

Cross cutting topic (5): Quality Change

A proxy approach to quality adjustment of a service industry

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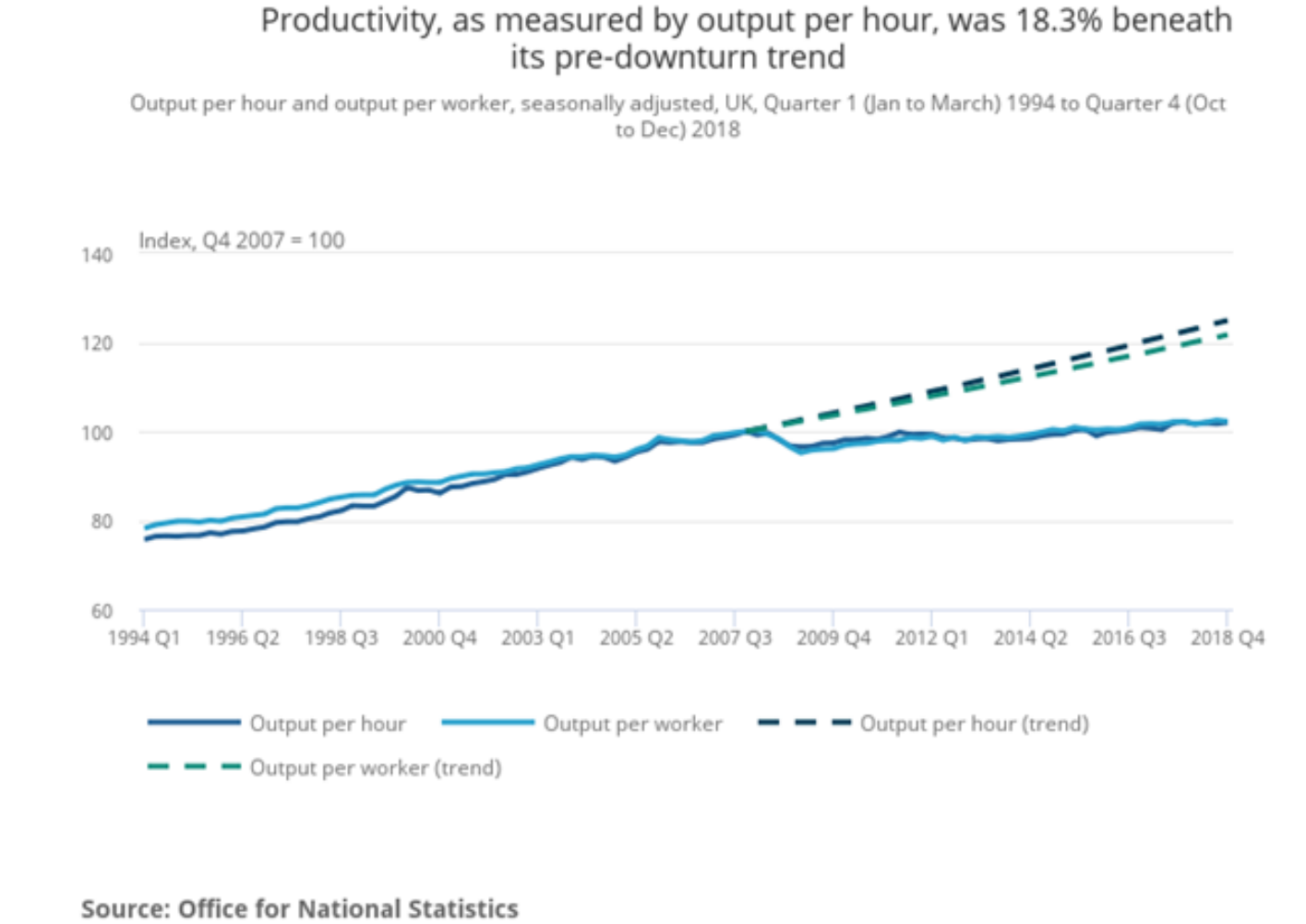
Deflators

- Allow for volume measures to be compared in real terms
 - Price changes removed from current price data series
- Accounting for quality change is major challenge
 - Standard techniques not always suitable or practical
 - Consequently deflators of goods and services impacted by rapid quality advancement often tend towards upward bias
- Key aim of ONS Deflator Strategy is to capture quality change more effectively in fast changing industries

