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Collapse Expanded:
The Great Trade Collapse Across and Within Borders

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Abstract
The dramatic decline in world trade during the global recession of 2008-09 is partly attributed to factors which are specific to cross-border transactions, such as the availability of export finance. In this paper, I examine the evolution of monthly trade volumes *within* Germany at the time of the crisis. Applying a difference-in-differences methodology, I find no measurable discrepancy in trade activity between domestic and international trade.

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1. Introduction

In the fourth quarter of 2008, global trade contracted sharply. According to the World Trade Organization (2010, p. 4), world exports dropped by 12 percent in 2009, the greatest decline in more than 50 years. Importantly, overall economic activity decreased at a much less dramatic rate, with estimates indicating a difference by more than factor four, such that trade also fell sizably relative to GDP.[1] The sudden, severe and synchronized slump in trade is frequently labeled the 'great trade collapse'; Baldwin (2009) provides an early comprehensive assessment of this episode.

Puzzled by the steep fall in trade, various explanations have been proposed and discussed in the literature. One line of reasoning emphasizes compositional effects. As import intensity differs across sectors in an economy, changes in trade may deviate strongly from changes in domestic expenditure. Once more complex production and demand structures are taken into account, the elasticity of trade to output is estimated to be substantially larger than one; see, for example, Bems, Johnson, and Yi (2010), Eaton, Kortum, Neiman, and Romalis (2011), and Bussière, Callegari, Ghironi, Sestieri, and Yamano (2013).

Another set of papers attributes the decline in trade to factors which are specific to cross-border transactions, such as the availability of export finance.[2] Amiti and Weinstein (2011) argue, for instance, that exports may be more dependent on external finance due to longer shipping times. If goods remain longer in transit, working-capital needs tend to increase, making (exporting) firms more vulnerable to financial shocks. Consistent with this idea, Ahn, Amiti, and Weinstein (2011) find that goods shipped by sea experienced an increase in unit values relative to goods shipped by air or land during the financial crisis. International transactions may also involve greater risks and uncertainties than domestic shipments. Ahn (2011) argues that due to fewer cross-border activities banks accumulate less information on foreign than domestic firms, making international trade finance loans riskier; Amiti and Weinstein (2011) find that exporters engaged in arm's-length trade have greater financing needs (presumably to insure risk) than firms shipping to foreign affiliates (with no

[1] The World Trade Organization (2010, p. 4), for instance, notes that world GDP declined by 2.4 percent over the same period.

[2] Based on evidence reported in Alessandria, Kaboski and Midrigan (2010a, 2010b), Novy and Taylor (2013) argue that it is more costly to order intermediate inputs from foreign than from domestic suppliers, showing that trade volumes respond to uncertainty shocks disproportionately strongly.

risk of default).[3] Further, although protectionism is widely considered to have not been a major factor behind the fall in trade, the implementation of trade-restricting measures may have contributed to the decline in cross-border transactions. Bown (2011) reports an increase in the use of temporary trade barriers during the crisis; Baldwin and Evenett (2009) document a wide range of WTO-legal policies in which discretion has been recently increasingly abused to discriminate against foreign firms.

In their detailed review of the literature, Bems, Johnson, and Yi (2013) note that a combination of factors probably accounts for the collapse in international trade in 2008-09. Based on quantitative results on the response of imports to changes in aggregate final expenditure in multi-sector models, they argue that expenditure changes explain about three-fourths of the decline in trade, while a still sizable fraction of the trade collapse is attributed to other causes, including frictions specifically related to cross-border activities. Most of the evidence on features which are specific to international transactions, however, is indirect and inconclusive. For instance, Behrens, Corcos, and Mion (2013) find no measurable variation in the exports-to-sales ratio for Belgian firms; they conclude that their results reject a crisis of cross-border trade per se. Bems, Johnson, and Yi (2013) note that "one prominent topic of debate concerns whether the financial crisis caused exports to fall more than production at the firm/sector level."

