

# Supply Chain Credit Risk

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## Executive Summary

Supply chains are at the heart of the global economy and successful supply chain risk management is critical to corporate success. Supply chain data is patchy, both for the individual companies in the supply chain and for the links between multiple supply chains. Bank-sourced credit data can help to identify some of the weak links in supply chain networks.

Some key conclusions:

- **Two decades of Globalization has made supply chains leaner but longer, agile but fragile.**
- **Supply chain problems may initially appear as operational problem but usually develop into credit problems for suppliers and OEMs.**
- **Based on data for 17 global companies with more than 3000 suppliers, the most important supplier countries are US, China, South Korea, UK and France.**
- **The same data shows considerable diversity in the supplier sectors; IT and software are the single largest category.**
- **Bank-sourced data shows that these companies typically rely on suppliers above or close to investment grade credit quality; but a very small number of suppliers are in the b and c credit categories. These suppliers may be the only providers of crucial inputs but they also represent the weakest links in individual OEM supply chains.**
- **Comparison of the OEM supplier groups shows some supplier concentration. A number of companies are suppliers to more than 5 of the 17 OEMs in this sample; and a few deal with more than 10 of the OEMs. Most of these are in marketing and corporate communications but some of them are diversified supplier firms who appear to pro-actively manage their risk as key members of multiple global supply chains.**
- **The Boeing Dreamliner aircraft – despite its previous production problems - uses Tier 1 suppliers that are typically of very high credit quality and that distribution has been unchanged in the past year.**
- **Auto Parts suppliers have seen a wave of mergers and acquisitions as they respond to the rapid shifts in technology and economics across their sector. This has had a positive impact on credit quality, but that may have reached a peak.**

*It is important to stress that, while this study highlights differences in company supply chains, this does not necessarily imply that some of these companies are poorer credit risks as a result. It does imply that some companies face supply chain challenges, and their success in managing those may be one of the key reasons for their historic success.*

*In summary, supply chain management is critical but the risk management process is very short of data. Bank-sourced data provides some valuable insights into supply chain credit risk.*

## 1 Introduction

Global supply chains have become increasingly complex, and supply chain risk management (“SCRM”) is a major issue for most large corporates.

Globalization of trade flows means that SCRM increasingly features in trans-national trade discussions. For example, a key issue in the current Brexit negotiations is the complexity of the supply chain across the UK and Continental Europe; some larger product sub-assemblies contain components which have repeatedly crossed borders during the manufacturing process. This is one of the main reasons that the EU is keen for the UK to stay within the Customs Union.

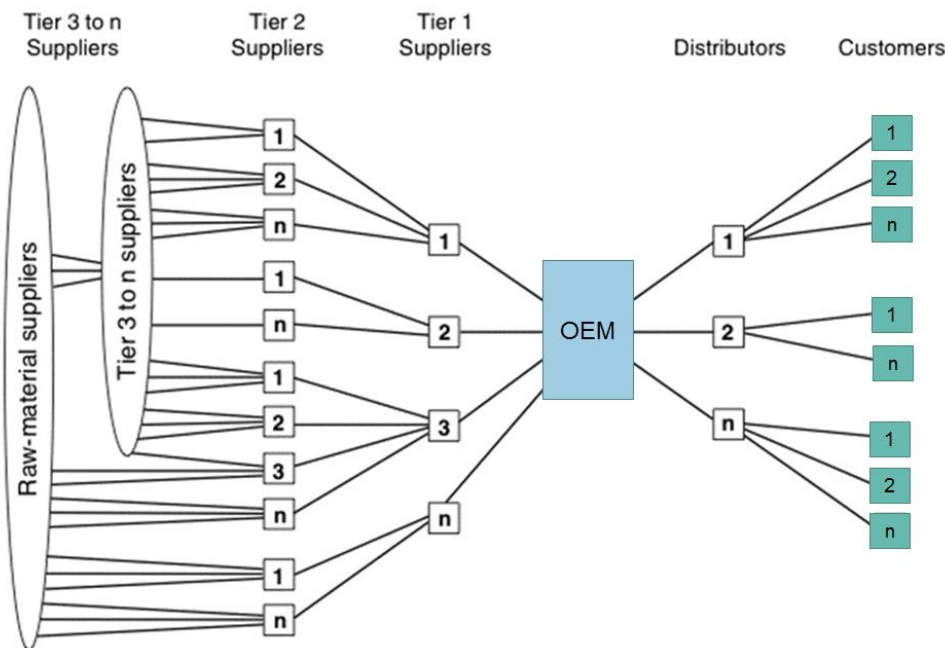
The development of “Just-in-Time” production processes began in the 1980s; it has squeezed working capital costs to a minimum and reduced the risk of overstocking. Supply chains are leaner and more agile as a result, but they are also potentially longer and more fragile.

