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The Great Export Recovery in German Manufacturing Industries, 2009/2010

by

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The Great Export Recovery in German Manufacturing Industries, 2009/2010*

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Abstract:

This paper uses comprehensive high-quality panel data from official statistics for exporting enterprises to investigate the micro-structure of the recent export recovery in 2010 in manufacturing industries in Germany after the great recession of 2008/2009. Almost all of the increase in exports was due to positive changes of exports in firms that continue to export (i.e. at the so-called intensive margin) while the increase of exports due to export starters (at the so-called extensive margin) was tiny. It is shown that Idiosyncratic shocks to very large firms played a decisive role in shaping the export recovery. These findings are remarkably symmetric to the results from an analysis of the great export collapse of 2008/09.

JEL classification: F14, E32
Keywords: Exports, great export recovery, granular economy, Germany

* All computations were done inside the Research Data Centre of the Statistical Office of Berlin-Brandenburg. The data used are confidential but not exclusive; see Zühlke et al. (2004) for a description of how to access the data.

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1. Motivation

Following the collapse of exports and imports during the Great Recession in 2009 global trade flows rebounded strongly in 2010. According to the WTO's World Trade Report 2011 the rise in the volume in goods exports in 2010 was the largest on record, enabling world trade to return to its pre-crisis level (World Trade Organization 2011, p. 19). German exports are a case in point. 2009 was the year with the sharpest decline in foreign trade in the history of the Federal Republic of Germany; the value of total exports declined by 18.4 percent compared to 2008. This was followed by the sharpest increase in exports in 2010, where exports increased by 18.5 percent (Statistisches Bundesamt 2012, p. 414).

While a number of studies analyze the Great Trade Collapse of 2008/2009 from a macroeconomic point of view and some studies take a microeconomic perspective and that try to understand what was going on under the veil of the macroeconomic developments by looking at firm level data[1] there is, to the best of my knowledge, no investigation of the Great Export Recovery that is based on firm-level data.[2] This paper contributes to the literature by using comprehensive high quality data for all firms (with a minimum workforce of twenty persons) from manufacturing industries in Germany, a leading actor on the world market for goods, to document the dynamics of exports during the period 2009/2010.

To anticipate the most important results this study demonstrates that a very large share of the increase in exports from manufacturing firms in Germany in 2010 was due to positive changes of exports in enterprises that continued to export (i.e. at the so-called intensive margin) while the decrease of exports due to export stoppers

[1] See Wagner (2012a) for a discussion of this literature and a study for Germany that uses firm-level data.

[2] For studies using macroeconomic data see World Trade Organization (2011) with evidence for many countries and Loschky (2011) for a detailed evidence on Germany.

(at the so-called extensive margin) was tiny. In West Germany where exports (measured at constant prices) increased by 16 percent a small fraction made of four percent of all exporting firms from the size class with 500 or more employees was responsible for 74 percent of the gross increase in exports. Idiosyncratic movements of the top 10 firms in an industry can explain a large fraction of export fluctuations here. The big picture was rather similar in East Germany where exports play a smaller role than in West Germany.

The rest of the paper[3] is organized as follows: Section 2 introduces the enterprise level data used in this study. Section 3 presents the empirical approach applied to decompose the overall change of exports into components that enables a look behind the veil of macroeconomic aggregates and discusses the results of the decomposition of export dynamics. Section 4 investigates the role of idiosyncratic shocks to the largest firms for the overall change in exports. Section 5 concludes.

