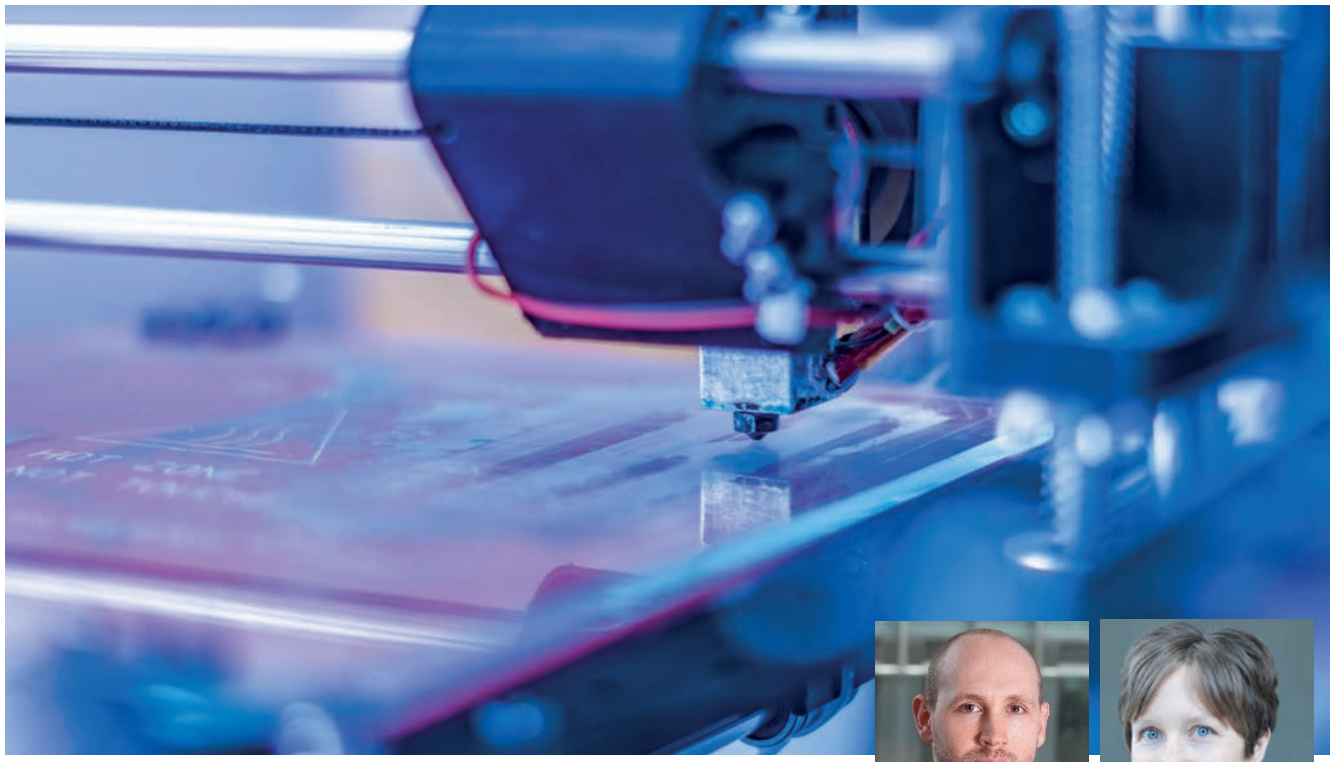


3D PRINTING

DISRUPTIVE TECHNOLOGY & LOGISTICS

George Abbatt, Director; and Emma Griffith, Senior Director:
Global Infrastructure & Project Finance; Fitch Ratings, New York, USA

The days of conventional machining by means of dyes, presses and hammers appear to be numbered with computer aided design (CAD) software, materials science and other technologies that 3D printing relies on becoming more advanced in recent years. Already a revolutionary practice for several industries, 3D printing (3DP) will prove to be a disruptive technology for logistics and how goods are transported across the world.

3% FOR 3DP BY 2037

We expect 3DP to grow significantly over the next 20 years, potentially reaching about 3% of total global manufacturing. 3DP is less labour intensive than traditional manufacturing and could reduce reliance on lower-wage countries for product assembly, which is a key driver of the US-China bilateral trade imbalance. In addition, as mass production via 3DP becomes more economically feasible, supply chains could be shortened with more manufacturing carried out locally. Net goods transportation may reduce as a result, negatively affecting transportation infrastructure's revenue.

The infrastructure segment likely to bear the brunt of this change over the next 20 years will be ports, given the central role of cargo transport for port activity as opposed to passenger traffic, as well as the central role maritime ports play in the handling of most international goods transportation. Additionally, the global relationship most likely to face the most significant test will be the one between the United States and China.

THE US AND CHINA

A significant portion of US imports from China are products that, in our view and based on recent technological advancements, are well suited for 3DP. Fitch expects that 20%-50% of these goods can be produced domestically, which could result in a reduction of 10%-25% in US imports from China. If trade protectionism continues to intensify, businesses in the US and China may have a strong incentive to adopt processes that facilitate domestic goods production, including 3DP. This could also help the US reduce its bilateral trade deficit with China.

