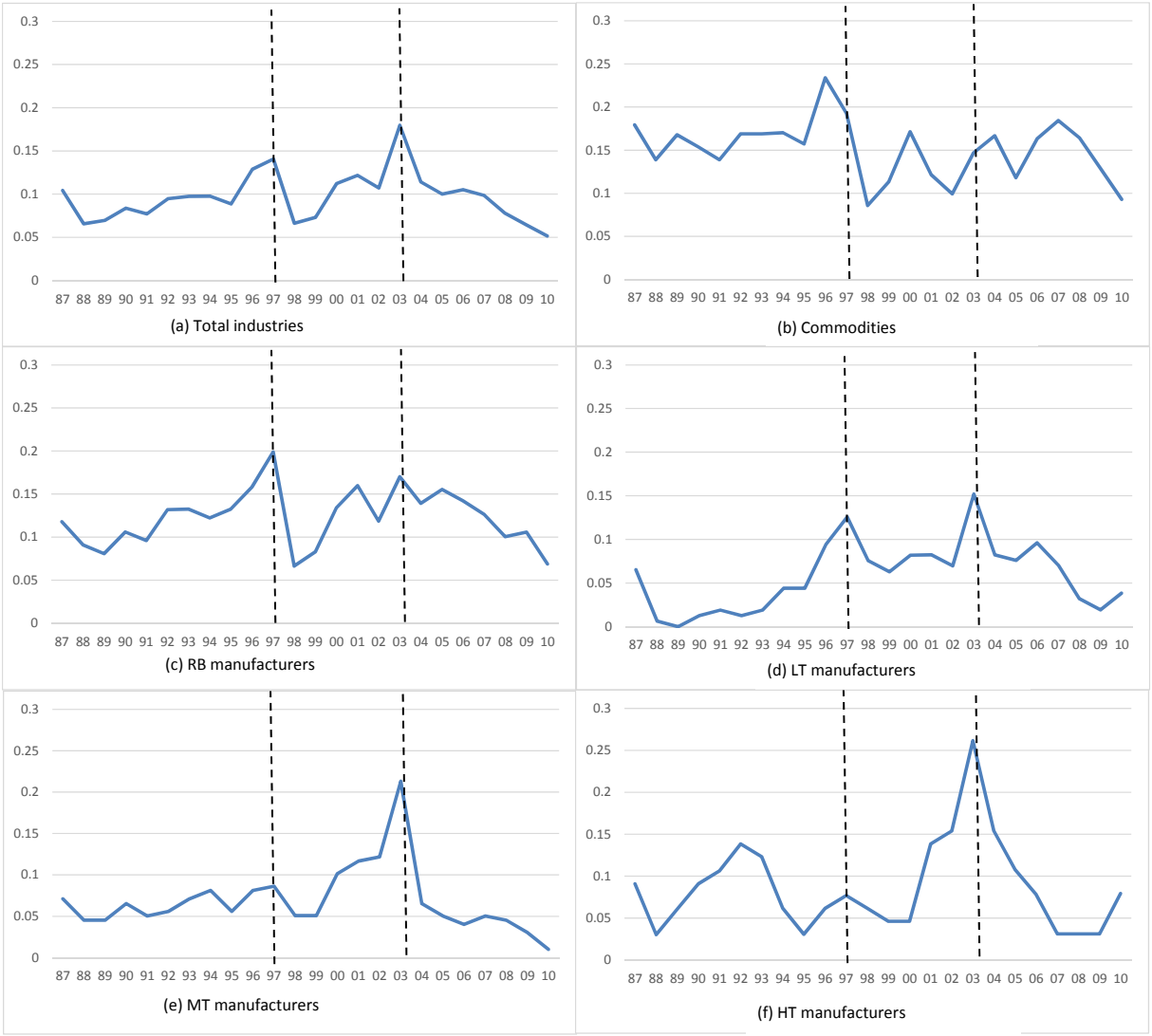
Year	Commodities		RB manufacturers		LT manufacturers		MT manufacturers		HT manufacturers		Others	
	industries	%	industries	%	industries	%	industries	%	industries	%	industries	%
1980	143	18%	198	25%	161	21%	201	26%	66	8%	11	1%
1985	142	18%	198	25%	161	21%	201	26%	66	8%	11	1%
1990	142	19%	195	26%	153	20%	197	26%	66	9%	11	1%
1995	138	18%	192	25%	159	21%	196	26%	65	9%	11	1%
2000	139	18%	192	25%	159	21%	197	26%	65	9%	11	1%
2005	138	18%	194	25%	158	21%	197	26%	65	9%	11	1%
2010	139	18%	189	25%	155	21%	198	26%	64	8%	11	1%
2015	134	18%	189	25%	156	21%	195	26%	63	8%	11	1%

Table 1 shows some stylized facts of the German export basket in different periods. Based on export values, medium technology manufactures is clearly the main category with a share around of 50% of total German exports in our data. The second most important category since 1995 are high technology manufacturers, which have increased their share in the German export basket since 1980, outperforming low technology manufacturers. Table 2 shows that the relevance of the categories switches when looking at number of industries. While medium technology manufacturers continue having the highest share, the share only amounts to a quarter. High technology manufacturers cease being the second most important category for exports.

