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by  
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# Transaction data for Germany's exports and imports of goods

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## 1. Transaction data for Germany's exports and imports of goods

In Germany information on the goods traded internationally and on the countries with which these goods are traded is available from the statistic on foreign trade (*Außenhandelsstatistik*). This statistic is based on two sources. One source is the reports by German firms on transactions with firms from countries that are members of the European Union (EU); these reports are used to compile the so-called *Intrahandelsstatistik* on intra-EU trade. The other source is transaction-level data collected by the customs on trade with countries outside the EU (the so-called *Extrahandelsstatistik*).<sup>1</sup> The raw data that are used to build the statistic on foreign trade are transaction level data, i.e. they relate to one transaction of a German firm with a firm located outside Germany at a time. Published data from this statistic report exports or imports aggregated at the level of goods traded and by country of destination or origin.

Recently, the German Federal Statistical Office prepared data based on the raw data from the statistic on foreign trade that can be accessed by researchers inside the research data center of the Office. The unit of observation in these data is a transaction between economic agents located in two countries, e.g. the export of X kilogram of good A with a value of Y Euro from Germany to China. In exports, the data cover 24,885,099 transactions in 2009 and 35,120,715 transactions in 2014. In imports, the data cover 9,839,271 transactions in 2009 and 13,428,004 transactions in 2014.

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<sup>1</sup> Note that firms with a value of exports to and imports from EU-countries that did not exceed 400,000 Euro in the previous year or in the current year do not have to report to the statistic on intra-EU trade. For trade with firms from non-member countries all transactions that exceed 1,000 Euro (or have a weight that exceeds 1,000 kilogram) are registered. For details see Statistisches Bundesamt, Qualitätsbericht Außenhandel, Januar 2011.

The data cover trade with all countries (243 different countries in exports and 239 different countries in imports). For a given year, the sum over all export or import transactions is identical to the figures published by the Federal Statistical Office for total exports or imports of Germany.

The record of the transaction usually<sup>2</sup> includes a firm identifier (tax registration number) of the exporting (or importing) firm. Over the years 2009 to 2014 the data include information on export activities of 212,742 different firms and information on import activities of 251,646 different firms. Using the firm identifier information at the transaction level can be aggregated at the level of the trading firm to generate year-firm-product-value-weight-destination (or –origin) data. The firm identifier is used to link information on export and import transactions of a firm, too.

In short, the data do not only show “who trades and how much”, but also “who trades how much of which goods of which value and which weight with which countries”. Note that this information is available not only for firms from manufacturing industries, but for firms from all parts of the economy, that trade goods internationally.<sup>3</sup>

The firm identifier that is included with the data can be used to link information on the firms from other sources with the transaction data. These other sources include surveys performed by the statistical offices. For example, for firms from manufacturing industries the monthly report submitted to the statistical offices includes information on the number of employees and on total turnover that can be used to compute turnover productivity of the firm and to investigate the links between productivity and various margins of exports and imports. Panel data based on the

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<sup>2</sup> Note that this identifier is missing for 0.67 percent of all export transactions and 1.2 percent of all import transactions for various reasons including that traders do not have a (German) tax identification number. Further details were not revealed to me.

<sup>3</sup> Note that exports and imports of services are not covered by the statistic on foreign trade.

monthly report data can be used to generate a proxy for the age of the firm and to investigate the links between firm age and margins of trade. For a representative sample of manufacturing firms covered by the cost structure survey we have information on the number of employees active in research and development (R&D) in a firm and on spending for R&D that can be used to investigate the link between innovation activities and trade margins. From the same source the rate of turnover profitability of a firm can be computed and the links between profits and margins of foreign trade can be investigated.

Besides data from surveys performed by the statistical offices firm level data from other sources, including data from commercial data providers, can be linked to the transaction level data. Examples include information on credit rating scores of firms from *Creditreform*, a leading credit rating agency in Germany, that are used to investigate the role of credit constraints for margins of exports and imports. Evidently, linking the transaction level data on exports and imports with information from other data sources (that are provided by the statistical offices or by external providers) enhances the potential of the transaction level data for economic analyses by an order of magnitude.

In the transaction level data products are distinguished according to very detailed classifications. In the data used for the studies surveyed in this paper, the Harmonized System at 6-digit level (HS6) is used as the product classification system. The data cover 5,370 different goods in exports and 5,389 different goods in imports.