This paper looks at some of the largest global corporations and uses bank-sourced data to assess the level and distribution of credit risks across their supply chains.

## 2 Credit Risk in Supply Chains

Supply chains vary in length and complexity; and the risk for each organization partly depends on its position in one or more supply chains. Figure 2.1 shows a typical supply chain with one Original Equipment Manufacturer (“OEM”) positioned between suppliers and customers. Note that some of the Tier1 – Tier n suppliers may be members of multiple supply chains.

Figure 2.1 Typical Supply Chain



Source: National Research Council & National Academies Press

Consider the impact on Figure 2.1 of a major disruption in the form of an unexpected Tier 1 supplier or distributor/customer bankruptcy or operational issue (“Primary supply chain risk”). Or even more disruptive: a linked set of bankruptcies or operational issues between Tiers 1 and n. (“Secondary supply chain Risk”). If each link in the chain is heavily dependent for revenues on the company immediately above it, then it is possible that a failure in Tier 1 of the chain leads to a cascade of corporate and SME failures in Tier 2....n, compromising the operational and financial position of the OEM unless it is able to find a full replacement chain.

This paper will focus on primary supply chain risk but will touch on secondary supply chain risk in some specific examples.

### 3 Drivers of Supply Chain Credit Risk

Some of the key sources of overall supply chain risk have been identified by Ankit Kohli\*. Warning signs for a particular supplier include:

1. Operates in declining core market and/or revenue base is concentrated
2. Market share is declining, or being disrupted by new technology
3. Unstable management and poor supply chain management (!) – the “n-Tier” problem
4. Macro/geopolitical/natural disaster risk exposures
5. Regulatory risk exposure
6. Poor governance and resulting environmental/social risks to business sustainability

Typical examples (from a very long list) include document archive firms being disrupted by digitization, conflict and natural disasters in raw material supplier countries, undetected fraud, the recent move away from plastics, global tariff changes – the list is long.

These warnings signs are similar to a credit risk checklist; and some of these risks have a direct impact on credit quality, while others are directly operational. But operational issues have financial consequences, and financial problems lead to operational disruption, so it can be argued that most supply chain risk emerges as credit risk in some form or another.

Some primary credit risks can be insured. Companies like Euler Hermes and Coface offer trade credit insurance to cover vendor finance and unpaid invoices, but they do not normally extend that to secondary risks - they insure invoices and debts rather than loss of revenues arising from operational disruptions. There are specialized providers of Operation Risk Insurance; these typically cover internal errors, but they are usually capped at ceilings which are too low to compensate for major loss of revenue.

This implies that companies need to take responsibility for major elements of their supply chain risk. Some automotive OEMs have raised this to an art form, with companies like Ford and Toyota maintaining detailed supply chain maps and contingency plans.