In this short paper, I further examine the importance of border-related determinants for the decline in trade. Instead of analyzing a particular channel or mechanism, I analyze the evolution of cross-border deliveries in comparison with domestic shipments in Germany at the time of the crisis. Similar to Behrens, Corcos, and Mion (2013), I am particularly interested in the extent to which the collapse in trade has been a crisis of the activity of trading across national boundaries. However, while Behrens, Corcos, and Mion (2013) analyze data for a small open economy, Belgium, I examine data for one of the world's largest trading economies, Germany; see Amiti and Weinstein (2011, fn. 2) for a discussion of the evidence from Belgium. More notably, instead of analyzing firm-level trade ratios, I make use of macroeconomic data that describe the similar type of activities within and across borders, shipments.

[3] Berman, De Sousa, Martin and Mayer (2012) provide combined evidence on the two principal reasons for the use of trade finance, shipping times and risk, finding that exports fall to destinations in crisis, especially for destinations with longer shipping times.

Previewing the results, and in line with the findings in Behrens, Corcos, and Mion (2013), there is little support for border-related explanations of the collapse in international trade in 2008-09. Applying a difference-in-differences methodology, I find no measurable discrepancy in trade activity between domestic and international trade. Overall, the estimates indicate a general decline in the demand for tradables in Germany, irrespective of the final destination.

The remainder of the paper is structured as follows. In section 2, I describe the data and the methodology. Section 3 presents the empirical results, and section 4 provides a brief conclusion.

2. Data and Methodology

The German federal statistical office, Statistisches Bundesamt, regularly provides detailed information on trade activity in Germany. The data cover, among other details, the volume of transported goods (in metric tons) at various levels of aggregation. For instance, separate statistics are released by mode of transportation; some data are also available by goods category. Most notably, the raw transportation data contain information on the region of origin and the region of destination of shipments, both within Germany and abroad.[4]

In the empirical analysis, I use a subsample of the data which contains monthly trade volumes. At this level of timely detail, the publicly available data are aggregated along other dimensions. Specifically, the limitations include spatial features such that the statistics, taken from Statistisches Bundesamt (2012), differentiate between domestic and cross-border shipments only.

Table 1 describes the transportation data in more detail. There are three panels, each containing information by the type of trade (that is, shipments to domestic and foreign destinations) and the mode of transportation. The upper panel reports trade volumes; the other two panels tabulate trade shares derived from this data. All data refer to the year 2008. As shown in the middle panel, there are sizable differences in the importance of the various modes of transportation for aggregate shipments. With a share of 75 percent, the overwhelming majority of German goods, as measured by their weight, are shipped on roads.

[4] Nitsch and Wolf (2013) analyze subsets of the data on intra-German shipments to identify the effect of the former border between East Germany and West Germany on trade.

The differences between means of transportation become even more extreme, according to the bottom panel, if the trade destination is additionally taken into account. While intra-German shipments account for about 80 percent of total trade, the share falls below 5 percent for deliveries by air freight and by ocean vessel.

Although the cross-sectional features of the trade data are generally interesting and plausible, the analysis is primarily concerned with the variation of trade over time. In particular, I am interested in changes in trade activity during the global recession of 2008-09. As a start, therefore, Figure 1 plots the evolution of German cross-border transport volumes, using a window of +/- 18 months around the bankruptcy of Lehman Brothers in September 2008. In line with international evidence on the great trade collapse, Germany's external trade fell sharply; the amount of goods shipped to foreign destinations dropped from a monthly average of about 68 bn. tons in the first quarter of 2008 to 54 bn. tons a year later, a decline by more than 20 percent. The loss in transportation weight seems to be in line with findings that the collapse in trade was mainly due to a fall in volumes (that is, physical terms) not prices; see, for instance, Levchenko, Lewis and Tesar (2010) and Gopinath, Itskhoki and Neiman (2012).

Figure 2 extends the analysis. In addition to cross-border deliveries, the monthly volumes of domestic shipments are shown, both in absolute terms (left graph) and relative to September 2008 (right graph). Illustrating observations from Table 1, the large majority of German goods are shipped to domestic destinations, with intra-German transport exceeding foreign deliveries by, on average, factor four. Moreover, domestic shipments exhibit a strong seasonal pattern, with fluctuations in monthly trade activities by more than 50 percent. Most importantly, after the collapse of Lehman Brothers, the transaction volume between domestic partners experienced a tendency of serious decline, which was possibly even more pronounced than the contraction in international trade.