A significant proportion of US imports from China are products that, based on recent advancements, can be competitively produced in part or in whole with 3DP technology, in our view. These imports include machinery and electronic equipment, such as computers and mobile phones. Potentially 20%-50% of these goods could may migrate to domestic production as a result of 3DP.

Though the US and China provides the most fascinating case study of the impact of 3D printing, trade relationships between other countries throughout Europe, the Middle East and Africa, Latin America and other parts of Asia will also be be affected. The level of disruption that 3D printing can create for logistics is far-reaching and covers several different areas as highlighted below.

THE SUPPLY CHAIN

The adoption of 3DP could shorten supply chains by bringing the production of some components in-house, therefore closer to the source of demand, which would reduce the net transportation of end products

from traditional manufacturing centres like China, Taiwan and Japan. It could also increase the transportation of raw materials to be used as substrate for 3DP, with raw materials going directly to, or near, the product sale location. 3DP could also result in greater automation by reducing the inventory and assembly requirements for products, therefore reducing the number of steps and workers involved in manufacturing. For example, General Electric is now using its own 3D printers to manufacture jet engine fuel nozzle tips, realising a net cost reduction. The new component is 25% lighter and is made of a single piece, whereas previously it was made from around 20 pieces.

VALUE CHAIN

The use of 3DP may alter and even remove entire value chains. For example, if consumers are able to 3D print items at home, which otherwise they would buy in a store, such as replacement parts for domestic appliances, this will remove the need for the value chain that has developed to get the part from the manufacturer to the distributor. It may no longer be necessary to manufacture millions of objects in low-cost locations and ship them around the world to warehouses and shops. However, it is likely that alternative, more efficient, value chains would evolve, which may also be more environmentally friendly.

TECHNOLOGY BREAKTHROUGHS

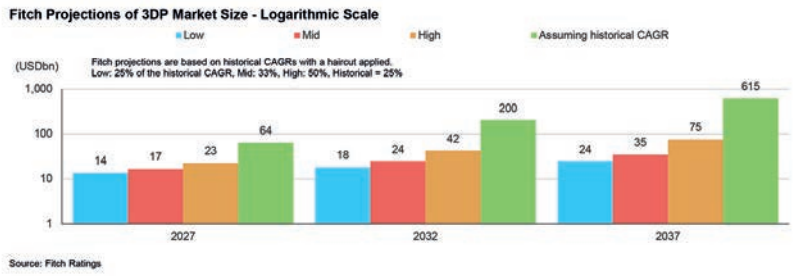
The speed of 3DP manufacturing processes could be greatly enhanced if technological breakthroughs, by a start-up, university research facility or R&D department of another incumbent firm, led to faster and more cost-efficient production for example. If incumbent firms are unable to adapt to new technology due to patent protection, prohibitive development costs or an inability to replicate the proprietary technology, they risk becoming uncompetitive.

DECENTRALISED MANUFACTURING

As technological advancements lead to smaller and cheaper 3D printers, manufacturing may become decentralised, which could disrupt traditional manufacturing company business models and change goods and materials traffic flows.

CLOSER TO MARKET

3DP may enable certain products to be produced closer to the end user, which would improve delivery times, but reduce traffic flows. 3DP may also allow certain products to be produced as cheaply in the market where they are sold as they would be in an area with cheap labour, therefore reducing dependence on low-cost labour.



Top US Goods Exports to China – 2018

Product	1(USDbn)	Contribution (%)	Potential for product to be manufactured more cheaply domestically via 3DP
Aircraft	18	15.0	Low
Machinery	14	11.6	High
Electrical Machinery	13	10.8	High
Optical and Medical Instruments	10	8.1	Moderate
Vehicles	9	7.8	High

NB: Data in the table may differ from the data shown in the breakdown of trade charts, because they come from different sources.
Source: Fitch Ratings, Office of the United States Trade Representative

Top China Goods Exports to US – 2018

Product	(USDbn)	Contribution (%)	Potential for product to be manufactured more cheaply domestically via 3DP
Electrical Machinery	152	28.2	High
Machinery	117	21.7	High
Furniture and bedding	35	6.5	Moderate
Toys and sports equipment	27	5.0	High
Plastics	19	3.5	Low

NB: Data in the table may differ from the data shown in the breakdown of trade charts, because they come from different sources.
Source: Fitch Ratings, Office of the United States Trade Representative

REDUCED BARRIERS TO ENTRY

Lower tooling costs associated with 3DP techniques may lead to reduced cost barriers for potential new entrants into manufacturing. However, other barriers to entry, such as intellectual property rights, patents and prohibitively expensive equipment, may continue to limit widespread adoption, if present.

CONCLUSION

With automotive, industrial, aerospace, consumer and medical companies already utilizing 3D printing, the new technology is already changing the status quo of how goods are delivered internationally. Also, as the mass production of 3DP becomes more economically feasible, supply chains will be shortened with more manufacturing done near company headquarters and net goods transportation may be reduced, which in turn could lower transportation industry revenue. What this also does over time is potentially reverse the several years of growth we have seen in world export volumes and shipping container traffic.

ABOUT THE AUTHOR

Emma W. Griffith and George Abbatt are both analysts in Fitch's Global Infrastructure Group. Emma is a Senior Director who leads Fitch's coverage of seaports in North America. George is a director focused on transportation and sports sector ratings in Europe.

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