\* <https://www.triplepundit.com/2015/04/12-business-and-sustainability-risks-that-can-disrupt-modern-supply-chains/>

### 4 Analysis Scope

This report focuses on Primary Supply Chain risk for 17 global OEM companies. These are listed in Figure 4.1, along with the number of suppliers (a total of 3,418 companies across all tiers) to each OEM identified by Factset and/or Bloomberg.

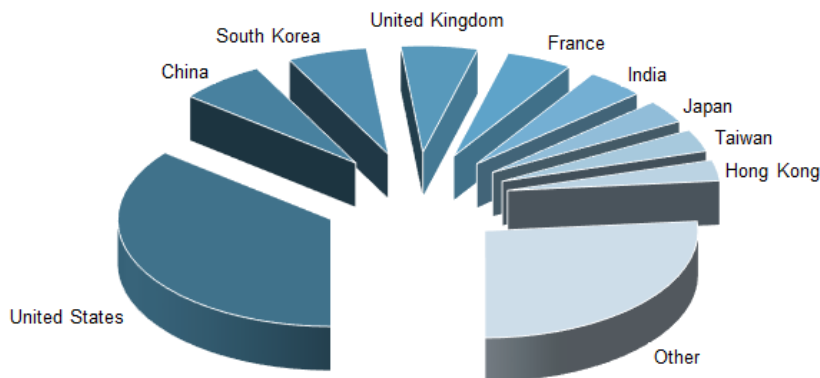
Figure 4.1 OEM analysis sample

Company	No. of Suppliers	Parent Country
Samsung Electronics Co., Ltd.	505	Korea
Walmart Inc.	481	US
Bayerische Motoren Werke AG	301	Germany
HP Inc.	244	US
Nestlé S.A	230	Switzerland
Coca-Cola Company	190	US
Unilever PLC	178	UK
Johnson & Johnson	170	US
Cisco Systems, Inc.	158	US
PepsiCo, Inc.	144	US
Home Depot, Inc.	141	US
BASF SE	133	Germany
Adidas AG	119	Germany
L'Oréal SA	116	Switzerland
Intel Corporation	107	US
NIKE, Inc. Class B	99	US

Source: Factset, Bloomberg

Figure 4.2 shows the geographic distribution of these suppliers.

Figure 4.2 Supplier Country of Origin (Top 20, with 9 individually identified)

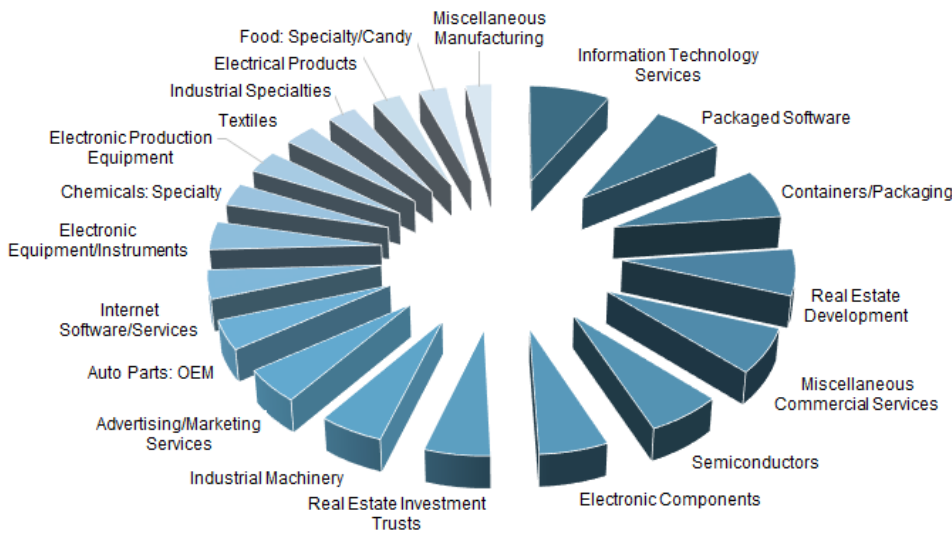


Source: Factset, Bloomberg

The US dominates the supplier set. This is partly because the OEM group is dominated by US companies, but it also shows that the local footprint for major US companies may be larger than recent debates have suggested. The prevalence of the UK – the fourth largest supplier – is a surprise, given that only one company (Unilever PLC) in the OEM set is domiciled in the UK.