4. Findings for export surges

The results of our baseline exercise are presented in Figure 3, which reports the percentage of export industries that experienced surges for the five categories of industries according to Lall´s classification and for the total number of export industries. The series indicate the percentage of total industries (or categories of industries) that experienced a surge in the six-year period beginning in the year reported in the figure. The value reported in the year 2003 in panel (a) indicates that 18% of German export industries experienced a surge during the 2003-20008 period. The preceding period against which this period is compared is 1997-2002.

Figure 3: Proportion of export industries with surges for the entire sample, total and by categories (in percentage)



Notes: The figure portrays the share of industries experiencing surges during 1986 until 2010. Every point implies that the share of industries with a surge starts in the year and remains for 6 years.
Source: UN Comtrade database, own calculations.

As can be seen in figure 3, there are always some German industries experiencing surges (i.e. a strong increase in export growth above the entire period's average, above foreign demand growth, and not just a recovery, continuing for 6 years), during the period of analysis. The share of industries experiencing surges that follow the above definition and last for at least 6 years is every year above 5% regarding all industries and total goods exports (see figure 3, panel a). There is a remarkable increase in the share of industries experiencing **surges** in **1997** (up to about 14% of all industries) and an even higher share of about 18% experiencing surges in **2003**.

While the share of industries experiencing surges decreases after 2003, one has to bear in mind that the figures may be distorted by crisis events: our approach takes into account surges during a six-year period. Consequently, all data points starting in 2003 already include the effects of the world-wide recession in 2008/2009.

Concentrating on **manufacturing exports to the world,** and differentiating by levels of technology (low, medium, **high**), the picture slightly changes (see figure 3, panels d, e, **f**). Especially for **high**

technology manufacturing exports, the share of industries experiencing surges is more pronounced in the early 1990s (1992: about 13%) than the one after the mid-1990s (7-8% in 1997), and surges from the early 2000s onwards are even more pronounced. The share of industries benefitting from surges increases from about 5% in 2000 to more than 26% in 2003 before dropping again to levels below 5% in 2007. This pattern holds even for the exclusion of exports to China and demand from China (see appendix).

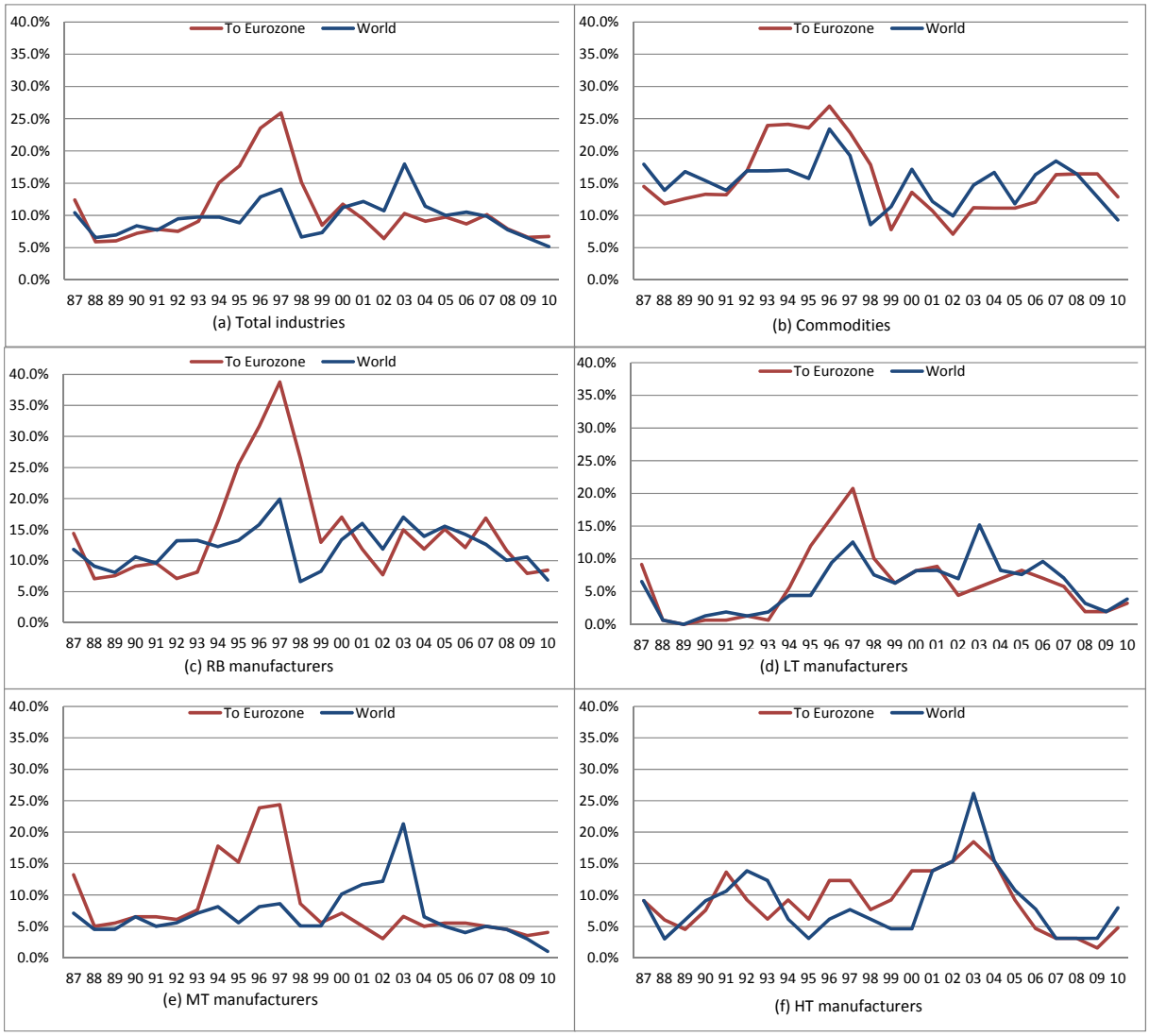
The **introduction of the euro** in 1999 does not seem to have a systematic influence, at least according to figure 3. During the period from 2000 up to the start of the financial crisis in 2007, the share of industries experiencing surges stays at elevated levels (above 10%, see figure 3). In order to check this impression, we perform our algorithm splitting exports from Germany to Eurozone countries and to non-Eurozone countries. The difference is that now we are looking at the evolution of exports from Germany to Eurozone countries. Since we want to keep the sample of countries fixed, we include only the exports to the former countries of the Eurozone since 1999 and Greece which joined in 2001[9].