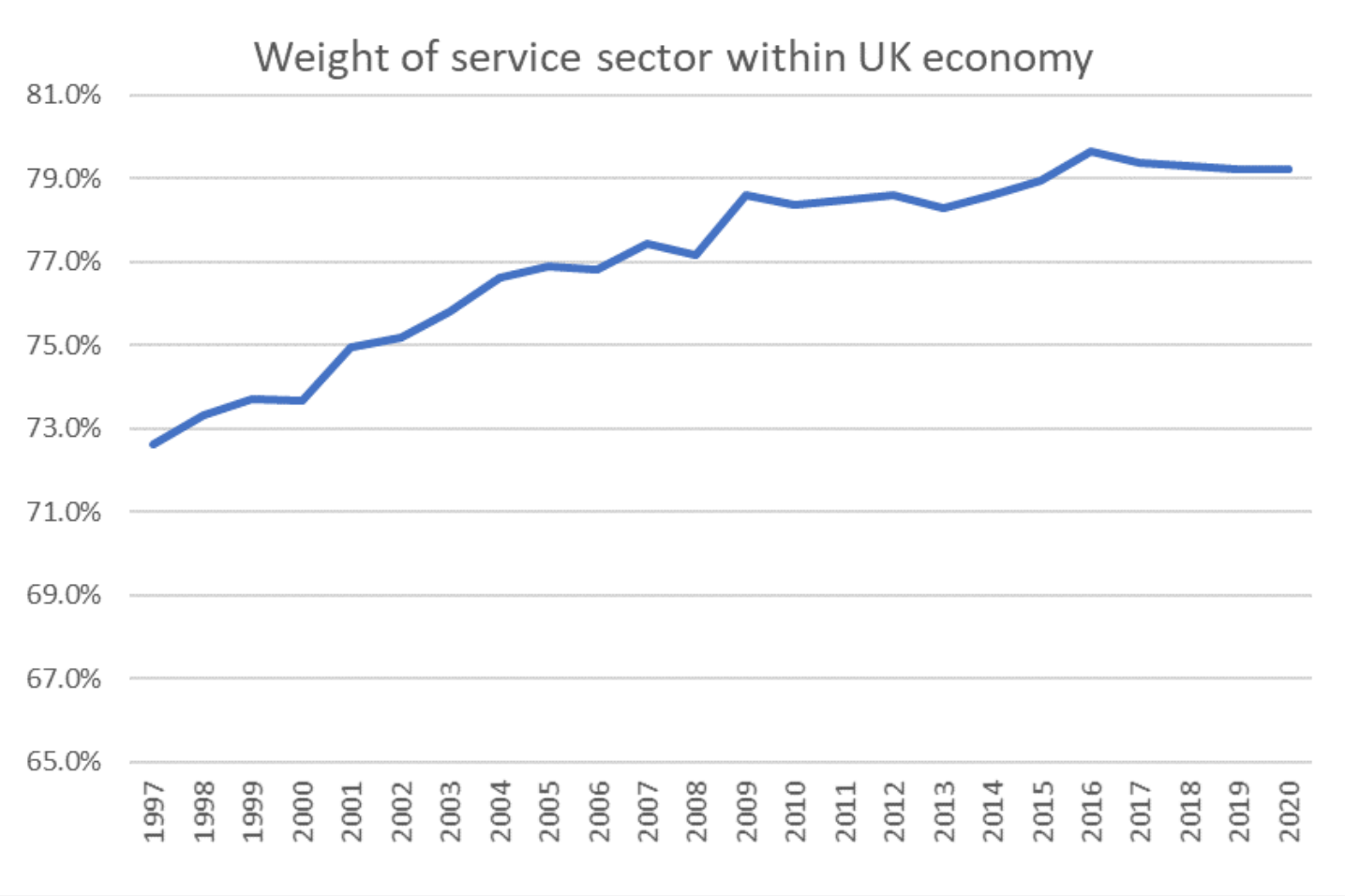
Productivity within service sector

- Low productivity growth in recent years for several service industries experiencing rapid technology change
- Expect rapid technology change to lead to increased productivity
- May reflect under-estimation of service productivity growth due to difficulties of adjusting for quality improvements