Figure 4.3 shows the sector distribution of these suppliers.

Figure 4.3 Supplier Sectors (Top 20)



Source: Factset, Bloomberg

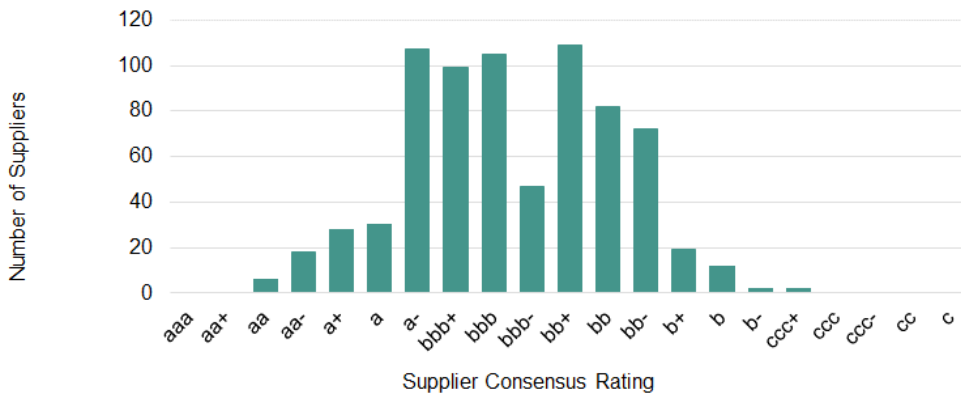
Semiconductors, Electronic Components, Equipment, Instruments and Products represents 14%. Information Technology and Software (Packaged and Internet) account for 13%. Real Estate in various forms is another 7.5%. Advertising and Marketing represents 3%. The largest single category – Information Technology – makes up just 5%.

This diversity mainly reflects the broad business mix of the OEM companies in this study, but it also shows the wide ranging impact that an OEM failure can have across a broad range of different industries.

### 5 Supply Chain Credit Risk for OEM supplier sample

Bank-sourced credit data covers a sample of 738 companies, representing 15% - 30% of these suppliers, depending on the individual OEM. This data provides an indication of the range of credit risks in each OEM supply chain, with the caveat that it is a sample rather than the full coverage. Figure 5.1 shows the distribution of credit risk for the unions set of all suppliers in the bank-sourced sample.

Figure 5.1 Distribution of Median Credit Risk for OEM Supplier Samples



Source: Factset, Bloomberg, Credit Benchmark

The majority (59%) of the suppliers in each OEM sample are investment grade. A very small number are in the **b** or **c** categories, and this may be unavoidable if they are the only producers of key components or raw materials. They will, however, represent potential weak links in some supply chains.

Figure 5.2 shows the detailed credit risk distribution across the supplier sample. The height of the blue bars represents the percentage of the relevant OEM supplier sample in each of the seven main credit categories.