The Federal Statistical Office prepared this type of data for the reporting year 2009 for the first time; the most recent data available at the time of writing this paper are for 2014. Using the firm identifier panel data can be constructed. Table 1

summarizes important characteristics of the transaction data for German exports and imports.

[Table 1 near here]

## **2. A bird's eye view on studies based on transaction data for German exports and imports of goods**

Since 2012 the transaction data for German exports and imports of goods that were prepared by the Federal Statistical Office have been used in a number of empirical studies to shed light on various aspects of trade activities of firms, to uncover new facts and to test hypotheses from theoretical models.<sup>4</sup>

A recent literature survey by Wagner (2018d) summarizes most of these studies under nine topics: the role of “superstars” in trade; the average number of goods traded and countries traded with; the dynamics of trade in the short run; new insights on the links between firm characteristics (productivity, credit constraints, firm age, innovation, foreign ownership, and profitability) and extensive margins of trade; quality of traded goods; evidence on hitherto undocumented types of foreign trade activities; the “lumpiness” of trade; the role of distance and time zone difference for firm-level trade; and econometric tests of implications of models of multi-product, multi-destination exporters. The appendix is a tabular survey of 34 empirical studies (listed in the references) that use these transaction level data for Germany's exports and imports of goods.<sup>5</sup>

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<sup>4</sup> Similar data for other countries have been used in a large number of studies; see Wagner (2016g) for a comprehensive survey of the international literature.

<sup>5</sup> Many of these papers are reprinted in Wagner (2019d).

### **3.     Whatever next?**

Results from empirical studies demonstrate that transaction level data for exports and imports of goods are a highly useful addition to the box of tools of empirical trade economists. This holds for transaction level data “as such” and more so for studies that use the transaction data together with information on the countries of destination of exports or on the countries of origin of imports. Many studies illustrate that the value of these data for research can be increased even more substantially when they are augmented by information on firm characteristics that are not recorded by the customs, including data from regular surveys by the statistical offices (for, e.g., productivity, firm age, innovations, and profitability) or data from other external sources (on, e.g., credit rating scores or foreign ownership status of firms).

Combining transaction data with data for country characteristics is easy because the countries of destination and origin of goods are identified directly in the data. Linking transaction data with data on firm characteristics is easy, too, when the firm identifier in the transaction data prepared by the Federal Statistical Office can be used directly (so that linkage is technically easy) and when the firm level data to be linked are either collected by official statistics or are publicly available (including data from commercial sources) so that the linkage is legally possible. Linked data of this kind have been used in many studies (see Table 2).

The situation is more difficult if the firm identifier in the transaction data is not identical with the firm identifier in the firm level data to be matched. Sometimes, the enterprise register system can provide a solution here because it includes the turnover tax registration number (that is in the transaction data) and other firm identifiers (like the registration number in the “Handelsregister”) that might be in the data to be linked to the transaction data. If the linkage is legally possible, it is



technically feasible here, too, as is illustrated by the case of linking transaction data and credit rating scores (see Wagner 2015a, 2015d).

The situation is different if the data to be linked to the transaction data are neither provided by the statistical offices nor publicly available. Irrespective of the existence or not of an identical firm identifier in these data (or of the availability of some kind of workaround), as a rule matching is not legal then, and, therefore, impossible. This situation arises when confidential data from different data producing agencies should be matched, e.g. data from the federal employment agency (“Bundesagentur für Arbeit”) for firms and transaction data for exports and imports of these firms from the statistical office. The only way out here is to ask all firms for their written consent to match information across the boundaries of the data producing agencies – which means that such matching is next to impossible in practice.

However, things are changing here. According to the latest revision of the federal statistics law (“Bundesstatistikgesetz” BStatG) it is now legally possible to match firm level data from the statistical offices with firm level information gathered by the central bank (“Bundesbank”) – see §13a BStatG. Among others, this offers the possibility to match data on international transactions of goods from the statistic on foreign trade with data on international transactions of services collected by the Bundesbank in the future. Furthermore, transaction data from the statistic on foreign trade can be matched with information on foreign direct investments (FDI) by firms collected by the Bundesbank to investigate the links between trade in goods, trade in services, and FDI.

In any case one should try to build the tailor-made data set that fits the research question best with the firm level data that are available from various sources and that can be matched, technically and legally. The payoff might be high, and much higher than the costs.

