

New digital technologies are supposed to bring us unprecedented efficiencies and new opportunities for value creation. So why has the productivity of major economies been slowing down over the past 10 years?



WHY HAS GLOBAL PRODUCTIVITY GROWTH BEEN weak over the past few years since the 2008 recession? It presents a puzzling picture given that it coincides with the emergence of technologies with capabilities for improving productivity.

Particularly perplexing is that the sectors contributing most to the slowdown seem to be the most intensive users of information and communication technologies. Furthermore, several G7 economies have showed a slowdown in productivity over the last decade as depicted in Chart 1. Many other countries have experienced a similar slowdown in productivity.

This anomaly—called the productivity paradox—has had analysts scratching their heads and hypothesizing possible causes.

The aftermath of the financial crisis continues to have an impact on markets. We also know that the inexorable rise of digitalization has brought with it a number of challenges as well as opportunities. Its take-up is being hampered by a lack of skills, and while some firms are performing disproportionately well, there remains a long tail of SMEs that are struggling to adopt the new technologies. These could all be factors, but is there something else going on?

One area that is ripe for further exploration is the need for business model innovation alongside technological innovation.

We know that the introduction of new technologies does not—by itself—translate into productivity gains. One of the lessons we have learned from the industrial past is that when electric motors first replaced steam engines in the U.S., there was very

little initial improvement in productivity. It was only when firms completely changed their business processes and corresponding business models that the technology had a significant impact on productivity – and that process took 30 years.¹ Is something similar going on with the so-called ‘Fourth Industrial Revolution’?

Is the Problem Productivity Measurements?

Productivity is measured either by looking at processes within individual firms or by looking at the macroeconomic indicators.

There are two problems with this approach. First, the firm-level measures focus on improving the efficiency of existing business models and not the effectiveness of the business models themselves. It looks at how value is created and captured – and how efficient a firm is at doing that – and not at the strength of its customer value proposition.

This is a major shortcoming when trying to understand the productivity of a busi-

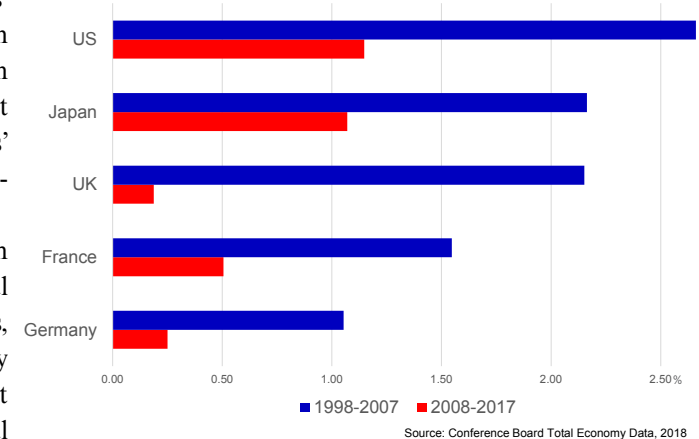
ness model; it needs to take account both of the firm’s and its customers’ perspectives. Studies have shown that firms which place too much emphasis on efficiency (and not enough on meeting their customers’ needs) inhibit their potential to innovate their business model.

The second problem arises from the flipside of that scenario. Digital technologies have, in some cases, so radically transformed the way products are made and sold that it makes productivity for national income growth difficult to calculate. For example, the ‘old’ business model in which a firm creates value and then transfers it to the consumer has been totally disrupted by firms such as Uber where individuals – in this case, drivers – play a key part in the value creation. In other sectors, different models have emerged in which, for example, content is given away free to the consumer with a view to charging corporate customers for advertising.

Towards a New Business Model Framework

There is definitely something interesting going on with business models. On the one hand, a lack of innovation may be stifling the productivity gains new technologies can

CHART 1
Average Growth in Labour Productivity



offer. On the other, where business model innovation has taken place, it could be affecting our ability to measure productivity properly.

If firms are to solve the productivity paradox – and policymakers are to support them in their endeavors – they need to be better able to understand and measure the productivity of their business models and be able to change them accordingly.