Figure 4 reproduces figure 3, plotting the former measure of surges and the performance in terms of surges if we only use the export to the Eurozone countries. Concentrating only on German exports to **the euro area** and on demand for exports from the euro area, one can see that industries exporting to the euro area mainly benefitted from surges from the mid-1990s onwards: 1997 reports with 26% the highest share of industries experiencing surges (see figure 4). With the introduction of the euro, the share drops to 10% of industries and more or less remains on that level up to 2007. This indicates that especially the years before euro introduction had an important and lasting effect on German exports to the euro area that was more important than later periods of improved price competitiveness.

Yet, high tech manufacturing exports did not benefit the same way during the period leading to euro introduction (figure 4, panel f). The pattern for high tech manufacturers to the euro area is similar to the one of total high tech manufacturing exports (even though at lower levels and more volatile) to the world, and, at the same time, different to the pattern of total exports. The share of high tech industries exporting to the euro area and benefitting from surges is highest in 2003, with more than 18% of industries experiencing surges, compared to close to 14% in 1991.

[9] The complete list of countries is the following: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal and Spain.

Figure 4: Proportion of export industries with surges for exports to the euro area and demand from the euro area only (in percentage)



Notes: The figure portrays the share of industries experiencing surges during 1986 until 2010, yet, with the additional information about exports to and demand from the euro area only. Every point implies that the share of industries with a surge starts in the year and remains for 6 years.
Source: UN Comtrade database, own calculations.

Our results seem to confirm that a period of stable (or even improving) price competitiveness measured here by the REER based on relative unit labour costs is favourable for trade activities. Our prior is confirmed with figure 3, since we find export surges for total exports (figure 3, panel a) as well as for all categories of industries (except commodities, panel b-f). As the peak of export surges seems to take place around the period 2003-2008, after the introduction of the euro, our findings are in line with authors stressing the competitiveness enhancing effect of the euro coupled with relatively low unit labour costs developments. As one can see in the figures, this effect seems to be especially important for sectors where Germany has some kind of technological or institutional advantage (medium and high technology). High technology manufacturers with surges reach a share of 26.2% during the period 2003-2008. High tech manufacturers are the category with the highest reaction to the improvement of price competitiveness, followed by medium technology manufacturers, where 21.3% of industries experience surges.

5. Intensive margins and hysteresis in exports

Before turning to intensive margins and hysteresis, we first discuss potential distortions due to measuring exports in values, as this may overstate the relevance of single industries. Table 2 shows the main results, focusing on the period 2003-2008. The upper half of the table presents total and sectoral exports and surges in terms of the number of industries; the lower half provides the same information in million euros of 2010. The upper half thus provides useful information in terms of numbers (percentage) of industries that had surges, whereas the lower half gives a sense of the economic relevance of the sectors that had surges. The two types of information are complementary. When measured in money value, one could potentially overestimate (underestimate) the importance of export surges if the industries with surges are few (many) but their exports imply a large (low) amount of money. Similarly, one could overestimate (underestimate) the significance of surges if there is large (low) number of industries with surges but with low (large) economic significance.

As table 2 demonstrates, we find quite similar results in terms of economic relevance (value in euro) and sectors. Regarding all goods exports, sectors with surges amount to 18%, measured by the share of the value of exports in euros as well as by the number of industries as a share of the total number. For the five categories of industries, percentages of industries with surges in numbers vs. euros do not exactly match, but do neither indicate problems of distortion, with the exception of primary products.