2. Data

The data used in this study are based on the monthly report for establishments in manufacturing industries, a survey conducted regularly by the German statistical offices that is described in detail in Konold (2007). This survey covers all establishments from manufacturing industries that employ at least twenty persons in the local production unit or in the company that owns the unit. Participation of firms in the survey is mandated in official statistics law. For this study the information collected at the establishment level has been aggregated at the enterprise level (see Malchin and Voshage (2009) for details). The unbalanced panel data set includes all firms that were active in at least one year over the period 2009 and 2010. The

[3] The following sections closely follow the companion paper on the Great Export Collapse (Wagner 2012a).

nominal export values reported in the survey were deflated using the index of export prices (2005 = 100) reported by the Deutsche Bundesbank.[4]

Although the data are comprehensive for the manufacturing sector of the German economy, some limitations have to be pointed out. First of all, although the data are based on monthly reports of the firms, the data can only be accessed by researchers in the research data centres of the statistical offices after aggregation to annual values. Another limitation is the absence of any information on products exported and destination countries. Therefore, it is not possible to investigate the role of other extensive margins besides starting and stopping to export, i.e. adding or dropping products or destinations. Furthermore, in this data set, export refers to the amount of sales to a customer in a foreign country plus sales to a German export trading company; indirect exports (for example, tires produced in a plant in Germany that are delivered to a German manufacturer of cars who exports some of his products) are not covered by this definition.

3. Decomposition of export dynamics

3.1 Method of analysis

With the panel data set described in section 2 firms can be followed over time. The basic idea on how to look behind the veil of aggregate figures of export dynamics familiar from publications of official statistics is to apply a technique widely used in the analysis of job turnover[5] in a slightly modified way. When firms are compared between the two years 2009 and 2010 there are some which did not export in both

[4] See Deutsche Bundesbank, Monatsbericht, September 2012, p. 66*.

[5] A comprehensive description of this method of analysis for job creation and destruction can be found in OECD (1987). This decomposition of changes in total exports leads to the distinction of five different types of firms that is both intuitively clear and economically meaningful. If we were interested in

years. These firms are ignored in the analysis. Each of the other firms belongs to one of five types:

(1) *Export starters* (firms that did not report exports in 2009 but in 2010).

(2) *Enterprises with increased exports* between 2009 and 2010.

(3) *Enterprises with constant exports* in both years.

(4) *Enterprises with decreased exports* between 2009 and 2010.

(5) *Export stoppers* (firms that did report exports in 2009 but not in 2010).[6]

The net change in total exports between the two years is the sum of the positive gross changes by the first two types and the negative gross changes by the last two types of firms. The percentage rate of change in total exports can be decomposed accordingly to show the relative contribution of each of these types of firms to total export dynamics.[7]

This decomposition analysis can be performed for all enterprises from manufacturing industries and for various subgroups of firms. In this paper results are

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changes in the share of exports in total sales over time instead we would have used a decomposition method familiar from studies on aggregate productivity growth; see Haltiwanger (1997).

[6] Due to the construction of the panel data set some remarks on the interpretation of *export starters* and *export stoppers* are necessary: The group of export starters includes plants which exported in earlier years but which did not have to report to the survey because they were too small (for example, a firm with 18 employees in 2008 and 21 in 2009), did not belong to the manufacturing sector (for example, an establishment that earned more than half of its revenues from farm sector activities in 2008 but more than half from manufacturing activities in 2009), or relocated to Germany from a foreign country between 2008 and 2009. Similarly, the group of export stoppers includes plants which continued to export in later years but which did not have to report to the survey any longer because they became too small, did not belong to the manufacturing sector any more, or relocated out of Germany. This fuzzyness in the classification of firms as export starters and stoppers could be reduced only by checking the files kept in the statistical office by hand - which is not possible due to time constraints (binding for the people from official statistics) and data protection laws (binding for me).

[7] The same method was used in an analysis of export dynamics before; see Wagner (2012a) for a discussion. Note that none of these studies investigates the great export recovery of 2009/2010.

reported for enterprises from six size classes (measured by the number of employees: 1-19, 20 - 49, 50 - 99, 100 - 249, 250 - 499, and 500 and more)[8].

