Investment Research

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# How the digital economy is changing corporate pricing and inflation

- Digitalisation is increasing the consumer surplus through lower prices, more variety and richer experiences. For producers, it can help profit margins through cost advantages and revenue enhancing channels.
- Digital markets are largely based on network effects, making a large user-base critical. This often leads to a 'winner-takes-most (if not all) game' environment where dominant players create barriers to entry as a result of their robust growth.
- The digital economy provides a means to optimise prices for individuals in a rapid, flexible and extensive manner. The mass customisation movement will further enable requirement-based, personalised price-setting.
- These developments suggest lower prices, dispersion within consumption baskets and uncertain price stability. Measuring inflation will face old but growing challenges.

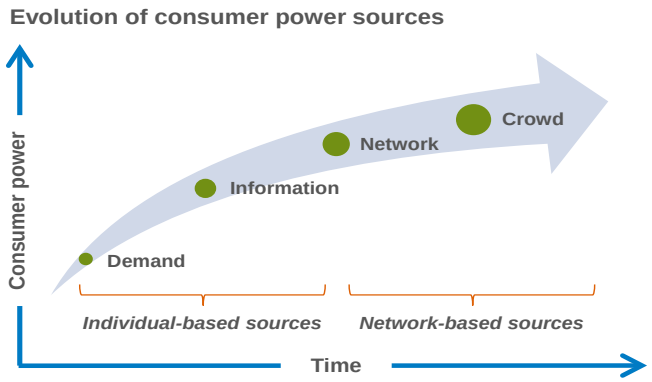
## Shifting the balance of power

Technology and innovation are intrinsically deflationary. They lower barriers to entry, increase opportunity as well as competition and compress prices. This is certainly not a new phenomenon, for example, improvements in sailing technology in the 15th century triggered the European Age of Exploration, marking the beginning of globalisation and transforming the price dynamics of various commodities, notably textiles and spices. In 15th century London, a carpenter's daily wage could buy a mere 150 grams of cinnamon, compared to more than 10 kilograms today[1].

Digitalisation is no exception to this trend, rather making it even more relevant, as the balance of power in the digital economy has been shifting towards the consumer (*Exhibit 1*). Digital markets significantly enhance the consumer surplus through an increased variety of products and lower average selling prices[2]. Channels of transmission include business-to-customer, business-to-business, business-to-employee and consumer-to-consumer interactions[3]. Economic theory tells us that innovation increases productivity, while lower search costs, better information and low barriers to entry increase competition, which in turn lower prices. This pattern is playing out via the growth of e-commerce and digital platforms, which have facilitated transparency and reduced market friction. Consumers today are the most informed, educated and connected they have ever been.

*Exhibit 1*

**Consumer empowerment in the digital economy**




*Source: Journal of Interactive Marketing 27 (2013)*

The pricing power end-game for businesses is essentially to shield profit margins. On the producer's end, processes are getting more agile and automated; cutting costs through labour arbitrage and better capital allocation. Digitalisation offers cost advantages through operational efficiency and channels for better customer penetration. For instance, digital content has exploded in the computer and video game industry with the shift from selling physical game discs to digital game downloads and add-on content. The profit margins on digital sales are significantly higher as games are sold straight to customers, cutting out the retailer, which helps improve inventory management. There is also a huge monetisation opportunity from additional content (selling new levels, new characters, special weapons etc.) and customer engagement. At Electronic Arts, which created the popular *Fédération International de Football Association* (FIFA) gaming franchise, digital channels account for 60% of revenue, up fourfold since 2010. Consequently, the firm's profit margins have expanded by a similar scale.

[1] Munro, J., "The Luxury Trades of the Silk Road: How Much Did Silks and Spices Really Cost?", University of Toronto, Oct 1983.
[2] Brynjolfsson, E., Smith, M. and Hu, Y., "Consumer Surplus in the Digital Economy", MIT Sloan School of Management, Nov 2003.
[3] "Measuring the Internet Economy: A Contribution to the Research Agenda", OECD Digital Economy Papers, No. 226, 12 July 2013

## Multi-sided and monopolistic

The scale that today's digital giants have achieved in a short space of time is incredible. Facebook, Amazon, Netflix and Google comprise over 7% of the S&P 500 by market capitalisation but account for only 2% of the employees. With low or no costs for end users, there is a question about whether or not enormity of scale remains necessary for success in the digital economy. Today's digital giants are monopolies in their own right but pursue a strategy which is largely growth and innovation focused, so as to create intangible barriers to entry by crowding out the competition. This suggests the emergence of a new kind of non-predatory price-taking monopoly - and this behaviour can largely be explained by the fact that consumers are businesses' main assets in the digital economy.

These developments suggest that the digital economy is one of increasing returns where firms focus on growth in an effort to dominate their entire market. In turn, digital markets increasingly appear as a winner-takes-most (if not all) game[4]. This is in contrast to the world of diminishing returns that typically comprises resource heavy businesses - a world in which expansion ultimately leads to diminishing returns in the form of rising costs or falling profits. The world of increasing returns, on the other hand, exhibits positive feedback mechanisms where a product or business that is ahead, gets further ahead and one that loses advantage, loses further[5].