Productivity puzzle



Growing service sector



Challenges in measuring service quality change

- Adjusting for quality change of services is challenging due to the often-heterogeneous nature of products
 - Tailored to client's needs
 - Unique
 - Change from period to period
- Quality of a service is a function of its intangible characteristics
 - Reliability
 - Effectiveness
 - Customer satisfaction
- Quality change can be subjective depending on perspective of individual
- Therefore, most standard quality adjustment methods not practical for application

Pricing methods

- Ideally the pricing method would inherently account for quality changes or productivity
- Many of ONS's SPPIs use time-based methods
 - Survey asks how long workers of different grades/positions work over given quarter and their charge-out rate
 - Does not inherently account for quality changes
- Model pricing would be a more suitable method for tracking price movements of unique products, though involves significant burden on respondent
 - Respondent constructs a model service that reflects its business
 - Respondent asked to estimate price of this service, had it been provided in each reporting period
 - Should reflect any changes to labour costs, which will reflect changes to productivity
 - Model must be updated to ensure it remains reflective of services provided

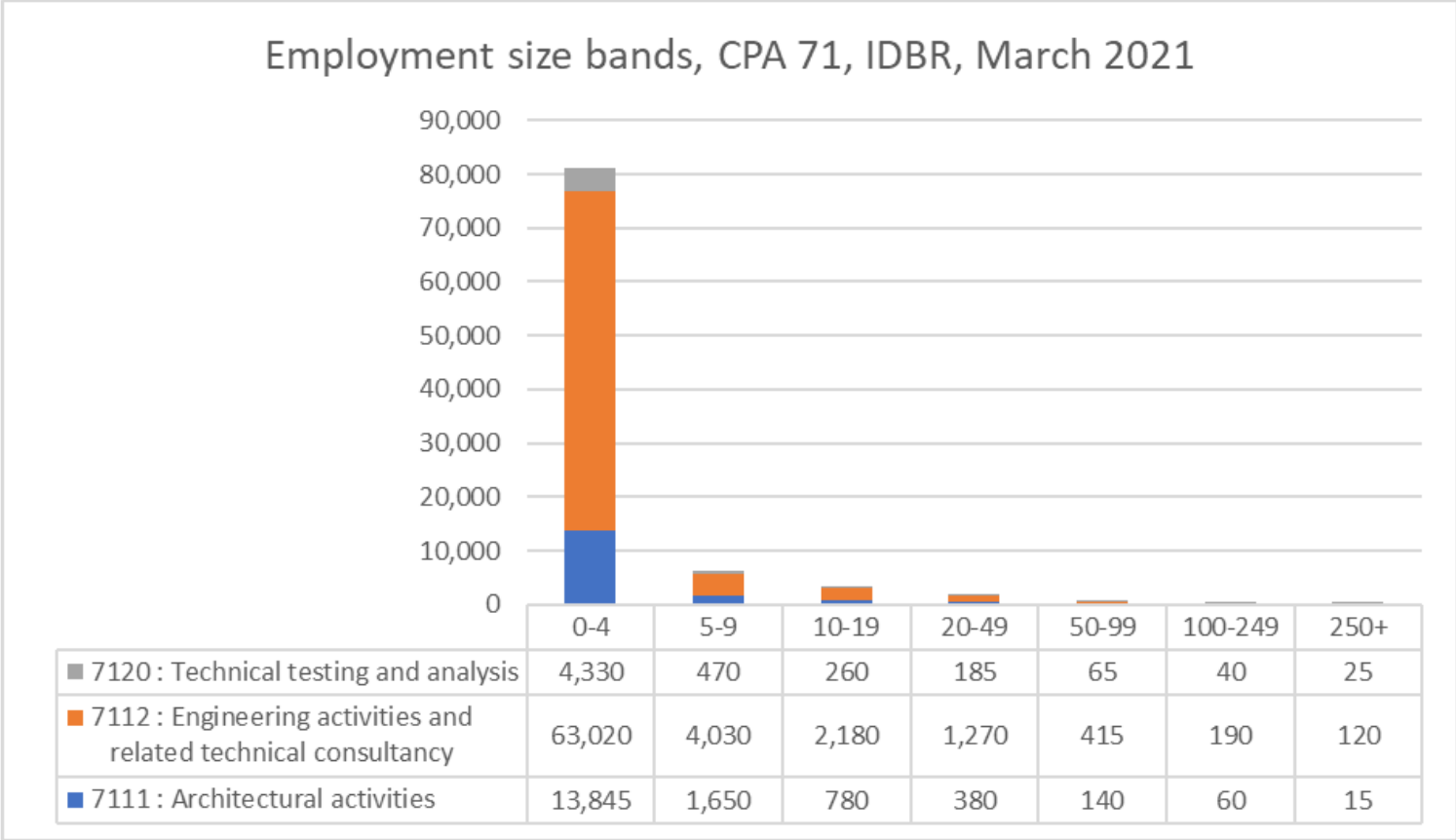
Case Study: Architecture & Engineering (71.1)