Table 2: Export Surges in Germany between 2003 and 2008, Base line exercise

Concept	Total Exports	Primary products	RB manufactures	Low Tech. Manufactures	Medium Tech. Manufactures	High Tech. Manufactures
Number of industries	756	138	190	156	197	64
Number of industries with surges	137	21	33	24	42	17
% on surges within groups	18.1%	15.2%	17.4%	15.4%	21.3%	26.6%
% on total surges	100%	15%	24%	18%	31%	12%
Exports (in millons of euros of 2010)	4,784,357	163,676	670,544	639,679	2,439,602	870,856
Export surges (in millons of euros of 2010)	868,998	19,238	140,675	121,352	458,786	128,948
% of surges within groups	18.2%	11.8%	21.0%	19.0%	18.8%	14.8%
% on total surges	100%	2%	16%	14%	53%	15%

Source: UN Comtrade data, own calculations.

Table 3 tries to identify intensive margins in exports that may indicate hysteresis effects. The distinction between extensive margins (higher export probability) and intensive margins (higher export volumes) relates to theoretical models for trade of heterogeneous firms that differ in productivity (see Melitz 2003). Applied to our approach, industries that benefitted from periods of price competitiveness in the past, and experienced surges, should have a greater likelihood of a good export performance in later periods.

Table 3 concentrates on the share of *industries that experienced surges during 2003 to 2008*. It first provides the value of exports of these industries for total exports as well as categories, not only for the period 2003 to 2008, but also for the previous (1997-2002) as well as for a following 6-year period (2010-2015). The aim is to demonstrate that the positive effect on values of exports is sizeable. The table shows the acceleration of export values over time for those industries with surges during 2003 to 2008, compared to the previous period. The results are impressive: *For industries with surges during 2003 to 2008*, total export values during this period increased by 56% compared to 1997 to 2002. There seems to be some kind of lasting positive effect on exports, as for the same industries export values increased by 110% during 2010 to 2015 compared with 1997 to 2002. Yet, we have to stress that these industries did not necessarily benefit from renewed surges.

Intensive margins seem to be even more important for high technological manufacturers: Export values of those industries with surges during 2003-08 increased by 107% compared to the previous

6-year period. The lasting and accelerating effect on export values is even higher, as export values during 2010 to 2015 increased by even 319% compared to the period 1997 to 2002 for high tech manufacturers industries with surges in 2003 to 2008. For medium technological and resource-based manufacturers, intensive margins are also relevant; yet, the acceleration effect on export values is closer to the shares of all industries.

These findings try to demonstrate that for those industries with surges the increase in export values is relevant (see comparison for 2003 to 2008 with 1997 to 2002). In addition, there seems to be some kind of hysteresis, as increases during 2010 to 2015 over 1997 to 2002 are even higher. What stresses our point of hysteresis is that sectors that had not experienced surges during the period 2003 to 2008 have lower positive effects on export values, independently of comparing export values during 2003 to 2008 or during 2010 to 2015 with the values during 1997 to 2002.

Table 3: Intensive margin in million Euros of 2010

Sectors	Period	Total Exports	Primary products	Resource-based manufactures	Low Tech. manufactures	Medium Tech. manufactures	High Tech. manufactures
With surges during 03-08	1997-2002	558,631	14,590	93,442	84,293	304,027	62,278
	2003-2008	868,998	19,238	140,675	121,352	458,786	128,948
	2010-2015	1,174,210	33,552	176,529	136,766	566,259	261,103
	03-08 vs 97-02	***56%***	***32%***	***51%***	***44%***	***51%***	***107%***
	10-15 vs 97-02	***110%***	***130%***	***89%***	***62%***	***86%***	***319%***
Without surges during 03-08	1997-2002	2,875,457	115,704	445,440	399,432	1,430,724	484,157
	2003-2008	3,915,359	144,438	529,869	518,328	1,980,816	741,908
	2010-2015	4,578,767	176,701	571,120	596,068	2,296,533	938,345
	03-08 vs 97-02	***36%***	***25%***	***19%***	***30%***	***38%***	***53%***
	10-15 vs 97-02	***59%***	***53%***	***28%***	***49%***	***61%***	***94%***

Source: UN Comtrade data, own calculations.

6. Robustness checks

First, we varied the period length of 6 years that stems from Palazzo and Rapetti (2017). Yet, as the length may appear arbitrary for Germany, we modified the period length from the base line of 6 years to 4, 5, and 7 years respectively. This does not change the results in an important way. Results are available upon request.

Second, we broadened the sample of countries. To expand the sample, we needed to reduce the number of years covered. Instead of starting in 1981 with a country sample of 37 countries, the second sample covers 46 countries, starting in 1987 (see the list of countries for both samples in the appendix).[10] The global maximum of surges is still in 2003 and high technology manufacturers are again the most responsive sector. As this sample contains China, it might explain the bad performance of low technology manufacturers in terms of surges (see appendix A3, figure A3.1).

Third, the broadened country sample for the shorter period allows for controlling for the "China effect". Some authors claim that the good performance of Germany is not related to the relative reduction in costs but to the increase of China's demand for higher quality products. As the period of analysis is one where demand from China intensified, we excluded exports to China and demand for exports from China. According to our findings, the share of industries experiencing surges does not change in a systematic way (see appendix A3, figure A3.1). Our findings indicate that demand from China for German exports cannot explain German export success.

[10] China only started to report consistent export data from 1987 onwards.