3.2 Results

Results for West Germany[9] are reported in Table 1. From the first row it can be seen that exports from manufacturing enterprises rose dramatically by 16 percent from 2009 to 2010 during *The Great Export Recovery*. Most of this increase is due to positive changes of exports in enterprises that continue to export (i.e. at the so-called intensive margin) while the inrease of exports due to export starters (at the so-called extensive margin) is tiny. Surprisingly (at least for readers not familiar with the job creation and destruction literature, or with earlier studies on export dynamics based on firm level panel data) even in this period of an extreme export increase there were thousands of enterprises with decreased exports – more than one third of all firms fall into this group (see second row of Table 1). The decrease of exports due to these firms, however, is small compared to the increase in exports due to firms with increased exports.[10]

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[8] Enterprises are classified into a size class according to the average number of employees in the two years under consideration. If the number of persons was missing in the data set in one year (for reasons, see footnote 7), the figure from the other year was used. The number of employees in the base (first) year was not used to compute the size class because of the role of transitory employment shocks and the related regression-to-the-mean fallacy. For a discussion of this problem in the context of job creation and destruction in the US see Davis et al. (1996); Wagner (1995) shows that this is relevant for German firm level panel data, too.

[9] The economy differs between West Germany and the former communist East Germany even some 20 years after the unification in 1990, and this holds especially for exports (see Wagner (2008) for a detailed analysis). Therefore, all results were computed fro West Germany and East Germany separately.

[10] Note that there are no firms with constant exports. This is due to the use of a deflator when transforming the nominal export values reported by the enterprises into the real export values (measured in constant 2005 prices) used in the calculations here.

[Table 1 near here]

Results for enterprises from the five size classes that are reported in the lower panel of Table 1 show a rather similar broad picture with regard to the role of the extensive and intensive margins of exports and regarding the share of firms with decreased or increased exports. Note that the share of firms with decreased exports declines with an increase in the firm size class, while the opposite holds for the share of firms with increased exports.

The small group of firms with 500 or more employees are of a dominant importance for the total increase in exports. The share of these firms in all exports was 70.7 percent in 2009 and 72.4 percent in 2010. From the figures reported in row one of Table 1 it can be seen that the net increase of exports by 76.4 Mrd. Euro is the result of a gross decrease of exports by 27.6 Mrd. Euro and a gross increase by 104 Mrd. Euro. From this total gross increase in exports according to the last but one row of Table 1 77 Mrd. Euro are due to firms with increased exports from the largest size class. This means that 887 firms from the total of 22,748 firms – or four percent of all exporting firms – are responsible for around 74 percent of the gross increase in exports.

Results for East Germany are reported in Table 2. The big picture is the same as for West Germany. Changes at the extensive margin due to export starters and export stoppers contributed only marginally to the overall development of exports. The rate of change of exports was driven by developments at the intensive margin. The role of a small number of large firms in the Great Export Recovery was even more pronounced in East Germany. 67 firms (or 1.7 percent of all exporting firms) with at least 500 employees were responsible for 64.4% of the gross increase of exports.

[Table 2 near here]

The look behind the veil of macroeconomic aggregates by using firm level data to decompose the overall change in exports into its components reveals one striking fact: A small fraction of firms from the largest size class is responsible for shaping the big picture. To put these findings into perspective, Table 3 documents evidence on the concentration of exports and domestic sales in enterprises from German manufacturing industries in 2009 and 2010. The shares of the 3, 10, 50 and 100 largest exporters (by value of export sales) and largest firms in domestic sales (by value of domestic sales) are reported separately for West Germany and East Germany.

[Table 3 near here]

In both parts of Germany a small number of very large firms are responsible for a large share of both exports and domestic sales. This concentration is higher in exports than in domestic sales, and it is higher in East Germany than in West Germany. This illustrates that a small fraction of large enterprises is responsible to a high degree for the macroeconomic development, a point that is elaborated on in the next section.

4. The granular nature of manufacturing exports in Germany

Standard macroeconomic reasoning usually discards the possibility that idiosyncratic microeconomic shocks to firms may lead to large aggregate fluctuations by referring to a diversification argument.[11] A classical case in point is the argument put forward by Robert Lucas (1977) that such microeconomic shocks would average out and, therefore, would only have negligible aggregate effects. In a recent Econometrica paper Xavier Gabaix (2011) proposes that, contrary to this traditional view, idiosyncratic firm-level shocks can indeed explain an important part of aggregate economic movements and provide a micro-foundation for aggregate shocks. He shows that the "averaging out" argument breaks down if the size distribution of firms is fat-tailed and very large firms play an important role in an economy. This is the case in the United States, where, according to the findings of Gabaix (2011), the idiosyncratic movements of the largest 100 firms appear to explain about one-third of variations in output growth. Wagner (2012b) reports similar evidence for the manufacturing sector in Germany and finds that idiosyncratic shocks in the largest firms are important for an understanding of aggregate volatility in German manufacturing industries.