Figure 5.2 Credit Risk distribution for combined OEM supplier sample

Company	aaa	aa	a	bbb	bb	b	c	No. of Suppliers
Walmart Inc.	—	—	—	■	■	—	—	481
Samsung Electronics Co., Ltd.	—	—	—	■	■	—	—	505
HP Inc.	—	—	—	■	■	—	—	244
Bayerische Motoren Werke AG	—	—	—	■	■	—	—	301
Home Depot, Inc.	—	—	—	■	■	—	—	141
Nestlé S.A	—	—	—	■	■	—	—	230
Cisco Systems, Inc.	—	—	—	■	■	—	—	158
Coca-Cola Company	—	—	—	■	■	—	—	190
Johnson & Johnson	—	—	—	■	■	—	—	170
PepsiCo, Inc.	—	—	—	■	■	—	—	144
Unilever PLC	—	—	—	■	■	—	—	178
BASF SE	—	—	—	■	■	—	—	133
L'Oréal SA	—	—	—	■	■	—	—	116
H&M Hennes & Mauritz AB Class B	—	—	—	■	■	—	—	102
adidas AG	—	—	—	■	■	—	—	119
Intel Corporation	—	—	—	■	■	—	—	107
NIKE, Inc. Class B	—	—	—	■	■	—	—	99

Source: Factset, Bloomberg, Credit Benchmark

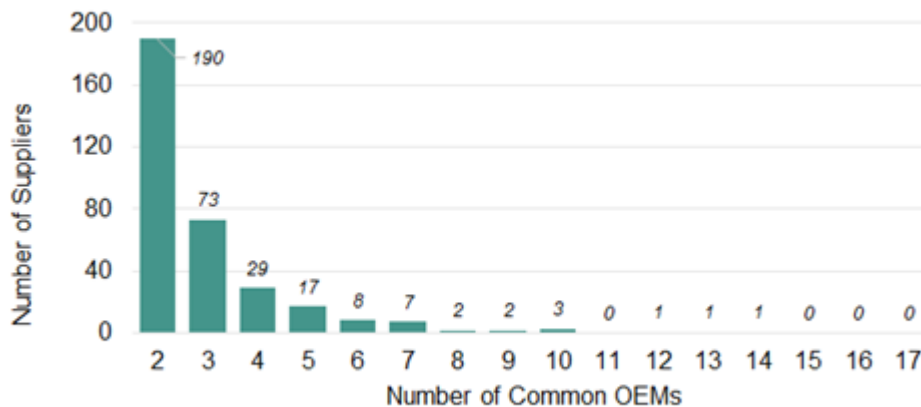
A minority of these OEM companies have material numbers of non-investment grade suppliers (**bb** or less) in their supply chain. But (based on the CB supplier samples), most OEM companies in this study **primarily** use investment grade suppliers.

## 6 Supply Chain Interconnections

Many of the suppliers in the sample group deal with more than one of the OEMs in this study. This is not surprising, but it also raises the interesting issue that some suppliers may be revealed to be key players in the supply chain for a diverse set of OEMs.

Figure 6.1 shows the distribution of suppliers who deal with more than one of the 17 OEMs in this sample.

Figure 6.1 Supply chain interconnections between OEMs



Source: Factset, Bloomberg

Of the sample (which represents about 20% of the full OEM supply chain), there are 190 suppliers who supply two of the OEMs; and 73 who supply three. There are 17 who supply 5 of the OEMs, and 3 who supply 10. 3 companies supply 12 or more of the OEMs.

Figure 6.2 lists the companies which supply 8 or more OEMs.

Figure 6.2 Single companies (in supplier sample) that supply multiple common OEMs

Company	No. of OEMs	Country	Industry
MDC Partners, Inc.	14	US	Consumer Services
Ascential PLC	13	UK	Consumer Services
Interpublic Group of Cos. Inc.	12	US	Consumer Services
Sodexo SA	10	France	Industrials
Standex International Corp.	10	US	Misc. Manufacturing
WPP PLC	10	UK	Consumer Services
Esco Technologies Inc.	9	US	Industrials
Indorama Ventures Ltd.	9	Indonesia	Chemicals
Berry Global Group Inc.	8	US	Consumer Services
Smurfit Kappa Group PLC	8	Ireland	Basic Materials

This list includes a number of firms involved in advertising, marketing, communications and business intelligence; as well as major providers of packaging. But it also includes companies such as Standex and Esco whose core business aims to provide diversified supply chain elements. Such companies are deliberately positioned within the supply chain and have designed their businesses to diversify the risk that they represent to any one OEM. The irony is that they have succeeded to the point where they are used by most of these OEMs.