7. Conclusions

As the debate about the role of price competitiveness for German export success continues, this approach tries to provide evidence that empirical approaches – even though finding a statistically significant effect – might even underrate the role of price competitiveness as they mostly assume a linear relationship. Our approach tries to show that periods of competitive real exchange rates are important for increasing export market shares, leading to a lasting positive effect on exports.

Using the approach of Palazzo and Rapetti (2017), we find evidence for German export surges after periods of increasing price competitiveness. Surges are periods of several years where exports of an industry increase at higher rates than world demand for the industry, and at higher rates than in the past, excluding simple recoveries from former troughs. Using this approach, we can show that German exports developed better than demand from the rest of the world would justify, yet, that the relevance of this effect differs between industries. High technology manufacturers seem to benefit the most, in contrast to findings by Carlin et al. (2001).

We even find evidence for surges when isolating demand effects from and (total and high-technological manufacturers) exports to China, which questions the argument that China's demand has been driving German export success. We find several episodes of export surges that relate to periods with a stable real competitive exchange rate, stressing the role of price competitiveness.

In addition, we find evidence that those industries that benefitted from surges in the past are likely to benefit from successful export developments (not necessarily additional surges) in later periods. This might finding might indicate hysteresis in export success, in line with theoretical models like Melitz (2003).

Yet, we have to admit that we can only provide evidence for coincidence of improved price competitiveness and export surges. We cannot prove our point, and we do neither control for alternative explanations.

Appendix

A1: Composition of countries in the two samples

Rest of the world	
Since 1981	Since 1987
Algeria	Algeria
Argentina	Argentina
Australia	Australia
Austria	Austria
Barbados	Barbados
Bolivia	Bolivia
Canada	Brazil
Cyprus	Canada
Denmark	Chile
Ecuador	China
Finland	Cyprus
France	Denmark
Greece	Ecuador
China, Hong Kong SAR	El Salvador
Iceland	Finland
Ireland	France
Israel	Greece
Italy	Guatemala
Japan	China, Hong Kong SAR
Malaysia	Iceland
Mauritius	Ireland
Morocco	Israel
Oman	Italy
Netherlands	Japan
New Zealand	Malaysia
Norway	Mauritius
Peru	Mexico
Philippines	Morocco
Poland	Oman
Portugal	Netherlands
India	New Zealand
Singapore	Norway
Spain	Panama
Sweden	Paraguay
Switzerland	Peru
United Kingdom	Philippines
USA	Poland
	Portugal
	India
	Singapore
	Spain
	Sweden
	Switzerland
	Turkey
	United Kingdom
	USA