Gabaix (2011) argues that many economic fluctuations are attributable to the incompressible "grains" of economic activity, the large firms. Therefore, he names this view the "granular" hypothesis. The granular view does not neglect the role of aggregate shocks like changes in monetary, fiscal, and exchange rate policy as important drivers of macroeconomic activity. It only argues that such aggregate shocks are not the only important drivers, and that firm specific idiosyncratic shocks, too, are an important, and possibly the major, part of the origin of business-cycle fluctuations (Gabaix 2011, p. 764).

As said the "averaging out" argument of standard macroeconomic reasoning breaks down if the size distribution of firms is fat-tailed and very large firms play an

[11] This section builds on the investigation of the granular nature of the German manufacturing sector in Wagner (2012b).

important role in an economy. From the percentage shares of the largest enterprises in total exports in manufacturing industries West Germany[12] in 2009 and 2010 that are documented in Table 3 it is evident that the exports of manufacturing enterprises are highly concentrated. The very large firms, therefore, represent a large part of the export activity in the manufacturing sector.

In Table 4 the estimated power law exponents for exports are reported for all firms and for firms from 24 manufacturing industries.[13] A power law is a relation of the type $Y = k*X^{ß}$, where Y and X are variables of interest, ß is the power law exponent, and k is a constant.[14] A popular way to estimate the power law exponent ß for the firm size distribution (where firm size is measured by exports here) is to compute the rank of each firm in the size distribution and to run an OLS regression of log(rank) on a constant and log(size). The estimated regression coefficient of log(size) is an estimate for ß. Gabaix and Ibragimov (2011) show that this procedure leads to strongly biased estimates in small samples. They provide a simple practical remedy for this bias by suggesting to use rank – ½ instead of rank and then run log(rank – ½) = *k* - ß*log(size). They show that the shift of ½ is optimal and reduces the bias to a leading order. Note that the standard error of ß is not the OLS standard error reported by the computer program, but is asymptotically given by $(2/n)^{½} *|b|$ (where n is the number of firms used in the estimation).

[Table 4 near here]

[12] This section looks at West Germany only. A separate analysis of the exports from the East German manufacturing sector is not possible because the number of firms in many industries is far too small.
[13] The industries are at the 2-digit level. For a definition of industries see the appendix table.
[14] Gabaix (2009) is a comprehensive survey of power laws and applications in economics and finance.

The estimated power-law coefficient for exports is statistically significantly different from zero at an error level of less than 1 percent in German manufacturing as a whole and in every industry. According to the R^2-value the fit is rather tight. These results indicate that exports are power-law distributed in all industries. Descriptive results, therefore, indicate that the distribution of exports from the German manufacturing sector as a whole and from the various industries that are part of it can be characterised as fat-tailed.

To test for the granular nature of exports from German manufacturing industries the data for enterprises from 22 of the 24 manufacturing industries that are described above are used and the role of the 10 largest firms in each industry is considered.[15] The empirical approach closely follows Gabaix (2011, p. 750ff.). The idiosyncratic firm-level sales shock is measured by the "granular residual" that is computed as follows. g_{it} is the growth rate of exports for firm i and year t, computed as log($exports_{it}$) – log($exports_{it-1}$). $g10_t$ is the average of the growth rates of the 10 largest firms (according to exports in year t-1) in an industry. The granular residual is a weighted sum of the 10 largest firm's growth rate minus $g10_t$, where the weights are the shares of the firms in total exports of all firms in an industry in year t-1. Here, t refers to 2009 and t-1 refers to 2008.