- Increasing use of emerging technologies over the last 10-20 years
- Expect to see the impact of quality improvements reflected in the deflators
- However, our existing deflators fail to recognise technological advancements and productivity revolution within the industry
- We aim to use insights from characteristics of the services to develop a method for incorporating quality change

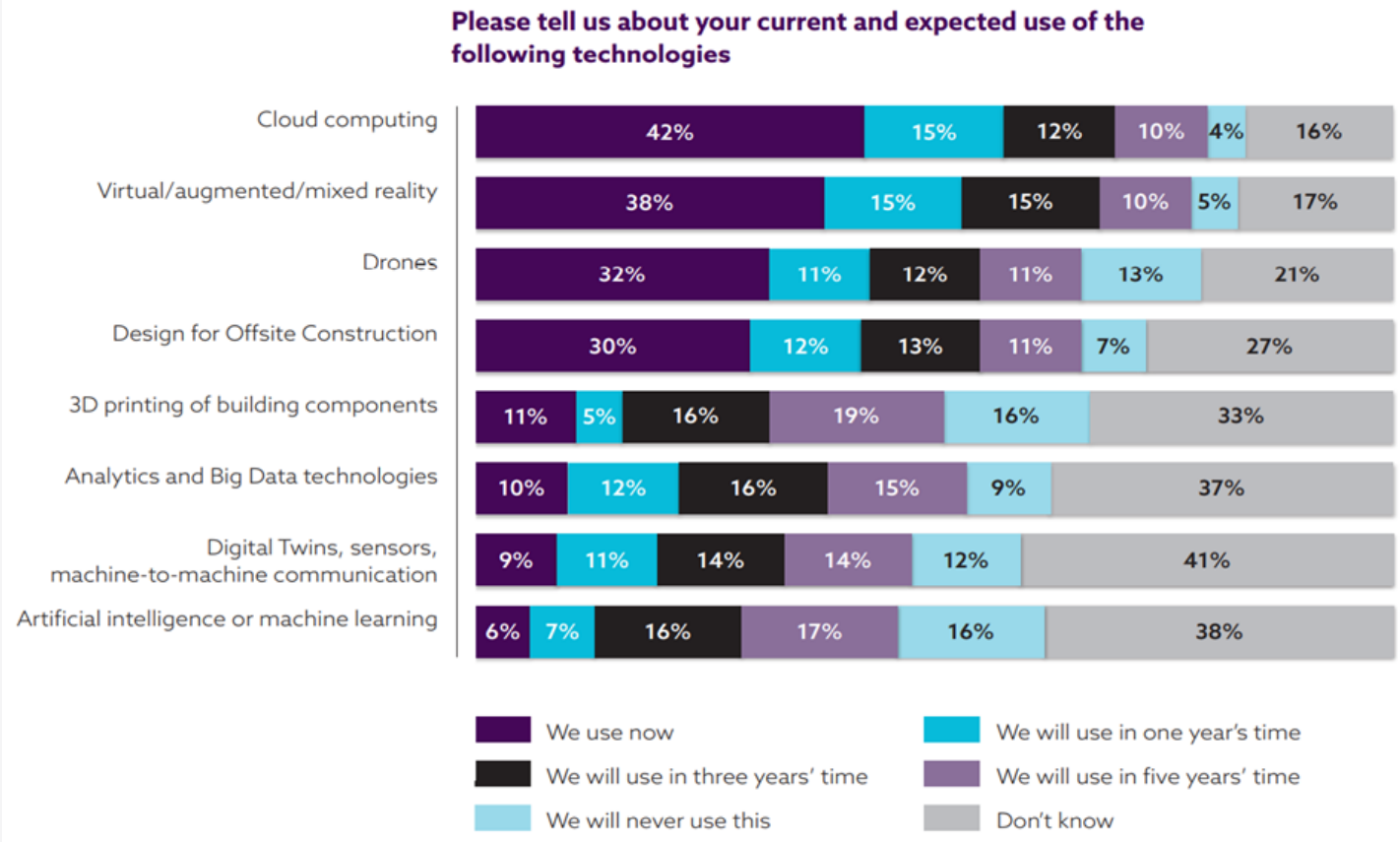
Case study: Architecture & Engineering - sample