A2: Lall's (2000) sector classification

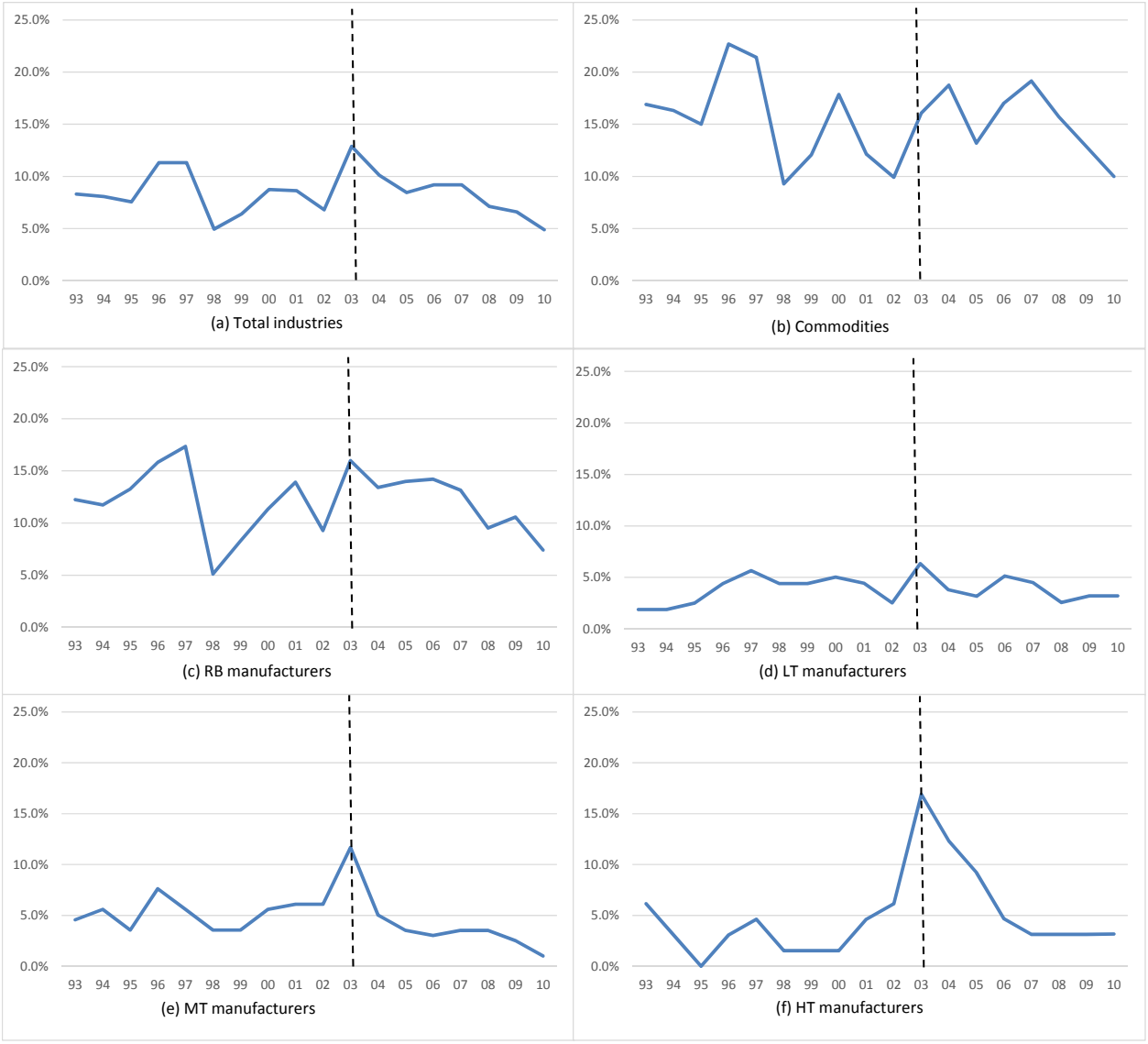
Commodity code	Description	Lall's category
341	Fish, fresh or chilled, excluding fillet	Commodities
412	Other wheat and meslin, unmilled	Commodities
421	Rice in the husk or husked, but not farther prepared	Commodities
572	Other citrus fruits, fresh or dried	Commodities
575	Grapes, fresh or dried	Commodities
577	Nuts edible, fresh or dried	Commodities
711	Coffee green, roasted; coffee substitutes containing coffee	Commodities
723	Cocoa butter and paste	Commodities
913	Lard, pig and poultry fat, rendered or solvent-extracted	Commodities
2222	Soya beans	Commodities
2320	Natural rubber latex; natural rubber and gums	Commodities
2460	Pulpwood (including chips and wood waste)	Commodities
2634	Cotton, carded or combed	Commodities
2681	Wool greasy or fleece-washed of sheep or lambs	Commodities
2732	Gypsum, plasters, limestone flux and calcareous stone	Commodities
2741	Sulphur (other than sublimed, precipitated or colloidal)	Commodities
2785	Quartz, mica, felspar, fluorspar, cryolite and chiolite	Commodities
2879	Ores and concentrates of other non-ferrous base metals	Commodities
2911	Bones, ivory, horns, coral, shells and similar products	Commodities
3222	Other coal, not agglomerated	Commodities
3223	Lignite, not agglomerated	Commodities
121	Bacon, ham, other dried, salted or smoked meat of domestic swine	RB manufacturers
141	Meat extracts and juices; fish extracts	RB manufacturers
230	Butter	RB manufacturers
240	Cheese and curd	RB manufacturers
371	Fish, prepared or preserved, nes	RB manufacturers
481	Cereal grains, worked or prepared, not elsewhere specified	RB manufacturers
483	Macaroni, spaghetti and similar products	RB manufacturers
619	Sugars and syrups nes; artificial honey; caramel	RB manufacturers
1223	Tobacco, manufactured; tobacco extract and essences	RB manufacturers
2512	Mechanical wood pulp	RB manufacturers
2517	Chemical wood pulp, soda or sulphate	RB manufacturers
2820	Waste and scrap metal of iron or steel	RB manufacturers
3232	Coke and semi-coke of coal, of lignite or peat; retort carbon	RB manufacturers
3353	Mineral tar pitch, pitch coke	RB manufacturers
4113	Animals oils, fats and greases, nes	RB manufacturers
4233	Cotton seed oil	RB manufacturers
4236	Sunflower seed oil	RB manufacturers
5111	Acyclic hydrocarbons	RB manufacturers
5112	Cyclic hydrocarbons	RB manufacturers
5161	Ethers, epoxides, acetals	RB manufacturers
5221	Chemical elements	RB manufacturers
5233	Salts of metallic acids; compounds of precious metals	RB manufacturers
5513	Essential oil, resinoid, etc	RB manufacturers
6419	Converted paper and paperboard, nes	RB manufacturers
6612	Cement	RB manufacturers
6633	Manufactures of mineral materials, nes (other than ceramic)	RB manufacturers
6635	Wool; expanding or insulating mineral materials, nes	RB manufacturers
6639	Articles of ceramic materials, nes	RB manufacturers
6821	Copper and copper alloys, refined or not, unwrought	RB manufacturers
6822	Copper and copper alloys, worked	RB manufacturers
6831	Nickel and nickel alloys, unwrought	RB manufacturers
6851	Lead, and lead alloys, unwrought	RB manufacturers
6871	Tin and tin alloys, unwrought	RB manufacturers