#### **4. Access to transaction level data for Germany's exports and imports of goods**

The micro data on export and import transactions are strictly confidential but not exclusive; see <http://www.forschungsdatenzentrum.de/datenzugang.asp> for information on the general conditions governing access to micro data from official statistics. For detailed information on how to access the transaction level data for exports and imports please contact Melanie Scheller at Destatis ([Melanie.Scheller@destatis.de](mailto:Melanie.Scheller@destatis.de)).

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Table 1: Important characteristics of the transaction data for German exports and imports

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Unit of observation	Export or import transaction
Information included	Value (€), weight (kg), good (HS6 classification), country of destination (export), country of origin (import)
Years covered	2009 -2014
Number of observations	Exports: 24,885,099 (2009); 35,120,715 (2014) Imports: 9,839,271 (2009); 13,428,004 (2014)
Number of countries	243 different countries in exports, 239 different countries in imports
No. of firms	212,742 different firms in exports; 251,646 different firms in imports
No. of goods	5,370 different goods in exports; 5,389 different goods in imports

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## Appendix: Tabular survey of empirical studies using transaction level data on German exports and imports

Author(s) (Year)	Data	Topics	Important findings
Wagner (2012a)	2009; exports by firms; value, value of largest product, number of different goods exported, number of destination countries; matched with firm characteristics	Econometric test of implications of the theoretical model by Bernard, Redding and Schott (QJE 2011)	Number of products exported and number of export destinations are positively and statistically highly significantly related with total exports, exports of the largest product across all markets, and productivity.
Wagner (2012b)	2009; exports and imports by firm; number of goods exported or imported, number of countries trades with, values of transactions; matched with firm characteristics	Productivity premia for multi-product and multi-country traders from manufacturing industries	Firms that trade many goods or that trade with many countries are much more productive than firms of the same size from the same industry that trade some goods or trade with some countries only.
Wagner (2012c)	2009; exports and imports by firms; number of different goods traded and number of countries traded with; matched with firm characteristics	Differences in productivity distributions of firms with different numbers of traded goods and different numbers of countries traded with in manufacturing industries	The larger the number of goods exported or imported, and the larger the number of countries exported to or imported from, the higher is the productivity of the firm - not only on average, but over the whole productivity distribution.
Wagner (2013a)	2009; exports by firms; number of different goods exported and number of destination countries; matched with firm characteristics	Are low productive exporters marginal exporters in manufacturing industries?	Low-productive exporters are not marginal exporters defined according to the number of goods exported or the number of countries exported to.
Wagner (2013b)	2009-2010; imports by firms; value, number of different goods imported, number of countries or origin	Extensive margins of imports in the great import recovery of 2009/2010	Firms that imported in both 2009 and 2010 are much more important for import dynamics than import starters and stoppers; firms that increased their imports imported on average more goods and from more countries of origin in 2009 than firms that decreased their imports, and they increased both extensive margins of imports, while firms with decreased imports reduced both.



Wagner (2014a)	2009-2010; exports by firms; value and volume of exports for the ten most important exported goods; matched with firm characteristics	Low-productive exporters and quality of exported goods in manufacturing enterprises	Low-productive exporters are competitive because they export high-quality goods.
Wagner (2014b)	2009-2010; exports by firms; value and volume of exports for the ten most important exported goods; matched with firm characteristics	Quality of exported goods and firm characteristics in manufacturing enterprises	Exporters of high-quality goods tend to use high-quality inputs
Raff and Wagner (2014)	2009; exports by firms; number of goods exported and number of destination countries; matched with firm characteristics	Foreign ownership and the extensive margins of exports in manufacturing enterprises	Foreign-owned firms do export more goods to more countries after controlling for firm size, productivity and industry affiliation.
Wagner (2014c)	2009-2010; exports by firms; value, number of different goods exported, number of destination countries	Extensive margins of exports in the great export recovery of 2009/2010	Firms that exported in both 2009 and 2010 are much more important for export dynamics than export starters and stoppers; firms that increased their exports exported on average more goods and to more countries in 2009 than firms that decreased their exports, and they increased both extensive margins of exports, while firms with decreased exports reduced both.
Wagner (2014d)	2009-2010; exports by firms; value and volume of exports for the ten most important exported goods; matched with firm characteristics	Quality of exported goods and profitability in manufacturing enterprises	Exporters of high-quality goods tend to be more profitable.
Wagner (2014e)	2009-2010; imports by firms; number of goods imported and number of countries imported from; matched with firm characteristics	Extensive margins of imports and profitability in manufacturing enterprises	Profits not higher in firms that import more goods and from more countries; productivity advantages of importers with large extensive margins are eaten up by extra costs related to buying more goods in more countries.