The graphical analysis presented above is suggestive but not sufficiently conclusive. Therefore, to analyze the patterns in trade in more detail, I adopt a difference-in-differences approach. Specifically, I estimate regressions of the form:

$$Shipments_{dt} = \beta\, Domestic_d + \gamma\, (Domestic_d \times PastLehman_t) + d_t + \varepsilon_{dt},$$

where $Shipments_{dt}$ is the log volume of German shipments to destination d at time t; $Domestic_d$ is a dummy variable equal to one for shipments to national destinations and zero otherwise; $PastLehman_t$ is a dummy variable equal to one for the crisis period after the

collapse of Lehman Brothers and zero otherwise; d_t are a full set of (monthly) time dummies; and ε_{dt} is the error term. The coefficient of interest to me is γ, which captures the difference between domestic and international shipments at the time of the crisis. To the extent that the great trade collapse mainly applies to cross-border transactions only, this coefficient should be positive.

3. Empirical Results

I begin by analyzing shipments aggregated across all modes of transportation and a balanced sample of 18 months before and after the bankruptcy of Lehman Brothers. Still, to allow for some flexibility, I gradually extend the definition of the crisis episode, examining the treatment effect of the crisis on trade over periods of different length.

Table 2 presents the estimation results. In the first column, I explore the difference between national and international shipments in Germany in October 2008, that is, immediately after the Lehman shock. The coefficient β on the domestic shipments dummy is, in line with previous observations, positive and statistically highly significant, capturing the systematic difference in levels between domestic and foreign trade. The key coefficient of interest, however, is γ, which captures the crisis effect on the relative difference in trade. As shown, the coefficient is positive and statistically significant, indicating that domestic trade indeed performed better than cross-border activities in October 2008. Taken at face value, this finding provides empirical support for border-related explanations of the great trade collapse. In the remaining columns of Table 2, however, I redefine the dummy for the crisis period such that the interaction term captures the differences in trade over longer periods of time. Specifically, I gradually extend the definition of the crisis episode from the first three months after the bankruptcy of Lehman Brothers (such that the interaction term covers the fourth quarter of 2008) in column 2 up to a period of 18 months past Lehman (such that the pretreatment period and posttreatment period are exactly balanced) at the extreme right of the table. For all these (plausible) specifications, the estimates of γ become statistically indistinguishable from zero, implying that there is no identifiable difference between domestic and cross-border trade in the post-Lehman period. Apart from October 2008, the month immediately following the Lehman shock, the national boundary of Germany had no measurable effect on the pattern of shipments.

Table 3 presents some of the robustness checks. Specifically, results are reported for separate transportation modes, for shorter and longer sample windows, and when transit shipments instead of cross-border trade are used as control group. To economize on space, I report the estimates of β and γ for only two specifications of the interaction term, the immediate (one month) Lehman disaster episode and the full post-Lehman sample period.

The first six rows tabulate results for shipments by mode of transportation. Not surprisingly, the estimated β coefficients differ in sign and magnitude, reflecting the varying importance of domestic trade for individual means of transportation. More notably, while there is also considerable variation in the evolution of intranational and international trade in October 2008, there is no measurable difference in trade patterns across modes of transportation for longer periods during the time of crisis.[5] Figure 3 provides accompanying graphical illustrations, displaying often only minor discrepancies in indexed trade volumes.

Next, I examine the sensitivity of the results to the length of the sample, shortening the window to +/- 12 months around the bankruptcy of Lehman Brothers in September 2008 (row 7) and also extending the sample to cover the five-year period from 2007 to 2011 (row 8). Again, the key findings turn out to be extremely robust. Apart from the immediate Lehman shock, national and international shipments display a similar performance during the crisis episode. Finally, I replace international deliveries with transit shipments as the measure of cross-border activity. Reassuringly, there is, as before, strong evidence of internal and external trade synchronicity when trade collapsed in 2008-09.

4. Conclusions

A growing number of papers aims to examine the causes and consequences of the dramatic decline in world trade during the global recession of 2008-09. While there seems to be an emerging consensus that most of the fall in trade can be reasonably explained by asymmetries in expenditure changes across sectors, there have also been suggestions of (and relevant work on) other channels. Some of the proposed mechanisms, such as the availability of export finance, are specific to cross-border transactions.