Commodity code	Description	Lall's category
6423	Registers, exercise books, file and book covers, etc, of paper	LT manufacturers
6424	Paper and paperboard cut to size or shape, nes	LT manufacturers
6517	Yarn of regenerated fibres, not for retail, monofil, strip, etc	LT manufacturers
6518	Yarn of regenerated fibres, put up for retail sale	LT manufacturers
6579	Special products of textile materials	LT manufacturers
6593	Kelem, Schumacks and Karamanie rugs and the like	LT manufacturers
6665	Articles of domestic or toilet purposes, of other kind of pottery	LT manufacturers
6731	Wire rod of iron or steel	LT manufacturers
6732	Bars, rods (not wire rod), from iron or steel; hollow mining drill	LT manufacturers
6733	Angles, shapes, sections and sheet piling, of iron or steel	LT manufacturers
6744	Sheet, plates, rolled of thickness 4,75mm plus, of iron or steel	LT manufacturers
6747	Tinned sheets, plates of steel (not of high carbon or alloy steel)	LT manufacturers
6911	Structures and parts of, of iron, steel; plates, rods, and the like	LT manufacturers
6935	Gauze, cloth, grill, netting, reinforced fabric and the like	LT manufacturers
6953	Other hand tools	LT manufacturers
6973	Domestic, non-electric, heating, cooking apparatus, and parts, nes	LT manufacturers
6999	Other base metal manufactures, nes; and of cermets	LT manufacturers
8219	Other furniture and parts thereof, nes	LT manufacturers
8429	-- other outer garments	LT manufacturers
8452	-- womens, girls, infants, suits, dresses, etc, knitted, crocheted	LT manufacturers
8461	-- of wool or fine animal hair, not elastic nor rubberized	LT manufacturers
8462	-- of cotton, not elastic nor rubberized	LT manufacturers
8941	Baby carriages and parts thereof, nes	LT manufacturers
8994	Umbrellas, canes and similar articles and parts thereof	LT manufacturers
5123	Phenols and phenol-alcohols, and their derivatives	MT manufacturers
5138	Polycarboxylic acids and their derivatives	MT manufacturers
5335	Glazes, driers, putty etc	MT manufacturers
5822	Aminoplasts	MT manufacturers
5824	Polyamides	MT manufacturers
5826	Epoxide resins	MT manufacturers
5831	Polyethylene	MT manufacturers
5832	Polypropylene	MT manufacturers
5833	Polystyrene and its copolymers	MT manufacturers
5913	Herbicides, for sale by retail or as preparation	MT manufacturers
5982	Anti-knock preparation, anti-corrosive; viscosity improvers; etc	MT manufacturers
6712	Pig iron, cast iron, spiegeleisen, in pigs, blocks, lumps, etc	MT manufacturers
6716	Ferro-alloys	MT manufacturers
6782	Seamless tubes, pipes; blanks for tubes and pipes, of iron or steel	MT manufacturers
7111	Steam and other vapour-generated boilers; super-heated water boiler	MT manufacturers
7112	Auxiliary plant for boilers of heading 7111; condensers	MT manufacturers
7138	Internal combustion piston engines, nes	MT manufacturers
7211	Agricultural and horticultural machinery for soil preparation, etc	MT manufacturers
7212	Harvesting and threshing machines; fodder presses, etc; parts nes	MT manufacturers
7233	Road rollers, mechanically propelled	MT manufacturers
7234	Construction and mining machinery, nes	MT manufacturers
7268	Bookbinding machinery; parts thereof, nes	MT manufacturers
7272	Other food-processing machinery and parts thereof, nes	MT manufacturers
7283	Other mineral working machinery; and parts thereof, nes	MT manufacturers
7284	Machinery for specialized industries and parts thereof, nes	MT manufacturers
7368	Work holders, dividing heads for machine-tools, etc; tool holders	MT manufacturers
7371	Metallurgy and metal foundry equipment, and parts thereof, nes	MT manufacturers
7372	Rolling mills, rolls therefor, and parts, nes of rolling mills	MT manufacturers
7411	Gas generators, and parts, nes of gas generators	MT manufacturers
7413	Industrial and laboratory furnaces and ovens, etc, parts, nes	MT manufacturers

Commodity code	Description	Lall's category
7416	Machinery, plant, laboratory equipment for heating and cooling, nes	MT manufacturers
7422	Centrifugal pumps (other than those of heading 74281)	MT manufacturers
7432	Parts, nes of the pumps and compressor falling within heading 7431	MT manufacturers
7439	Parts, nes of the machines falling within headings 7435 and 7436	MT manufacturers
7442	Lifting, handling, loading machinery, telphers and conveyors	MT manufacturers
7449	Parts, nes of the machinery falling within heading 7442	MT manufacturers
7492	Cocks, valves and similar appliances, for pipes boiler shells, etc	MT manufacturers
7493	Shaft, crank, bearing housing, pulley and pulley blocks, etc	MT manufacturers
7731	Insulated electric wire, cable, bars, etc	MT manufacturers
7732	Electrical insulating equipment	MT manufacturers
7752	Domestic refrigerators and freezers	MT manufacturers
7822	Special purpose motor lorries and vans	MT manufacturers
5416	Glycosides, glands, antisera, vaccines and similar products	HT manufacturers
7129	Parts, nes of steam power units	HT manufacturers
7169	Parts, nes, of rotating electric plant	HT manufacturers
7188	Engines and motors, nes (wind, hot air engines, water wheel, etc)	HT manufacturers
7511	Typewriters; cheque-writing machines	HT manufacturers
7512	Calculating, accounting, cash registers, ticketing, etc, machines	HT manufacturers
7518	Office machines, nes	HT manufacturers
7522	Complete digital data processing machines	HT manufacturers
7523	Complete digital central processing units; digital processors	HT manufacturers
7591	Parts, nes of and accessories for machines of headings 7511 or 7518	HT manufacturers
7712	Other electric power machinery, parts, nes	HT manufacturers
7781	Batteries and electric accumulators, and parts thereof, nes	HT manufacturers
7783	Automotive electrical equipment; and parts thereof, nes	HT manufacturers
7922	Aircraft of an unladen weight not exceeding 2000 kg	HT manufacturers
7923	Aircraft of an unladen weight from 2000 kg to 15000 kg	HT manufacturers
7928	Aircraft, nes and associated equipment	HT manufacturers
8741	Surveying, navigational, compasses, etc, instruments, nonelectrical	HT manufacturers
9610	Coin (other than gold coin), not being legal tender	Others

