

in brief...

Cotton and cars: the huge gains from process innovation

New inventions are good for economic growth, but equally important are improvements in the way we make things – what’s known as process innovation. **Tim Leunig** and **Joachim Voht** measure the impact of two such innovations – mechanical cotton spinning and the motorcar assembly line – on the world’s material wellbeing.

In material terms at least, life today is much better than it was in the past for almost everyone living in a developed nation. Think of all the items we have now that we did not have then – from the internet and mobile phones to more trivial items such as apple cinnamon cheerios, a favourite American breakfast cereal.

These ‘new goods’ enrich our lives, and economists have worked out just how much they are worth. They have found that the internet is worth 2-3% of GDP, the mobile phone 0.5-1% and even apple cinnamon cheerios raised the welfare of Americans by 0.002% of GDP. Some people really didn’t like their previous breakfast cereal.

There are two stages in making a new good valuable to society. First, it has to be invented, and we rightly celebrate inventors throughout the ages. But inventions also have to be adopted, and that means that they have to offer good value to consumers. The people who come up with ways of producing things more cheaply are also important in making us better off.

We have investigated the scale of two such innovations: mechanical cotton spinning and the motorcar assembly line. Both led to sensational price declines and both transformed what had been luxury items for upper class consumption – Indian calicoes and motorcars – into items of everyday consumption for a significant part of the population. Workers on Ford’s Model T assembly line could afford the cars they made; cotton spinners could wear cotton shirts.

Henry Ford did not invent the motorcar. Nor was his Model T a particularly good motorcar. Ford was not even the first to use a moving assembly line. But he was the first to ‘mass produce’ a car, a phrase he was also the first to use.

The effects were impressive: the time taken to assemble a Ford chassis fell from just under 12.5 hours in the spring of 1913 to 93 minutes a year later. Greater efficiency led to big falls in price: the Model T cost \$950 in 1909 and \$360 in 1916, a fall in real terms of more than two thirds. Ford realised his aim of building a car ‘so low in price that no man making a good salary will be unable to own one’.

Between 1908 and 1927 Ford sold a total of 15 million Model Ts. It was so ubiquitous that in his 1945 novel *Cannery Row*, John Steinbeck wrote that ‘Most of the babies of the period were conceived in Model T Fords and not a few were born in them.’ Ford also forced other car firms to follow suit, so that between 1908 and 1923 the average price of a car fell from \$2,126 to \$317 in 1908 terms. At the same time, annual sales rose from just 64,000 to 3.6 million.

One way of working out what Ford’s process innovation was worth to the American people is to calculate how much extra they would have had to pay to buy the cars they did in fact buy, at the price prevailing prior to Ford’s innovation. This measure is known as ‘social savings’. On that basis, Ford’s value to the American people was a staggering 14.7% of GDP.

Of course, we know that not everyone who bought a car at \$317 in 1923 would have been willing to pay \$2,126 for it. We can estimate the shape of the demand curve, and on that basis Ford’s innovation was worth around 1.8% of GDP. Although much smaller than our earlier number, it still means that the average value of a Ford car to consumers was around twice the price they had to pay. Ford made himself rich and created lots of jobs, but most of the benefits of his innovation went to the people who bought his cars.

Mechanising the production processes of car and cotton was as valuable as inventing the internet



Her habit of measuring time in terms of dollars gives the woman in business keen insight into the true value of a Ford closed car for her personal use. This car enables her to conserve minutes, to expedite her affairs, to widen the scope of her activities. Its low first cost, long life and inexpensive operation and upkeep convince her that it is a sound investment value. And it is such a pleasant car to drive that it transforms the business call which might be an interruption into an enjoyable episode of her busy day.

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product that has been invented that has had a bigger effect on welfare, as quickly, as these two improvements in the way in which we make things.

It is sometimes said – usually wrongly – that everything worth inventing has been invented. But even if that were the case, economic growth could and would continue. Innovators would strive successfully, and to great effect, to produce existing things more cheaply. This would raise our standard of living, allowing us to buy more of the goods that already exist or to spend less time at work while having the same material standard of living.

Those who make existing goods cheaper should be celebrated just as much as those who invent them in the first place. Both are crucial to understanding why we can, today, live so much better than we were able to in the past.

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TUDOR SEDAN, \$590 FORDOR SEDAN, \$685 COUPE, \$525 (All prices f. o. b. Detroit)



The same is true of mechanising cotton spinning in the Industrial Revolution. Again, the fall in price was spectacular. Cotton yarn that had sold for 107 pence a pound in 1784 sold for just under 13 pence in 1820.

The social savings from mechanising cotton yarn production were of a similar order of magnitude to those of mechanising car production – 17.6% of British GDP. Of that, 7.5% went to British consumers, while the other 10.1% went to the people around the globe who were now able to buy cotton goods more cheaply.

The consumer surplus estimate, this time simply for the cotton used by British people, was around 2.6%, again a substantial number. As the famous historian AJP Taylor, himself born to a cotton family, once remarked, 'Every piece of cotton cloth is going to make someone warmer or cleaner or more comfortable'.

These two process innovations each produced gains for consumers that were, even when estimated conservatively, equal to the expenditure on them. Furthermore, the gains took relatively little time to be realised.

Improving the production processes of these two existing goods was as valuable in terms of consumer welfare as inventing the internet, and much more valuable than inventing mobile phones. Indeed, it is hard to imagine any

This article summarises 'Spinning Welfare: The Gains from Process Innovation in Cotton and Car Production' by Tim Leunig and Joachim Voth, CEP Discussion Paper No. 1050 (<http://cep.lse.ac.uk/pubs/download/dp1050.pdf>).

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