CPA 4-digit	Sample composition	Pricing and price collection method	Coverage
Architectural services (71.11)	39 items 34 suppliers	Time based Survey – stratified random sample	Prices from following 6-digit CPAs: <ul style="list-style-type: none"> - Landscape architectural services - Building project architectural advisory services - Project site master planning services
Engineering services and related technical consulting services (71.12)	72 items 58 suppliers	Time based Survey – stratified random sample	Prices from following 6-digit CPAs: <ul style="list-style-type: none"> - Engineering services for industrial/manufacturing projects - Engineering advisory services - Project management services for construction projects - Geophysical services - Engineering services for building projects

Case study: Architecture & engineering - business size in CPA 71



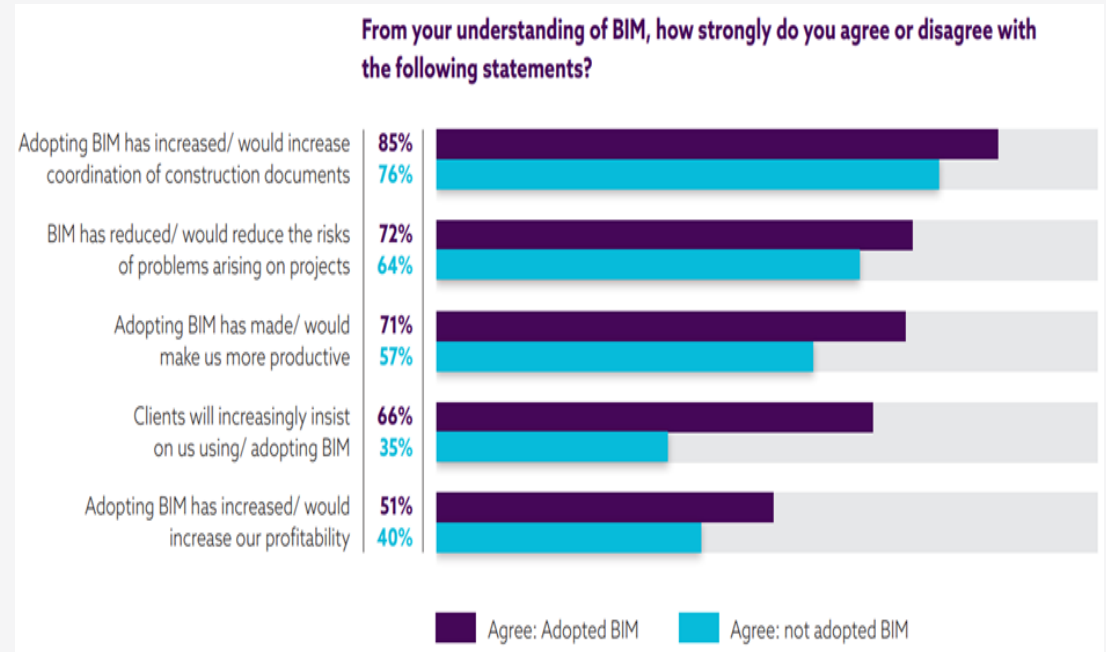
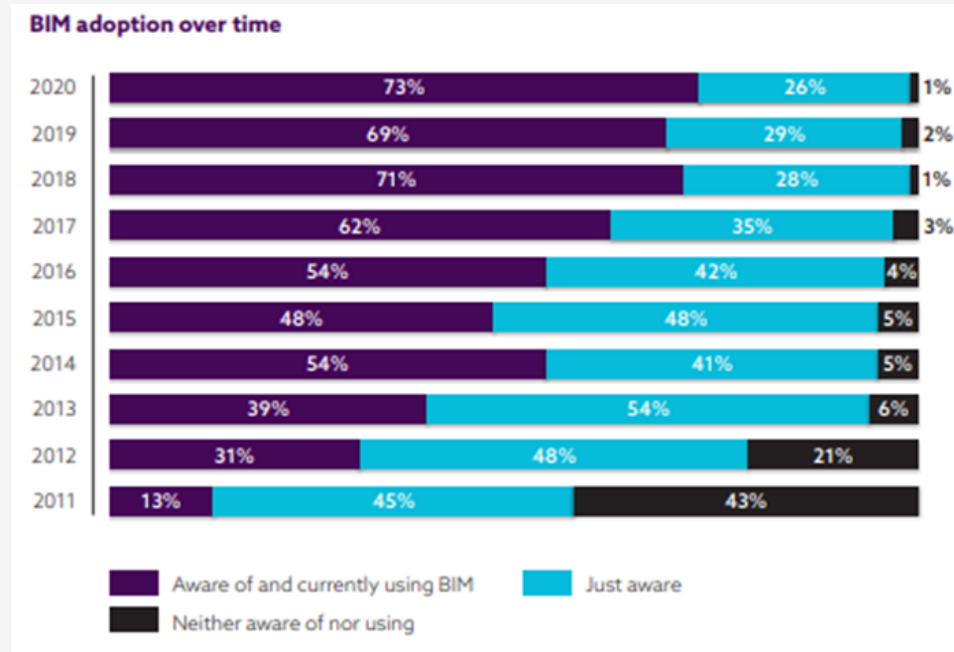
Case study: Architecture & engineering – quality change