Wagner (2014f)	2009-2010; exports by firms; value and volume of exports for the ten most important exported goods; matched with firm characteristics	Export diversification and profitability in manufacturing enterprises	Profits tend to be larger in firms with less diversified export sales over goods and in firms with more diversified export sales over destination countries.
Wagner (2014g)	2009-2011; imports by firms; value of imports; matched with enterprise characteristics	Granular nature of imports in manufacturing sector	Imports are power-law distributed, distributions in industries are fat-tailed; idiosyncratic shocks to very large firms important for import dynamics in 2010/2011 but not in 2009/2010.
Wagner (2015a)	2009-2010; imports by firms; value, number of different goods, number of countries of origin; matched with firm characteristics and credit rating score	Credit constraints and margins of imports in manufacturing enterprises	Better credit rating score is positively related to extensive margins of import – firms with better score have higher probability to import, import more goods and source from more countries of origin. Share of imports in total sales is
Wagner (2015b)	2010; imports by firms; number of goods imported and number of countries imported from; matched with firm characteristics	Firm age and margins of imports	Older firms are more often importers, import more different goods, and import from more different countries of origin.
Wagner (2015c)	2010; exports by firms; number of goods exported and number of countries exported to; ten most important countries of exports and value of exports to these countries; matched with firm characteristics and distance to destinations	Firm age and margins of exports	Older firms are more often exporters, export more and more different goods to more destination countries, and export to more distant destination countries.
Wagner (2015d)	2009-2010; exports by firms; number of goods exported and number of destination countries; matched with firm characteristics and credit rating score	Credit constraints and extensive margins of exports in manufacturing enterprises	Credit constraints have a negative impact on both the number of goods exported and the number of export destination countries.
Wagner (2016a)	2010; exports by firms; number of exported goods and number of destination countries; matched with firm characteristics	Differences in extensive and intensive margins of exports in East and West German manufacturing enterprises	West German firms outperform East German firms at all four margins of exports (propensity to export, share of exports in total sales, number of exported goods and number of destination countries).

Wagner (2016b)	2011; 3,204,851 observations for import quality (unit value of imports) at firm-product-country of origin level; matched with information on distance to country of origin and other country characteristics	Relationship between quality of imported goods and distance to country of origin	Import quality increases with distance to countries of origin after controlling for firm-product fixed effects. Distance-related trade costs lead to within-firm selection of product quality across countries of origin. Firms that import multiple vertically-differentiated varieties of a product source higher quality varieties on more distant markets.
Wagner (2016c)	2009 – 2012; data on all import and export transactions by German firms recorded in official trade statistics	Characteristics of trading firms; dynamics of trading firms over time. Figures strictly comparable to the World Bank's Exporter Dynamics Database	Information for Germany as part of the World Bank's Exporter Dynamics Database; furthermore, for the first time strictly comparable results for imports are reported, introducing the Importer Dynamics Database. Paper documents selected results for trade as a whole, and for trade with France, the USA, and China.
Wagner (2016d)	2011; 7,112,614 observations for export quality (unit value of exports) at firm-product-destination country level; matched with information on distance to destination country and other country characteristics	Relationship between quality of exported goods and distance to country of destination	Export quality increases with distance to destination countries after controlling for firm-product fixed effects. Distance-related trade costs lead to within-firm selection of product quality across destinations.
Wagner (2016e)	2011; 3,376,598 observations for value of imports at the firm-product-country of origin level; matched with data for distance to countries of origin and other country characteristics	Use a gravity-equation to investigate the link between amount of firms' imports and distance to countries of origin	In line with stylized facts based on aggregate data, the quantity of imports declines significantly with distance within a firm for a given product.
Wagner (2016f)	2009 – 2012; transaction level data for exports and imports at the month-firm-product-country level, matched with country-specific information on per-shipment trade costs, gross national income, and gross national income per capita	Investigation of the frequency at which exporters and importers trade a given good with a given country	Imports and exports show a high degree of lumpiness. Empirical models show that the frequency of transactions at the firm-good-country level tends to decrease with an increase in per-shipment costs when unobserved firm and goods characteristics are controlled for.