The growth rate of total exports in an industry, defined as log(total exports in 2010) minus log(total exports in 2009), is regressed on the granular residual from the industry using Ordinary Least Squares (OLS). Results are reported in the first column of Table 5. They are not supportive of the granular hypothesis. The estimated coefficient for the granular residual is not statistically significant. If only aggregate shocks were important for the growth rate of total exports in an industry, then the R^2

[15] Industry 12 (manufacture of tobacco products) and industry 19 (manufacture of coke and refined petroleum products) were dropped due to the small number of firms from these industries.

of the regressions in Table 5 would be zero. It is. Idiosyncratic movements of the top 10 firms in an industry cannot explain a large fraction of export fluctuations.

However, it is well known that results estimated by OLS can be highly sensitive to a small fraction of observations that lay far away from the majority of observations in the sample. As a robustness check, therefore, we investigate whether the results reported depend on extreme observations, or outliers. Rousseeuw and Leroy (1987) distinguish three types of outliers that influence the OLS estimator: vertical outliers, bad leverage points, and good leverage points. Verardi and Croux (2009, p. 440) illustrate this terminology in a simple linear regression framework that is used here (the generalization to higher dimensions is straightforward) as follows: "Vertical outliers are those observations that have outlying values for the corresponding error term (the *y* dimension) but are not outlying in the space of explanatory variables (the *x* dimension). Their presence affects the OLS estimation and, in particular, the estimated intercept. Good leverage points are observations that are outlying in the space of explanatory variables but that are located close to the regression line. Their presence does not affect the OLS estimation, but it affects statistical inference because they do deflate the estimated standard errors. Finally, bad leverage points are observations that are both outlying in the space of explanatory variables and located far from the true regression line. Their presence significantly affects the OLS estimation of both the intercept and the slope."

Using this terminology one can state that the popular median regression estimator (also known as Least Absolute Deviations or LAD) protects against vertical outliers but not against bad leverage points (Verardi and Croux 2009, p. 441). Full robustness can be achieved by using the so-called S-estimator that can resist contamination of the data set of up to 50% of outliers (i.e., that has a breakdown point[16] of 50 % compared to zero percent for OLS). A discussion of any details of this estimator is beyond the scope of this paper (see Verardi and McCathie (2012) for this estimator and for Stata commands to compute it).

Results computed by the S-estimator are reported in the second column of Table 5. The robust estimator identifies seven outliers. These outliers are the observations from the industries 11 (beverages), 14 (wearing apparel), 18 (printing and reproduction of recorded media), 21 (basic pharmaceutical products), 29 (motor vehicles), 30 (other transport equipment) and 31 (furniture). When these outliers are dropped from the estimation sample the estimated regression coefficient for the granular residual is highly statistically significant. The R^2 value from the robust S-regression is considerably larger than the corresponding value from the OLS regression. According to the results from the robust regression, idiosyncratic movements of the top 10 firms in an industry can explain about half of total export fluctuations. This points out that the manufacturing part of the German export sector is a granular economy.

[Table 5 near here]

5. Concluding remarks

This study shows that a very large share of the increase in exports from manufacturing firms in Germany in 2010 was due to positive changes of exports in enterprises that continued to export (i.e. at the so-called intensive margin) while the increase of exports due to export starters (at the so-called extensive margin) was tiny. In West Germany where real exports increased by 16 percent a small fraction

[16] The breakdown point of an estimator is the highest fraction of outliers that an estimator can withstand, and it is a popular measure of robustness.

made of four percent of all exporting firms from the size class with 500 or more employees was responsible for around 74 percent of the gross increase in exports. The big picture was the same in East Germany. In West Germany idiosyncratic movements of the top 10 firms in an industry can explain a large fraction of export fluctuations.

These findings are remarkably symmetric to the results from the analysis of the great export collapse in German manufacturing firms discussed in Wagner (2012a). They demonstrate again that theoretical models should drop the assumption of homogeneous representative firms and consider heterogeneous firms instead – like, for example, in the rich literature from the *new new trade theory* surveyed in Redding (2011). Policy makers should be aware of the decisive role of a small number of very large firms for the development of the economy as a whole. These firms should be closely monitored. In a discussion of changes in laws and policy measures, and in evaluations of such changes, special emphasis should be put on the impact on the big players.