7 Case Study: Boeing 787 Dreamliner

The Boeing 787 Dreamliner entered service in 2011 after a 3-year delay. As a large-scale collaboration between many suppliers, it has suffered a disproportionate share of supply chain problems and these have resulted in the model being grounded at least once.

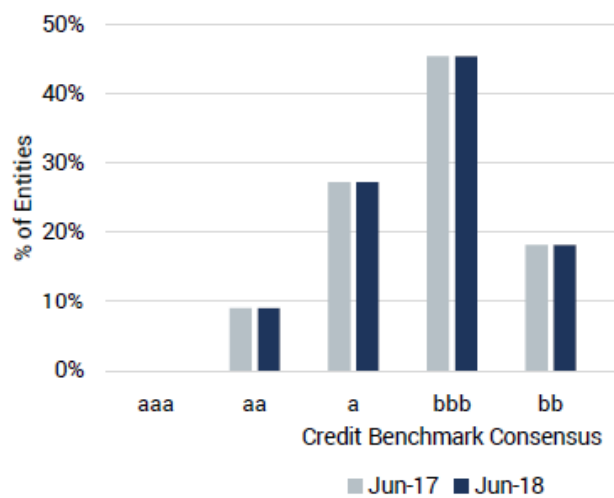
But it has also set new standards in passenger comfort and is seeing repeat orders from a growing list of airlines. The delays, write-offs and production problems have been a financial headache for Boeing as well as for their key suppliers (who have had to recall and redesign various components) but these could be viewed as the inevitable costs of a major collaborative project representing a step change in aircraft design. Figure 7.1 shows the main Tier 1 suppliers and Figure 7.2 shows the credit distribution for most of these companies where bank-sourced data is available.

Figure 7.1 Boeing 787 Dreamliner: Tier 1 Suppliers



Source: Boeing, Reuters

Figure 7.2 Credit Distribution for Tier 1 Dreamliner Suppliers



Source: Boeing, Reuters, Credit Benchmark

The credit distribution of the Dreamliner Tier 1 suppliers is mainly in the high quality categories. Bank-sourced data shows that more than 80% of these companies are viewed as investment grade; and unusually, the distribution has not changed in the past 12 months.

This suggests that when supply chain issues arise across well managed and financially strong companies, they typically have the resources to correct the problem and maintain their credit rating; if this large, collaborative project has a long and financially successful life expectancy, some of the Dreamliner suppliers could see their consensus credit ratings improve further. Success could be seen as compensation for their persistence during the difficult early stages of a complex supply chain project; an established and robust supply chain creates a significant barrier to entry.

Boeing has, however, learnt from the Dreamliner experience. For the 777X model, a number of supply components and processes have been brought back in-house and supplier management has become draconian. It will be interesting to see how this approach balances the risks of an integrated supply process against the frustrations of a diverse one.



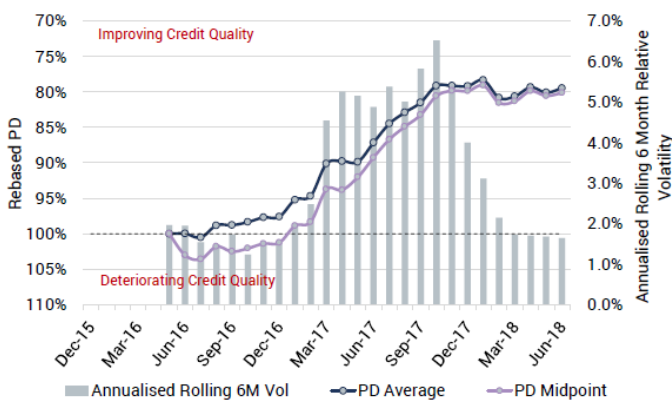
### 8 Case Study: Auto Parts Supply Chain risk

The global Automotive industry continues to grow but in an increasingly uncertain environment. Tariffs, environmental concerns, self-driving software and long-distance electric vehicles are all pushing auto companies to innovate. This entails major changes in their supply chains, with significant impacts on their suppliers.