Pricing strategies for digital companies are made more complex by the fact that their business models are often multi-sided, therefore optimal prices incorporate externalities from different sides. A simple example here is newspapers that can generate revenue from both readers' subscriptions and advertising. The price of subscriptions will be set in order to maximise revenues on both sides. Platforms tend to subsidise the price-sensitive or value-adding group and generate revenue from the set where demand moves with growth[6]. Thus, profit centres in the digital economy are shifting from final consumers to the other end of the value chain.

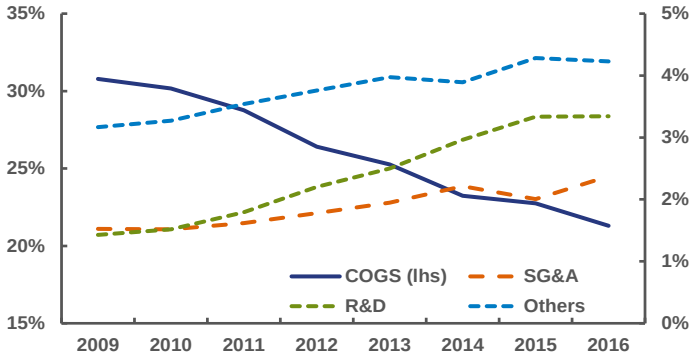
Google and Facebook generate 88% and 97% of their revenues respectively through advertising thanks to their ability to shape the way we use the internet. Similarly, Amazon's dominant position in retail enables it to obtain favourable prices from suppliers, in turn enabling it to give its consumers the best deal in terms of price and convenience. The evolution of Amazon's operating costs as a share of its revenue shows a gradual decrease in the cost of goods sold compared to rising expenses elsewhere; with the largest relative increase being in research and development (*Exhibit 2*). With consumer volume essentially being the edge, it is naturally optimal for these companies to engage their users in the value creation process by providing products for free or minimal cost along with exceptional user experience.

Due to the relatively low barriers to entry and ample availability of venture capital, the threat of new technologies disrupting a previously healthy market position persists in digital markets, and reinforces companies' desire to create barriers of entry through growth and innovation. Inorganic growth and diversification are also important developments. Internet sector mergers and acquisitions transactions have almost quadrupled over the last decade compared to a mere 15% growth overall. Disruption, by its nature, is rarely foreseen, thus the cycle of great companies losing market leadership to new competitors continues to repeat itself[7]. With the increasing pace of disruption, it is yet to be seen how long today's digital monopolies will continue to thrive.

*Exhibit 2*

**Steady decline in cost of goods sold at Amazon**

**Amazon's operating expenses (% of revenues)**




*Source: Bloomberg and AXA IM Research*

## Personal price setting

Digitalisation enables businesses to better segment their customer base and efficiently identify market trends. People are willing to pay different prices based on affordability and quality. The bilateral flow of information between customers and businesses is improving real time decision making and predictive analytics capabilities. These advances provide businesses that achieve scale with an unrivalled means to optimise prices in a rapid, flexible and extensive manner. In some ways this might work towards reversing the initial trend of increasing consumer surplus in the digital economy.

Traditionally, pricing methods have been largely based on elements like production costs, target margins, competitors' prices and volume-based discounts. It is estimated that up to 30% of pricing decisions that companies make fail to deliver the optimal price[8]. The power to harness massive pools of data on consumer characteristics is creating substantial opportunities. Digital environments enable firms to use customer information to help predict individual differences and

[4] Colin, N., "Winner-takes-most: the Two Worlds of Increasing Returns", The Family Papers, April 2016.

[5] Brian Arthur, W., "Increasing Returns and the Two Worlds of Business", Harvard Business Review, July-August 1996.

[6] Perset, K, "The Economic and Social Role of Internet Intermediaries", OECD, April 2010.

[7] Christensen, C.M. ,"The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail", Harvard Business School Press, 1997

[8] Baker, W., Kiewell, D. and Winkler, G., "Using big data to make better pricing decisions", McKinsey & Co., June 2014

willingness-to-pay, and to determine real time prices on a highly scalable level. Customer-specific, personalised pricing structures are estimated to improve revenues by around 25% compared to optimised uniform pricing structures[9]. Sophisticated marketers are increasingly deploying artificial intelligence to learn more about market dynamics behind products and services. On the other end, consumers are getting more informed, educated and connected. With digitalisation, we appear to be moving closer to an efficient market structure like that hypothesised in the financial world.

Uber, the popular taxi app, is a straightforward case of how data can be used to engineer prices to respond to demand, supply and individual preferences in a real-time, scalable manner. The data gathered could be granular enough to capture every user's behaviour based on location, weather conditions, time, and so on. "Surge pricing" uses algorithms to tactically raise prices when demand exceeds supply in a location *(Exhibit 3)*. This allocates available cars to the highest paying users while incentivising drivers.