[5] For shipments by rail, for which I find that domestic transportation volumes have performed significantly better than cross-border deliveries after the collapse of Lehman Brothers, international shipments have been already in decline in the pretreatment period.

In this short paper, I explore evidence on the underlying assumption in these analyses that the collapse in international trade exceeded the decline in intranational trade. Specifically, I examine the evolution of monthly trade volumes within and across German borders at the time of the crisis. Since there is no measurable discrepancy in trade activity between domestic and international trade, I find no empirical support for border-related explanations of the great trade collapse. The factors responsible for the strong decline in international trade seem to apply similarly to domestic trade.

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Table 1: Shipments by Mode of Transportation, 2008

a) Trade volume (mn. tons)

	All modes	Road	Railway	Sea	Inland water-ways	Pipeline	Air
Total	4,106.2	3,077.8	371.3	316.7	245.7	91.1	3.6
Domestic	3,217.8	2,895.5	239.3	4.1	57.6	21.3	0.1
Cross-border	809.8	146.8	111.9	312.5	165.4	69.8	3.4

b) Trade shares by mode of transportation (%)

	All modes	Road	Railway	Sea	Inland water-ways	Pipeline	Air
Total	100.0	75.0	9.0	7.7	6.0	2.2	0.1
Domestic	100.0	90.0	7.4	0.1	1.8	0.7	0.0
Cross-border	100.0	18.1	13.8	38.6	20.4	8.6	0.4

c) Trade shares by trade destination (%)

	All modes	Road	Railway	Sea	Inland water-ways	Pipeline	Air
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Domestic	78.4	94.1	64.4	1.3	23.4	23.4	3.6
Cross-border	19.7	4.8	30.1	98.7	67.3	76.6	95.0

Table 2: Baseline Results

Sample:	**Trade across all modes**				
Period:	**March 2007 - March 2009**				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Domestic shipments	1.380** (0.027)	1.382** (0.028)	1.397** (0.029)	1.357** (0.031)	1.379** (0.027)
Domestic shipments × 1 month past Lehman	0.098** (0.027)				
Domestic shipments × 3 months past Lehman		-0.003 (0.057)			
Domestic shipments × 6 months past Lehman			-0.094 (0.060)		
Domestic shipments × 12 months past Lehman				0.076 (0.056)	
Domestic shipments × Past Lehman					0.007 (0.054)
Adj. R^2	0.97	0.97	0.98	0.98	0.97

Notes: OLS estimation. Dependent variable is the log volume of shipments for domestic (treatment) and cross-border (control) trade. Robust standard errors in parentheses. **, * and # denotes significant at the 1 percent, 5 percent and 10 percent level, respectively. Time dummies (monthly) always included, but not reported. Number of observations is 74.

Table 3: Robustness Checks

	(1)		(2)		
	Domestic shipments	**Domestic shipm's × 1 mth past Lehman**	**Domestic shipments**	**Domestic shipm's × Past Lehman**	**Number of observa-tions**
Road	2.982** (0.024)	0.063* (0.024)	2.971** (0.023)	0.026 (0.047)	74
Railway	0.782** (0.021)	0.076** (0.021)	0.687** (0.013)	0.200** (0.024)	74
Sea	-4.345** (0.031)	0.287** (0.031)	-4.392** (0.036)	0.112# (0.059)	74
Inland waterways	-1.027** (0.020)	-0.098** (0.020)	-1.039** (0.009)	0.020 (0.041)	74
Pipeline	-1.138** (0.015)	-0.190** (0.015)	-1.129** (0.024)	-0.030 (0.031)	74
Air	-3.392** (0.030)	0.162** (0.030)	-3.385** (0.024)	-0.004 (0.061)	74
October 2007 - September 2009	1.395** (0.033)	0.083* (0.033)	1.363** (0.040)	0.071 (0.062)	48
January 2007 - December 2011	1.401** (0.021)	0.077** (0.021)	1.356** (0.028)	0.070# (0.040)	120
Use transit shipments as control group	4.261** (0.029)	0.058# (0.029)	4.251** (0.029)	0.023 (0.058)	74

Notes: OLS estimation. Dependent variable is the log volume of shipments for domestic (treatment) and cross-border (control) trade, except noted. Robust standard errors in parentheses. **, * and # denotes significant at the 1 percent, 5 percent and 10 percent level, respectively. Time dummies (monthly) always included, but not reported.