This has prompted a wave of mergers and acquisitions, which has had the effect of improving the average credit quality across the sector.

Figure 8.1 shows the credit trend since late 2016.

Figure 8.1 Credit Trends across the Auto Supply Chain

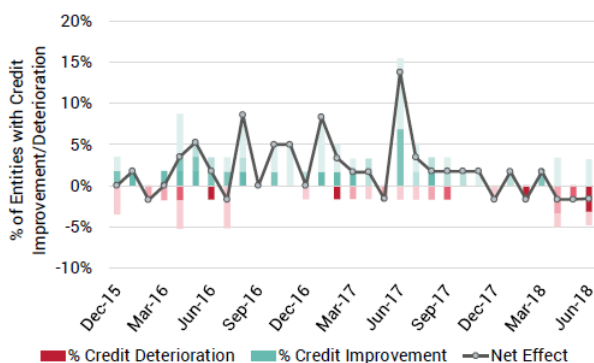


Source: Credit Benchmark

Credit quality improved steadily from early 2017 until early 2018, although recent data shows a stabilization. The volatility of the Auto Supply chain aggregate shows a dramatic drop.

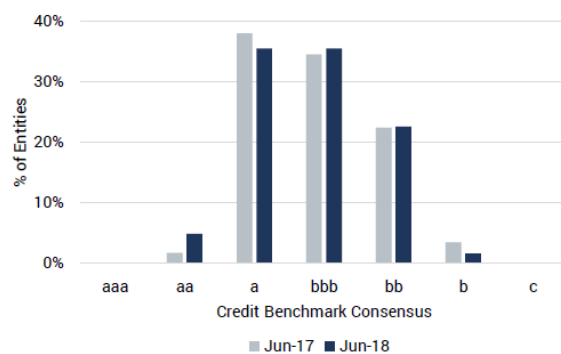
Figures 8.2 and 8.3 show the monthly credit movements as well as the credit distribution for this sector.

Figure 8.2 Auto Parts: Credit Quality Movements



Source: Credit Benchmark

Figure 8.3 Auto Parts: Credit Quality Distribution



Source: Credit Benchmark

In Figure 8.2, each improvement or deterioration represents 0.5 of a CBC notch. Until recently, the number of improvements matched or exceeded the number of deteriorations; the balance appears to be shifting towards deterioration. Figure 8.3 shows that, over the period March 2017 to March 2018, the proportion of auto supply chain companies in categories **aa** and **bbb** increased and the proportion in categories **a** and **b** decreased. Despite these mixed trends, over the whole period the sector has made the transition to investment grade. However, if latest trends continue, this may be set to reverse.

## Conclusion

Two decades of Globalization have made supply chains leaner but longer. They are also more flexible but this has brought fragility – the ability to operate Just-in-Time production can widen OEM margins but pushes risk onto the supplier. And if that supplier is specialized enough for the OEM to have leverage over them, it puts the OEM at risk if the supplier fails.

But as the Dreamliner example shows, willingness to take risks with long and broad supply chains may be a necessary condition for success. Supply chain risk management is multi-dimensional – what begins as an operational problem can become a credit issue and vice-versa. Either way, supply chain problems usually develop into credit risk problems, and credit insurance is unlikely to fully hedge those risks.

Large corporations are becoming more sophisticated in mapping and monitoring their supply chains but detailed company data can be very patchy for the lower tiers. Bank-sourced data can provide a quick and robust primary credit risk check for sectors and even for individual obligors. In due course, as supply chain mapping becomes more sophisticated, bank-sourced data could also become very useful in monitoring secondary credit risk.

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