COVID–19 and supply chains

This rapid evidence review looks at the impact on supply chains of past crises and disruption. The aim is to help those responding to the current crisis to understand the medium- to long-term impact of some of these events on their business's supply chains, and what role local authorities might have in recovery.

Context and available evidence

The COVID-19 pandemic and resulting economic crisis will hurt business eco-systems and put many firms out of business. Supply chain disruptions will play a major role in propagating the shock. An Office for National Statistics survey from March indicated that more than half of the firms that export or import products were already reporting supply chain disruptions.[1]

A rapid review of the literature on the supply chain effects of major shocks and natural disasters (see the annex) suggests that:

- The associated supply chain disruption has severe consequences for total aggregate output that persist after the shock

- The cost of switching to new suppliers plays an important role in determining the way major international shocks propagate through the domestic economy

- Shocks to upstream producers in production networks have a direct effect on downstream customers who end up cutting employment

- There are indirect effects on other suppliers who end up being adversely harmed by the shock

- The negative effects experienced by a production network are larger when the shock hits an influential sector or firms in the network

- Diversifying the supply chain helps insure against unexpected events

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1   https://www.bbc.com/news/52138535

Things to consider in developing the policy response

- Government may be able to help firms switch to alternative international suppliers and identify new customers by providing information, helping manage risks or providing credit guarantees. See our toolkits on export promotion agencies and export credit agencies.

- Limited information on local supply chains and the linkages between firms is likely to limit the scope for effectively targeting supply chain interventions (see the annex).

- It may be more feasible to identify particularly influential sectors or firms and intervene to provide direct support. Our major shocks toolkit considers the relevant evidence on policy responses. We will publish an updated briefing on this subject shortly.

- In the recovery stage, policy may want to encourage and assist firms to develop supply chains that are more resilient to disruptions and unexpected events. Existing business advice services may need help in developing appropriate guidance.[2]

Following is some guidance and a case study with a more detail about mapping supply chains.

Understanding the links between firms[3]

Mapping supply chains is difficult, and it may not provide the insight different local areas need. This is because, outside of input-output tables, building up an understanding of the links between firms requires primary datasets as the available secondary data is not adequate.

Input-output tables

Traditional input-output tables describe the sale and purchase relationships between producers and consumers within an economy. They provide a picture of the flows of products and services in the economy each year and how these are used to produce further products and to satisfy final demand. They are one way of understanding the links between firms. The Office for National Statistics traditionally published these once every five years, although they now aim to produce them annually.

Building on an understanding of sectors, these tables can provide some insight into how firms in different sectors may interact. Input-output tables use a version of the Standard Industrial Classification (SIC), which enables them to be matched with other datasets.

Limitations of input-output tables

- While they use SIC codes, which can in themselves be limited, they are also aggregated, so some detail is lost.

- They provide national, rather than local, data, so it cannot be understood from the data whether or not links are happening within a local area.

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2   A recent PWC survey suggests that supply chain issues are one of the main concerns for CEOs and that they are planning to change supply chain strategies. https://www.pwc.com/us/en/library/covid-19/pwc-covid-19-cfo-pulse-survey.html. This may represent a continuation of an underlying trend to move away from reliance on Chinese firms: https://www.supplychaindive.com/news/coronavirus-china-tariff-trade-supply-chains/574702/
3   Taken from What Works Centre for Local Economic Growth guidance on 'Using Data for Local Economic Policy'

Mapping supply chains

There is some academic literature that has been able to improve on traditional input-output tables using value added data.[4] To the best of our knowledge such analysis is not feasible in the UK, at least based on data available to researchers. This means that efforts to better map supply chains have had to rely on primary data instead.

Greater Manchester Combined Authority's work on the textile industry (see case study) used primary data sources to build a picture of the links between firms in a single industry. The primary sources were both quantitative gathering information over a two-year period, and qualitative via surveys with firms.

By combining quantitative and qualitative data, the combined authority was able to build a detailed understanding of the local supply chain and an analysis of how central different firms are to the sustainability of the industry. This in turn informed their decision about which firms to invest in as well as the funding conditions of their Regional Growth Funds.

Greater Manchester was able to apply this primary analysis to policy and make evidenced decisions about which firms to offer support to, but it was a resource-intensive approach and may not be available to smaller places.