Our research program is working on ways of doing exactly that. Digitalization, as we know, is having an impact on virtually every aspect of manufacturing, from 3D printing to last-mile logistics. In order to explore the relationship between business model innovation and productivity and develop some tools to measure its efficacy, we have chosen to focus on one key area -- intelligent auto-

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Dr. Chander Velu is University Lecturer in the Economics of Industrial Systems in the Engineering Department of Cambridge University's Institute for Manufacturing (IfM) in the U.K. He previously served as a member of the faculty at Cambridge Judge Business School and earlier as a management consultant for Booz Allen & Hamilton and Price-waterhouseCoopers in London. He completed a Master's degree in Finance, and a PhD in Management, at the University of Cambridge.

¹ David, P.A. (1990). The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox, American Economic Review Papers and Proceedings, 80(2), 355-361.

mation. This has the potential to underpin business model innovation in a range of different ways, as depicted in Chart 2.

The possibilities are evident. To date, however, there has been very little research into how business model development can be institutionalized alongside technology development.

The Rise of Smart Products

If we think there are ways intelligent automation can enable business model innovation, we can also see the potential for wholesale disruption of the conventional manufacturing model in which products can be manufactured close to the consumer. Distributed manufacturing presents enormous opportunities for increasing productivity but there are also some significant barriers in its way.

Let's take an example in the consumer appliance industry. Today if a washing machine part, for example, becomes faulty, the consumer has to wait between two days and six weeks to get the part from the manufacturer. The manufacturer, in turn, has to hold a large number of spare parts. In the future, it is highly likely that many consumer appliances will be embedded with sensors that will be capable of checking their own

quality and integrity. Imagine if a 'smart' washing machine were able to predict when a key part is likely to fail and the part communicates with the manufacturer directly. The manufacturer would then lend its intellectual property to a third-party firm closer to the customer. The third party firm would use 3D printing (additive manufacturing technology) to print and replace the part.

Such an industrial system will require new business models from the retailer, manufacturer, and in the form of new third-party 3D printers. These types of new business models will help increase productivity dramatically. In our appliance example, the manufacturer would no longer need to hold a large quantity of spare parts, and it would take much less time to deliver the parts to the consumer. Moreover, this would help reduce waste through better repair and recycling.

However, there are issues to consider such as legislation, regulation, quality control, and intellectual property. If the making of products is delegated to third parties, how can the IP owner ensure they get paid and how can they ensure that the product is manufactured at the right quality and is compliant with any regulations? Some of these issues can be solved by using digital ledger technologies. By digital ledger technologies we mean a broad swathe of complementary technologies



To solve the productivity paradox, companies need to better understand and measure the productivity of their business models.

CHART 2
The Evolution of Business Models

Sector	Old business model	New business model	Future business model
Manufacturing	Factory automation	Predictive analytics recommends products to customers and anticipates orders	Distributed manufacturing which combines intelligent products with additive manufacturing at the point of sale
Distribution	Online shopping	Predictive analytics recommends products to customers and anticipates ordersTaxi service	Fully automated fulfilment systems including the use of autonomous delivery vehicles
Sharing economy (egUber)	Taxi service	Predictive matching algorithm matches customers and drivers and adapts pricing to match demand and supply	Autonomous taxis

including bitcoin and other cryptocurrencies, blockchain, and security-related technologies.

If a consumer appliance such as a washing machine is connected to a distributed ledger, the data could be recorded and made accessible – securely – to a range of users who would then be in a position to develop new business models and hence drive productivity.

This benefits different parties. The designers of the appliance -- as well as monitoring usage and controlling their IP -- could check their products' performance and collect data that could be used to improve future designs. Product comparison firms could rate aspects of performance such as energy use and noise levels. Sales firms could value an appliance remotely by looking at its age, usage and repair history, and set up an auction. Regulators could check that the appliances meet safety standards. Custom design firms could develop bespoke parts and appli-

ances to meet the needs of particular demographics, such as the elderly or visually impaired. Rental firms could rent them, offering servicing and upgrades. These connected technologies can also help reduce environmental impact.

Solving the productivity paradox is going to be critical if economies around the world are to increase the value of their manufacturing and deliver economic growth. The development of digital technologies is creating plenty of opportunities to increase productivity but until firms are able to re-invent their business models we are unlikely to see the real productivity benefits at a national level. For individual firms, those that recognize that technological and business model innovation need to go hand in hand are most likely to derive the benefits from the next production revolution M

There is potential for wholesale disruption of the conventional manufacturing model in which products are made close to the consumer.