The bottom line, then, is that the by now familiar decomposition analysis and the granular approach recently introduced by Gabaix (2011) offer a highly useful tool for the analysis of export dynamics that should be used to deal with related topics (like the dynamics of investment and employment), too, that are highly relevant for theorists, empiricists and policy makers (and their advisors).

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Table 1: Decomposition of Export Dynamics in German Manufacturing Industries: West Germany – 2009 / 2010

	[1] Total exports in 2009 (Million Euro)	[2] Total exports in 2010 (Million Euro)	[3] Rate of change of exports (percent)	[4] Increase of exports due to export starters (% of [1])	[5] Increase of exports due to firms with increased exports (% of [1])	[6] Decrease of exports due to firms with decreased exports (% of [1])	[7] Decrease of exports due to export stoppers (% of [1])
All enterprises (No. of firms / share in %)	477,253	553,655	16.01	0.10 (625/2.87)	21.68 (12,716/58.47)	-5.39 (7,775/35.75)	-0.39 (632/2.91)
Enterprises with							
1 – 49 employees (No. of firms / share in %)	9,611	10,366	7.86	1.20 (430/5.16)	21.16 (4,194/50.32)	-12.77 (3,291/39.49)	-1.73 (419/5.03)
50 – 99 employees (No. of firms / share in %)	20,280	22,078	8.86	0.56 (140/2.42)	19.81 (3,471/59.91)	-10.61 (2,304/35.11)	-0.90 (149/2.57)
100 – 249 employees (No. of firms / share in %)	50,085	55,340	10.49	0.33 (38/0.83)	19.24 (2,984/65.27)	-8.90 (1,505/32.92)	-0.17 (45/0.98)
250 – 499 employees (No. of firms / share in %)	59,759	64,911	8.62	0.14 (12/0.68)	18.05 (1,180/67.31)	-9.43 (551/31.43)	-0.14 (10/0.57)
>= 500 employees (No. of firms / share in %)	337,519	400,961	18.80	0.005 (5/0.39)	22.81 (887/68.49)	-3.62 (394/30.42)	-0.39 (9/0.69)

Table 2: Decomposition of Export Dynamics in German Manufacturing Industries: East Germany – 2009 / 2010

	[1] Total exports in 2009 (Million Euro)	[2] Total exports in 2010 (Million Euro)	[3] Rate of change of exports (percent)	[4] Increase of exports due to export starters (% of [1])	[5] Increase of exports due to firms with increased exports (% of [1])	[6] Decrease of exports due to firms with decreased exports (% of [1])	[7] Decrease of exports due to export stoppers (% of [1])
All enterprises (No. of firms / share in %)	75,753	88,034	16.21	0.20 (210/5.28)	18.84 (2,223/55.90)	-2.72 (1,343/33.77)	-0.11 (201/5.05)
Enterprises with							
1 – 49 employees (No. of firms / share in %)	1,297	1,605	23.73	3.01 (136/8.13)	34.69 (832/49.76)	-12.14 (571/34.15)	-1.84 (133/7.95)
50 – 99 employees (No. of firms / share in %)	3,262	4,177	28.06	0.67 (50/4.51)	36.80 (645/58.21)	-9.00 (364/32.85)	-0.41 (49/4.42)
100 – 249 employees (No. of firms / share in %)	7,300	8,328	14.09	1.20 (##/##)	22.96 (531/60.55)	-9.46 (##/##)	-0.61 (##/##)
250 – 499 employees (No. of firms / share in %)	6,082	7,370	21.18	0.0006 (##/##)	27.41 (148/66.67)	-6.16 (##/##)	-0.07 (##/##)
>= 500 employees (No. of firms / share in %)	57,812	66,554	15.12	0.00 (0/0.0)	16.06 (67/68.37)	-0.93 (31/31.63)	0.00 (0/0.0)

Note: ## indicates a value that is classified as confidential by the Statistical Office