Case Study: Architecture & Engineering – 3D Building Information Modelling (BIM)

- BIM enables improved communication between parties working on project
 - Potential problems highlighted earlier, improving efficiency
- In 2011 UK government commenced programme encouraging use of BIM
- Since been rapid increase in use and awareness of BIM

Case study: Architecture & engineering – BIM take up and opinions



The majority of these statements would reflect increased quality of service as a result of using BIM

Case Study: Architecture & Engineering – quality adjustment options

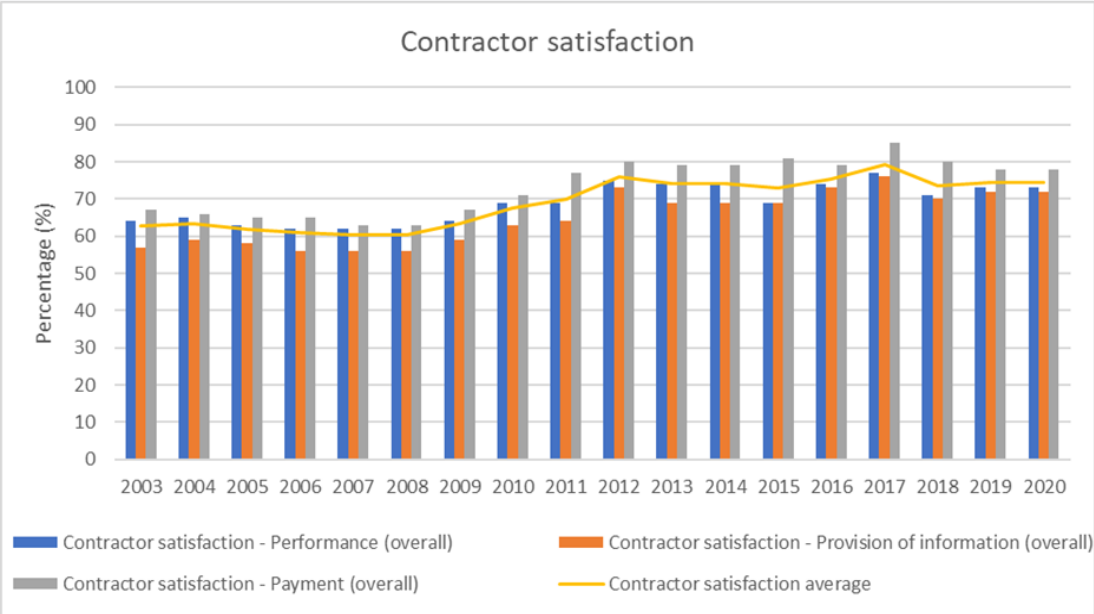
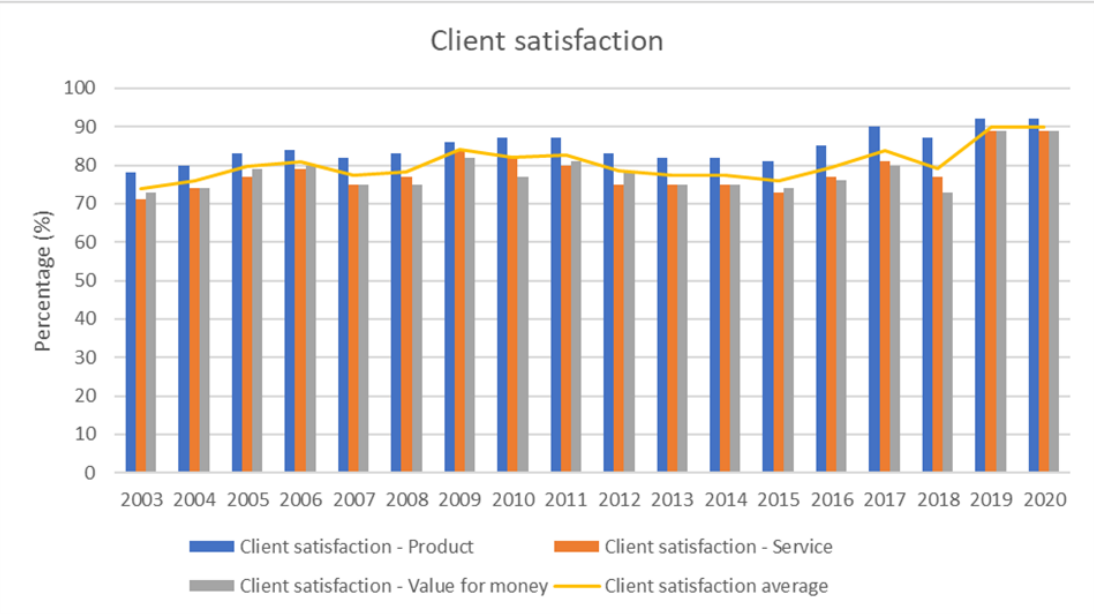
- 1) Implement a price adjustment using relevant proxies that could indicate a measure of quality change in the service
- 2) Use a pricing method which allows for inclusion of changes in quality or productivity, such as model pricing.

Option 1 is the focus of this presentation.

Case Study: Architecture & Engineering – adjustment using satisfaction as proxy

- Key Performance Indicators (KPIs) for the Construction sector available from UK industry performance reports published by Glenigan
 - Glenigan is market leader in field of construction sales leads and marketing intelligence
 - KPIs capture the sector's performance and provide benchmark for comparison across years:
 - Satisfaction (client and contractor)
 - Profitability
 - Predictability
 - Staff turnover
 - Sickness absence
 - Accident rates
 - Energy usage
 - Waste removal
 - Water usage
 - Commercial vehicle movements
- Satisfaction alone is a good indicator of quality as it is likely to be closely related to many other indicators of quality
 - This proxy for quality change is based on client and contractor satisfaction over time

Case Study: Architecture & Engineering – adjustment using satisfaction as proxy



Case Study: Architecture & Engineering – adjustment using satisfaction as proxy

- The quality adjusted index was calculated as follows:

- Step 1: Calculate a satisfaction indicator, an arithmetic mean of the client and satisfaction indicators

$$Satisfaction_t = \frac{Satisfaction_{client,t} + Satisfaction_{contractor,t}}{2}$$