Manufacturing is also moving towards mass customisation. Historically, manufacturing can crudely be broken down into two parts – mass production that is characterised by high volumes and low margins and bespoke production, which is characterised by low volumes and high margins. With digitalisation, we are getting the best of both worlds, creating bespoke mass production – implying higher volumes and margins. Henry Ford, whose company famously manufactured the model T in only one variety in the 1920s once said, "you can have it in any colour you want as long as it's black". In comparison, the modern BMW mini comes in 14 million different variations. With the focus on enhancing customer experience, the mass customisation movement will further enable requirement-based, personalised price setting.

*Exhibit 3*

**Uber "surge prices" in locations on New Year's Eve**


*Source: CNN Money (2015),Uber and AXA IM Research*

## Implications for inflation

The wave of innovation produced by digitalisation has and expectedly will continue to put downward pressure on prices as competition is enhanced by ecommerce and quality improvements become greater and more frequent. These effects are the most immediately visible and are already being debated, demonstrated by the recent methodological revisions to the telecommunications services component leading to downside inflation surprises. With all sectors, from transport and travel to food and financial services, being gradually impacted, the effects are likely to spread throughout the consumer basket.

However the idea that prices will keep trending lower seems counterintuitive given the monopolistic tendency of the digital economy. For now it appears that these monopolies do not raise barriers to entry and therefore prices. But it remains an open question. The growth of personal price setting and mass customisation also casts doubts about the direction of inflation being unilaterally down. If firms are better equipped to capture the consumer surplus, they may counter the competitive pressure by having greater dispersion in prices.

In any case, a situation where the same goods at the same time could have different prices, depending on who is buying, puts into question the relevance of aggregate inflation measurements. The consumer price index (CPI) basket could be challenged as a proper representation of inflation dynamics if the dispersion around it become large.

Other measurement issues have also emerged. Prices are generally sourced from businesses and do not reflect person-to-person transactions. This is getting increasingly important with the growth of the sharing economy; Airbnb and its implications for accommodation rental prices is a widespread example of this phenomenon. The growing number of second-hand transactions on digital marketplaces like eBay and Amazon is also potentially an important issue as prices of second-hand products (except cars) are generally excluded from consumer price statistics. The classic problem of measuring quality adjustments is bound to get more challenging with the pace of innovation and shorter product cycles. The digital revolution is likely to make quality changes in goods and services more important and more difficult to track[10].

Finally, the price of many digital services has gone down to zero. For example, there were 80 billion photographs taken back in 2000, compared to 1.6 trillion in 2015; with the price per photo dropping from 50 cents to zero and essentially the elimination of most monetary transactions concerning photos[11]. Pricing models where there is a fixed cost for access but a zero marginal cost for additional use entails monetary transactions failing to observe the price per unit. This measurement challenge is growing but not new: non-digital person-to-person services (such as babysitting for instance) have a quality-price split that is equally difficult to assess.

[9] Dubé, J. and Misra, S., "Scalable Price Targeting", NBER, Mar 2017

[10] Bean, C., "Independent Review of UK Economic Statistics", March 2016.

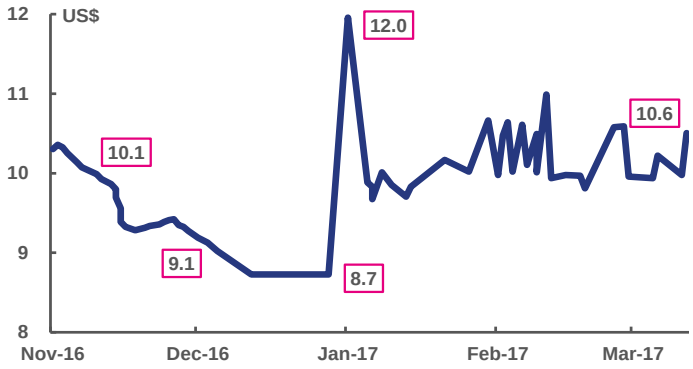
[11] Varian, H., "Slow growth in productivity: causes, consequences, and policies", The Brookings Institution, Sept. 2016.

The last question about inflation is whether dynamic pricing mechanisms may drive inflation volatility higher. While the weight of energy, the most volatile component of inflation today may drop with the emergence of alternative sources, most notably through electric cars, prices of common goods may become more erratic as they are exchanged on digital marketplaces where prices are often dynamically set by algorithms. Turbulent movements in the price of everyday staples are already a commonplace on digital platforms that often resemble trading in financial markets[12] (*Exhibit 4*). With the rise of e-commerce, online price based inflation measures are becoming more important and may lead to a whole new inflation regime[13].

*Exhibit 4*

**Market turbulence in the price of everyday staples**

**The cost of a 20-pack of Duracell batteries**




*Source: Keepa and The Wall Street Journal*

## DISCLAIMER



[12] Mims, C., "The High-Speed Trading Behind Your Amazon Purchase", The Wall Street Journal, March 2017.

[13] "The Billion Prices Project", MIT Sloan School of Management.