Table 3: Concentration of domestic and export sales in enterprises from German manufacturing industries, 2009 – 2010

Year	Share of largest # exporters in total exports (percent)				Share of largest # enterprises in total domestic sales (percent)			
	3	10	50	100	3	10	50	100
West Germany								
2009	12.77	25.18	37.66	44.72	7.75	14.01	25.31	30.76
2010	15.36	28.31	40.60	47.23	8.89	15.23	26.46	31.84
East Germany								
2009	##.##	62.86	74.82	80.02	16.23	23.30	36.51	43.68
2010	##.##	62.78	74.82	79.93	16.50	23.06	36.14	43.52

Note: ##.## indicates a confidential value

Table 4: Estimated power law exponents for exports in manufacturing industries, West Germany, 2010

Industry	ß	t-value	R^2	Number of enterprises
All	-0.354	-102.76	0.741	21,118
10	-0.356	-22.77	0.765	1,037
11	-0.246	-10.74	0.720	231
12	-0.525	-2.55	0.859	13
13	-0.345	-15.12	0.817	457
14	-0.342	-10.46	0.765	219
15	-0.364	-7.11	0.833	101
16	-0.251	-17.73	0.755	629
17	-0.410	-17.03	0.800	580
18	-0.178	-19.74	0.665	779
19	-0.689	-3.81	0.909	29
20	-0.595	-21.00	0.862	882
21	-0.538	-9.33	0.810	174
22	-0.342	-30.79	0.773	1,896
23	-0.301	-19.53	0.737	763
24	-0.488	-18.47	0.829	682
25	-0.257	-43.22	0.722	3,736
26	-0.454	-23.47	0.805	1,102
27	-0.383	-25.58	0.762	1,309
28	-0.402	-44.09	0.767	3,888
29	-0.501	-18.26	0.787	667
30	-0.568	-8.75	0.844	153
31	-0.267	-17.03	0.740	580
32	-0.308	-18.21	0.680	663
33	-0.295	-16.55	0.647	548

Note: For a definition of the industries see the appendix table. The power law exponent ß and its standard error are estimated by the method suggested in Gabaix and Ibragimov (2011); see text.

Table 5: Explanatory power of the granular residual for export growth in manufacturing industries, West Germany, 2009/2010

Independent variable: export growth 2009/2010 (percentage)

		Estimation method: OLS	Estimation method: S-estimator
Granular residual 2009/2010	ß	12.972	14.212
	P	0.254	0.002
Constant	ß	-78.88	-118.77
	P	0.625	0.050
Number of industries		22	15
R^2		0.080	0.544

Note: ß is the estimated regression coefficient, p is the prob-value. For a definition of the industries see the appendix table. For a definition of the granular residual see text.

Appendix: Definition of manufacturing industries and number of exporting enterprises in 2010

No.	Industry	No. of enterprises
10	Manufacture of food products	1,037
11	Manufacture of beverages	231
12	Manufacture of tobacco products	13
13	Manufacture of textiles	457
14	Manufacture of wearing apparel	219
15	Manufacture of leather and related products	101
16	Manufacture of wood and products of wood, except furniture	629
17	Manufacture of paper and paper products	580
18	Printing and reproduction of recorded media	779
19	Manufacture of coke and refined petroleum products	29
20	Manufacture of chemicals and chemical products	882
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	174
22	Manufacture of rubber and plastic products	1,896
23	Manufacture of other non-metallic mineral products	763
24	Manufacture of basic metals	682
25	Manufacture of fabricated metal products, except machinery and equipment	3,736
26	Manufacture of computer, electronic and optical products	1,102
27	Manufacture of electrical equipment	1,309
28	Manufacture of machinery and equipment n.e.c.	3,888
29	Manufacture of motor vehicles, trailers and semi-trailers	667
30	Manufacture of other transport equipment	153
31	Manufacture of furniture	580
32	Other manufacturing	663
33	Repair and installation of machinery and equipment	548
		21,118

Note: The 2-digit-industries are defined according to the German classification WZ 2008.

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