4   Bernard, Moxnes, Saito (2015) Production Networks, Geography and Firm Performance, NBER Working Paper
     No.21082 http://www.nber.org/papers/w21082; Bernard, Sweets, Warzynski (2016) http://cep.lse.ac.uk/pubs/
     download/dp1423.pdf

Case study: Textile industry survey

Greater Manchester Combined Authority

Context and objective

The combined authority gathered information on over 200 firms and several retailers to understand the supply- and demand-side barriers to growth alongside a desk review of key literature.

Problem

Quantifiable data is not readily available to Local authorities and local enterprise partnerships on barriers to growth and demand forecast.

Methodology

1. Manchester Local Authority gathered information on over 200 firms and several retailers during 2013 and 2014 to understand the supply and demand-side barriers to growth alongside a desk review of key literature.

2. They complemented this information with 130 site visits.

3. KPMG looked at the data and estimated the size of the growth opportunity.

4. Feedback that arose from the survey was discussed and analysed by domain experts at weekly industry-led board meetings and triangulated with quantitative data and national statistics.

5. Cluster and network analysis was carried out and centrality tested to understand which firms to invest in.

Results

This survey and methodology allowed a micro-level understanding of the entire textile supply chain in the UK. It identified barriers to growth and opportunities. Most importantly, it established networks of firms and identified which firms were most central to the development of the supply chain.

Limitations

Such a large qualitative endeavour comes at a high cost.

Why is it interesting for local industrial strategy?

The conditions for funding by the Regional Growth Funds were chosen on the basis of these survey findings. As such, the findings were directly used to guide policy intervention. Local authorities and local enterprise partnerships might similarly consider selecting firms to invest in on the basis of a detailed understanding of the local supply chain and how central firms are to the sustainability of an industry.

Annex: Summary of the evidence

In our rapid review we considered economic literature looking at the consequences of supply chain disruptions due to unexpected events such as natural disasters and the 2008 financial collapse.

Previous shocks are not fully comparable to this current crisis, making it difficult to extrapolate lessons from past experiences. The 2008 recession was not caused by a pandemic, while the Spanish flu in 1918 occurred at a time when production and supply chains were far less globalised. In this review we have focused on identifying the lessons that we think are likely to apply more generally.

The impact of major shocks on supply chains

Carvalho, Nieri, Saito, and Tahbaz-Salehi (2016) analyse the role of supply chain disruptions on the propagation and amplification of shocks after the Great East Japan Earthquake of 2011. The evidence shows that direct as well as indirect suppliers of affected firms were adversely affected and these disruptions account for a 1.2 percent point decline in Japan's gross output in the year after the earthquake.

Costello (2019) analyses how a banking sector shock propagates through the corporate economy. Specifically, the study shows that suppliers which were highly exposed to this shock (the 2008 financial crisis) end up affecting downstream customers who cut employment. There are two possible channels through which these downstream customers are adversely affected: the trade credit channel (i.e. reduction in the trade credit) and the sales channel (i.e. reduction in the total supply of goods and services). However, the study does not disentangle the contribution of each of them.

Barrot and Sauvagnat (2016) analyse the effect of firm-level idiosyncratic shocks on the production network. The study finds remarkable output losses for customers linked to affected suppliers. Furthermore, the output losses lead to substantial market value losses and there is evidence of negative spillovers to other suppliers. The point estimates are economically large, mainly for the case of suppliers producing specific inputs, which suggest that input specificity plays an important role in the transmission and propagation of the shock through the network and the entire economy.

Huneeus (2020) analyses the role of the cost of adjustment (i.e. the cost to adjust the links of production networks) on how shocks propagate. Using a general equilibrium framework, the study indicates that without accounting for this cost, an international negative shock would have had a much lower negative effect in the domestic economy.

Joya and Rougier (2019) examine how a diversified production network affects aggregate volatility. Using the 2008 recession, the study shows that, whenever the shock affects sectors placed in a denser part of the production network, the propagation is limited due to the existence of a number of alternatives (what they called "substitution effect"). Whenever the shock affects more influential sectors within the production network, the result is an increase in aggregated volatility (what they called a "contagion effect").

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