Figure 1: German Cross-Border Shipments

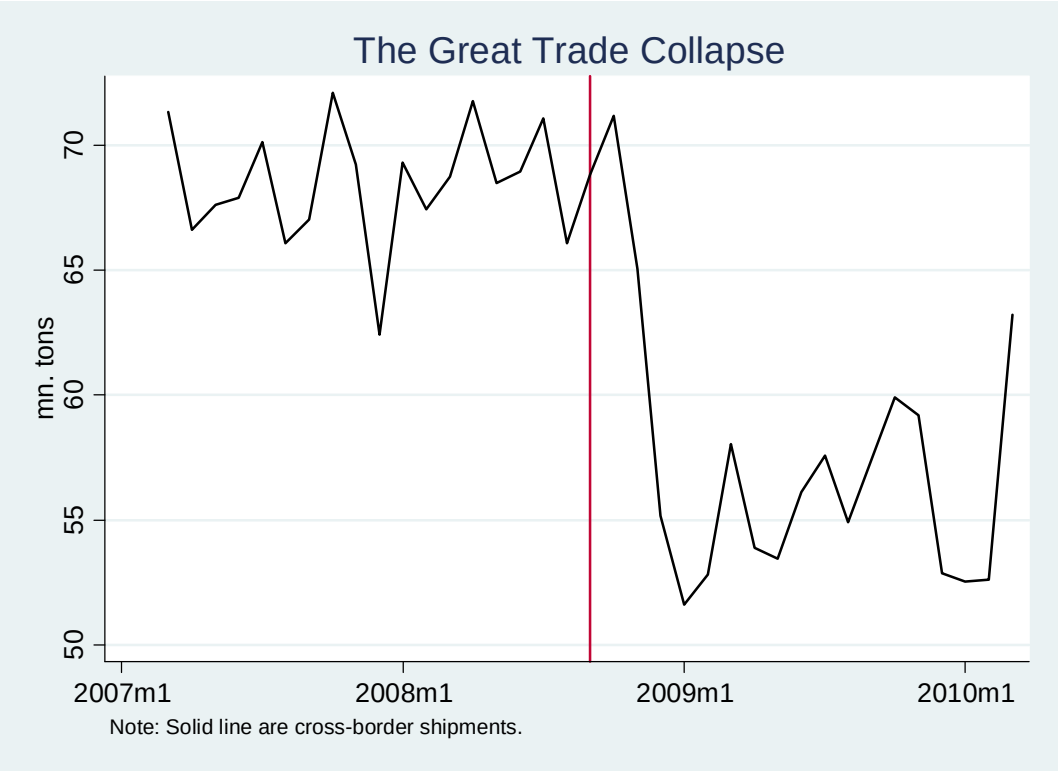
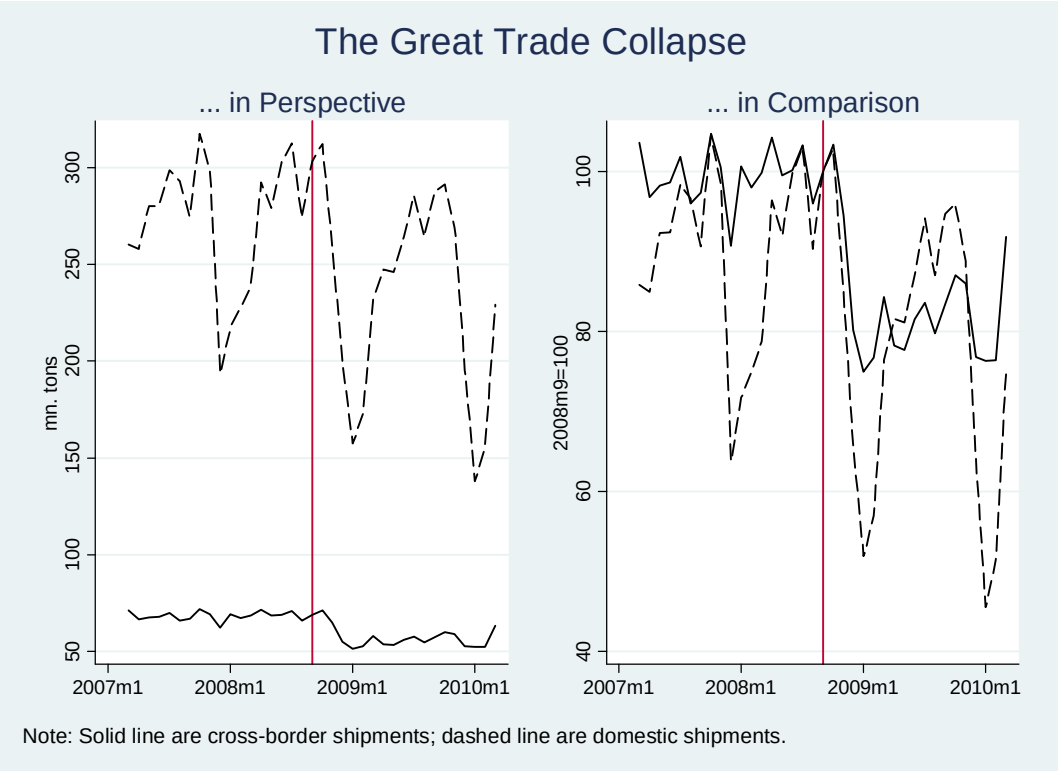
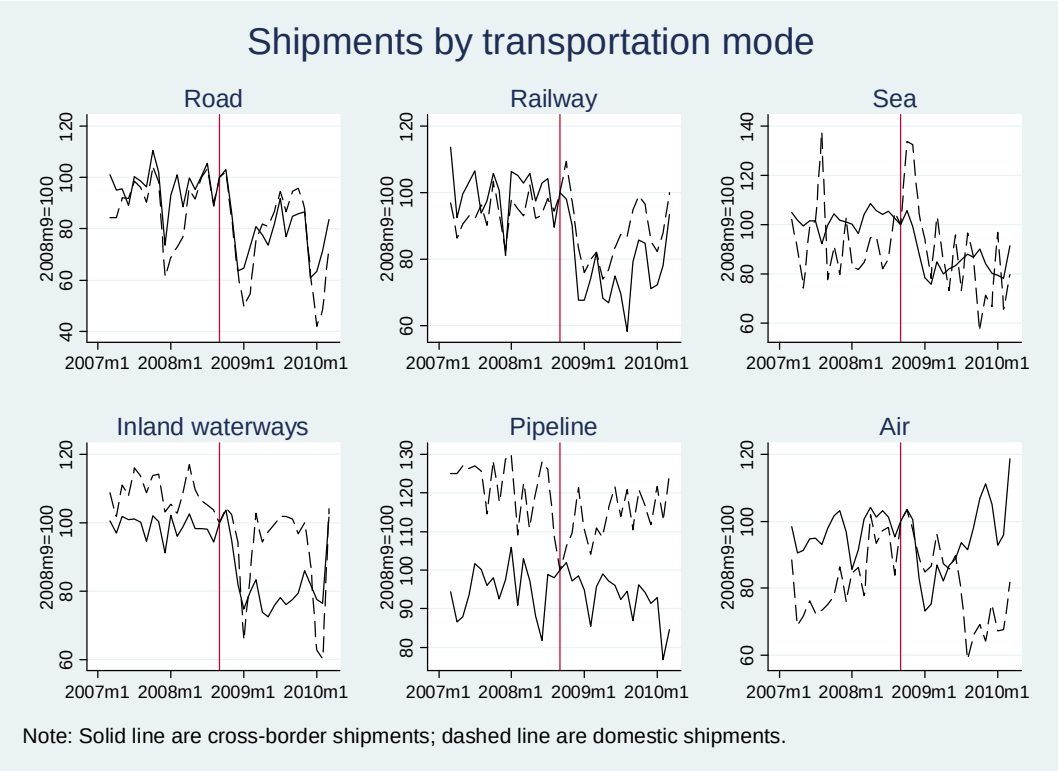


Figure 2: German Domestic and Cross-Border Shipments



Note: Solid line are cross-border shipments; dashed line are domestic shipments.

Figure 3: German Domestic and Cross-Border Shipments



Note: Solid line are cross-border shipments; dashed line are domestic shipments.