Wagner (2017a)	2011; 7,580,251 observations for value of exports at the firm-product-destination level; matched with data for distance to destination countries and other country characteristics	Use a gravity-equation to investigate the link between amount of firms' exports and distance to destination countries	In line with stylized facts based on aggregate data, the quantity of exports declines significantly with distance within a firm for a given product.
Wagner (2017b)	2010; exports by firms; number of goods exported and number of destination countries; matched with firm characteristics	Research and Development (R&D) activity of firms and extensive margins of exports	More innovative firms export more goods and they export to a larger number of countries
Wagner (2017c)	2009 – 2012; information taken from the Exporter and Importer Dynamics Database for Germany, based on transaction level trade data; matched with characteristics of countries traded with	Links between measures of trade dynamics (entry, exit and survival rates, and share of entrants, in exports and imports) and country characteristics (distance to Germany, difficulty of foreign trade, market size)	For EU-trade, distance is positively related to firm entry rate and firm exit rate, but negatively to firm survival rate. The size of the market is negatively related to firm entry and exit rates, but positively to firm survival in foreign trade activities.
Wagner (2017d)	2010 – 2011; data on the lumpiness of imports from Japan, China and the USA, computed from transaction level data for imports	Test of hypothesis that increase in per-shipment costs of imports from Japan due to the Fukushima disaster in 2011 lead to an increase in lumpiness of imports from Japan	Using China and the USA as control groups in a diff-in-diff approach it is found that the Fukushima trade shock reduced the average number of import-transactions per year at the firm-good level and, therefore, increased the degree of lumpiness in imports from Japan.
Wagner (2017e)	2012; transaction level data on imports and exports, combined with data on firm characteristics	Evidence on the extent of intra-good trade – the simultaneous export and import of identical goods by one firm – and on the differences between firms that are intra-good traders and firms	The share of intra-good trade in total trade is about 17 percent. Intra good trade matters for all goods and in nearly all industries. Compared to inter-good traders from the same industry firms that are intra-good traders are larger, more human-capital intensive, more productive, have a higher R&D intensity, and are more profitable.
Wagner (2018a)	2009 – 2012; data for import transactions merged with data for characteristics of importers	Multiple import sourcing, defined as importing the same good from more than one source country in a year	Large share of importers engage in multiple import sourcing; large share of total imports due to multiple sourcing. Probability and share of multiple sourcing increases with firm productivity and firm size.

Wagner (2018b)	2009 – 2012; transaction level data for imports and exports at the level of markets (countries of destination or origin and HS6-goods) matched with data on firm characteristics	Characteristics of trading firms and number of foreign markets served in exports or sourced in imports	Number of foreign markets is higher in firms that are larger, older and foreign owned and that have higher labor productivity, human capital intensity and R&D intensity.
Wagner (2018c)	2009 – 2014; transaction level data for all exports to countries outside the EU	Patterns of export participation at the firm-good-destination level over time; link between duration of exports and characteristics of destination countries	6.5 percent of all transactions recorded in each year; more than half of all patterns only observed once. Likelihood of permanent trade patterns increases within a firm with proximity and market size of destination countries.
Wagner (2019a)	2011; data for export transactions merged with data on destination country characteristics	Link between value of firms' exports and difference in time zones between Germany and destination countries	Time zones only decrease exports for smaller firms and for intermediate goods. Quantity of exports with increasing time difference within a firm for a given product for exports to the West (where time difference to German is negative) but not the East.
Wagner (2019b)	2009 -2011; transaction level data for exports and imports linked with firm level data from surveys from Official Statistics	Link between number of foreign markets (defined as combinations of one traded good and one country traded with) a firm is active on and firm profitability	Profitability of a firm is neither positively nor negatively related to number of foreign markets. Extra costs due to activity on more foreign markets tend to be balanced by extra benefits.
Wagner (2019c)	2011; data for export transactions merged with data on destination country characteristics	Link between export scope and characteristics of destination countries	Intra-firm differences in the number of different goods exported to a destination market are related to differences in distance between Germany and destination countries, differences in the economic size and the per capita income of these countries, and in the ease of doing international trade with these countries.

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