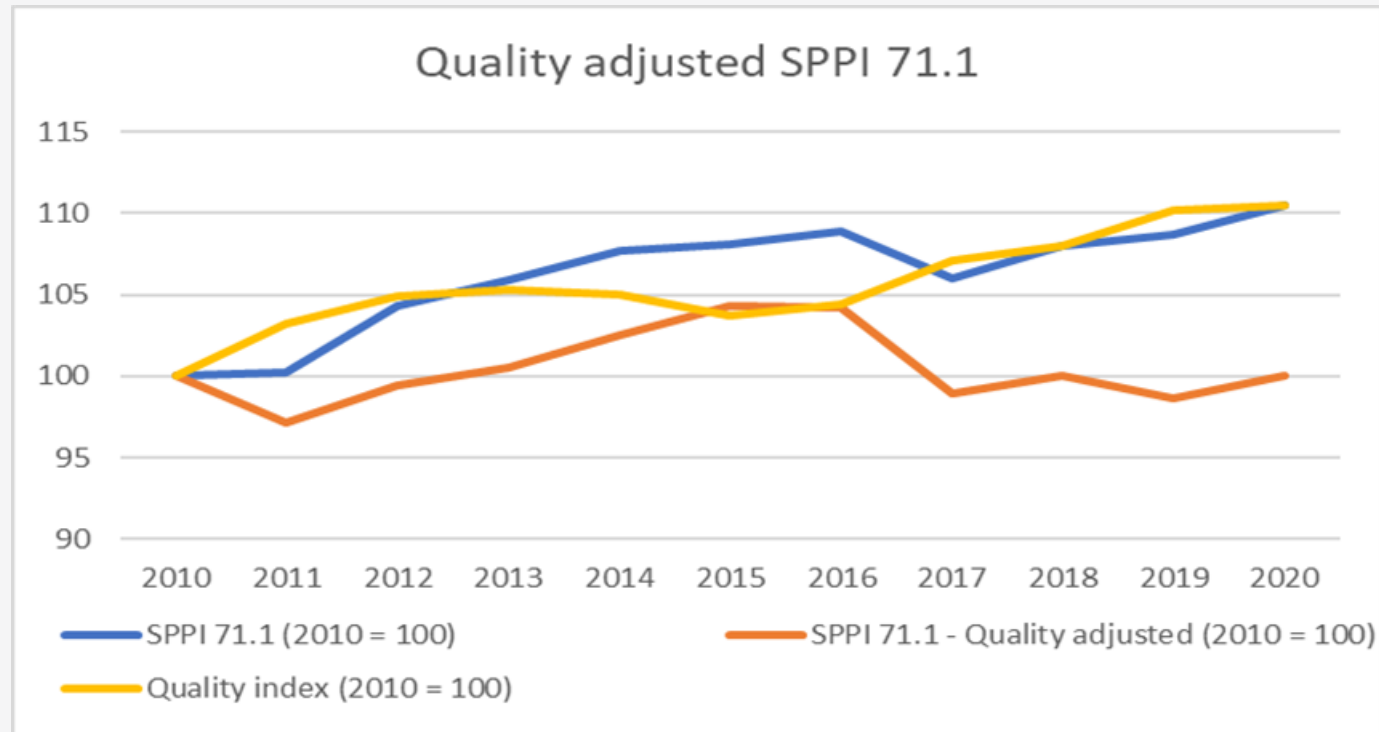
- Step 2: Calculate a quality index, a 3-year rolling average of the satisfaction indicator to smooth out year-to-year volatility

$$Quality\ index_t = \frac{\sum_{i=t-2}^t Satisfaction_i}{3}$$

- Step 3: Re-reference the quality index and unadjusted SPPI to 2010=100
- Step 4: Calculate a quality adjusted index, the ratio of the unadjusted SPPI to the quality index multiplied by 100

$$Quality\ adjusted\ index_t = \frac{Unadjusted\ index_t}{Quality\ index_t} * 100$$

Case Study: Architecture & Engineering – adjustment using satisfaction as proxy



- Unadjusted SPPI exhibits overall growth between 2010 and 2020, suggesting price increase
- Quality adjusted SPPI exhibits flatter trend
- By stripping out the quality improvements the price increases are offset
- Expect resultant volume measures to show more growth than those calculated with unadjusted SPPI
- Expect higher productivity growth over this period

Conclusions

- Adjusting for quality change of services is challenging
 - Heterogeneous nature of services often prevents application of standard methods
- Difficulties measuring quality change in growing service sector with increased digitalisation likely to have contributed to underestimation of productivity growth
- Application of proxy approach on Architecture & Engineering led to plausible inflation rates which would lead to higher productivity estimates
- We would like to continue our research by:
 - Investigating additional sources which may be more suitable for developing quality indices
 - Considering the use of additional KPIs such as people and environmental indicators
 - Investigating the potential of using this methodology for quality adjusting other service industries