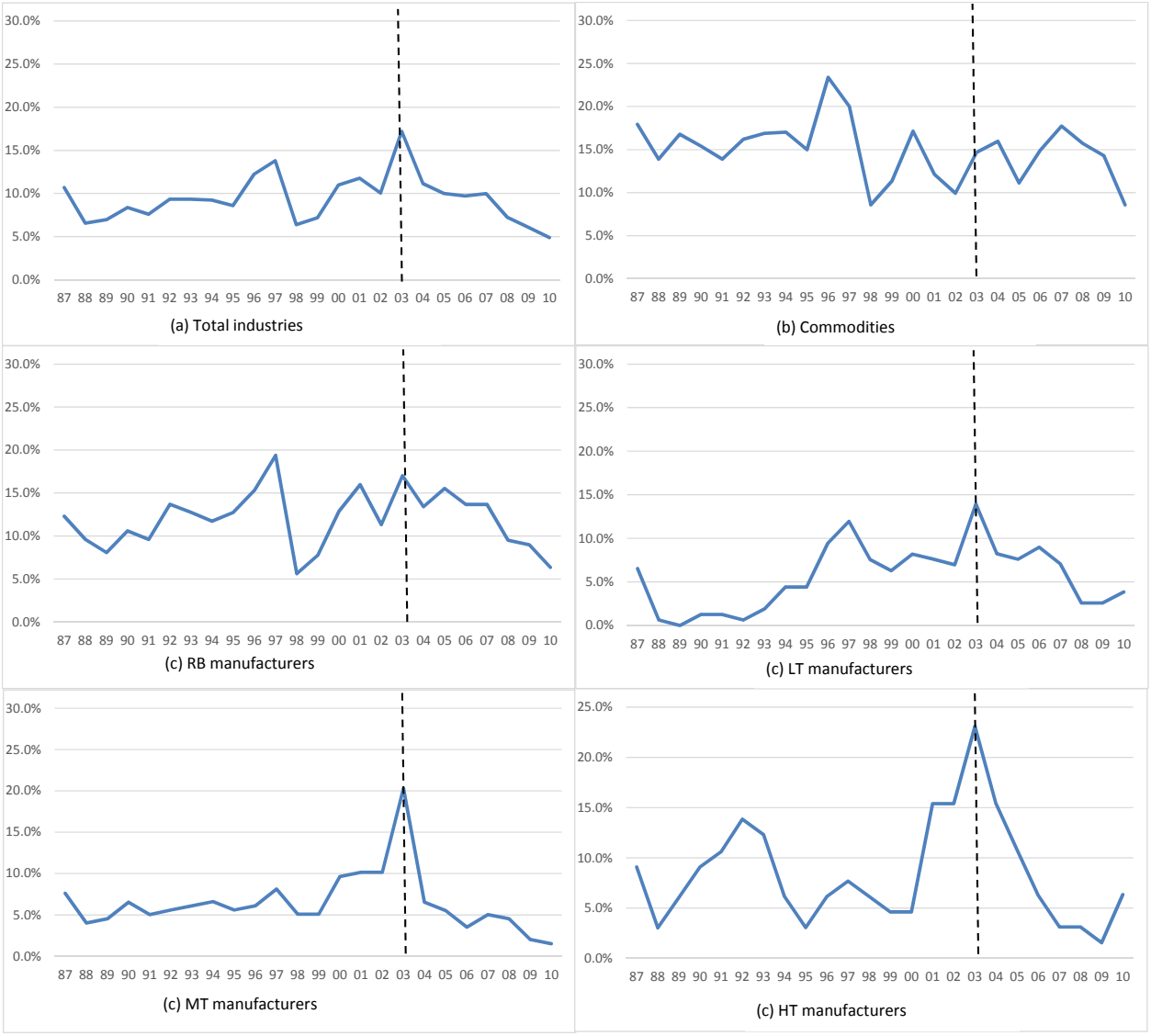
A3: Export surges for the sample of 46 countries starting in 1987, with and without China

Figure A3.1: Proportion of export industries with surges, expanded countries sample (1987-2015), (in percentage)



Source: UN Comtrade data, own calculations.

Figure A3.2: Proportion of export industries with surges, excluding exports to China (in percentage)



Source: UN Comtrade data, own calculations.

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