

Digital Servitization in UK SMEs

Antonios Karatzas, NBS, University of East Anglia

Dimitrios Dousios, NBS, University of East Anglia

Jawwad Raja, Copenhagen Business School

Georgios Papadopoulos, School of Economics, University of East Anglia

Marko Bastl, Marquette University

Euroma 2023

Leuven, Belgium



**Copenhagen
Business School**
HANDELSHØJSKOLEN



University of East Anglia

Funding statement

This work is funded by Interact

✦ InterAct is a £4.4 million, Made Smarter Innovation funded, Economic and Social Research Council-led network that aims to bring together economic and social scientists, UK manufacturers, and digital technology providers to address the human issues resulting from the diffusion of new technologies in industry.


Pioneering human insight for industry

<https://interact-hub.org/>



Digital Servitization in UK SMEs

Current state of Digital Servitization research

- ✦ Digital servitization: The convergence between servitization and digital technologies
- ✦ Clear shortcomings:
 - ✦ Lack of quantitative measures of DS
 - ✦ Over-representation of qualitative studies
 - ✦ Limited and/or unclear applicability of insights to SMEs
- ✦ Warranting further research
 - ✦ Limited understanding of the factors that lead firms to *choose* one (digital) servitization business model over another
 - ✦ Limited understanding of what digitally enabled service-based business models *are most suitable* under different conditions



Digital Servitization in UK SMEs

Aims

Study 1: To identify environmental and organisational factors that differentiate between Business Models (SSC / JPIM)

→ *Explain* the choice of BM

Study 2: Identify the configurations of environmental and organisational factors that are conducive to higher SME performance of different digital servitization business models (Euroma / IMM)

→ *Explain* differential performance of SMEs given the BM choice



Digital Servitization in UK SMEs

‘Causal’ conditions

✦ Contextual/environmental Determinants:

- ✦ Competitive Intensity
- ✦ Demand Unpredictability
- ✦ Product/Process Complexity
- ✦ Technological Turbulence

✦ Organisational Determinants:

- ✦ Product-Service Distinctiveness
- ✦ Service orientation of employee culture
- ✦ Digital maturity (degree of digitization)
- ✦ Entrepreneurial Orientation



Digital Servitization in UK SMEs

DS business model typology applicable to SMEs

- ✦ The project developed and operationalised a typology.
 - ✦ Main influences
 - ✦ Suppatvech et al. (2019) and Kohtamäki et al. (2019)
- 0: Pure product (no services)
 - 1: Product + Services (digital technologies play no role in providing them)
 - 2: Add-on
 - 3: Usage-based
 - 4: Solution-oriented
 - 5: Platform (Cenamor et al. 2019)



Digital Servitization in UK SMEs

DS typology applicable to SMEs

- 3. The **'add on'** business model: Our company employs digital technologies **to enable additional functions or add customized services** to our existing physical product or service. Here, technology embedded in the product (such as sensors, actuators, software, connectivity components) enables **the provision of digital features such as software applications, and/or services** (e.g., continuous or on-demand access to information, feedback and/or reports), that help the customer make their use of the product, or their process/operation, more efficient
- 4. The **'usage-based'** business model: Our company employs digital technologies to enable customers **to use our product, while the ownership of the product remains with our company (or a third party)**. Customers pay based either on a negotiated plan, or on the actual usage of the product. Technology embedded in the product measures and **monitors its usage/consumption to enable 'pay-per-use', or to make a service/product available for a restricted, contractually agreed, time span**. The product(s) can either be cycled among customers, (i.e., a 'leasing' model where digital technology is used to monitor and grant access, schedule product maintenance, etc.) or remain exclusive to a single customer for the duration of a contract.
- 5. The **'solution-oriented'** business model: Our company employs digital technologies to **provide a contractually agreed outcome**, such as a certain level of continuous utilization and uninterrupted usage (i.e., availability), or performance of the product, to a specific customer. Here digital **technology allows our company to access real-time information on the product's status and/or pattern of its operation, in order to offer more effective maintenance, repair and operational support services (e.g., advice, consulting) to ensure the agreed outcome**, and in extension, to optimize a core process/operation of the customer.
- 6. The **'platform'** business model: Our company provides and manages a **digital 'platform' that enables access to our company's product(s) and/or service(s), or facilitates the exchange** of products, services and information between providers and customers, aiming to create value for all parties, by, for example, optimizing asset utilization or making processes more efficient.



Digital Servitization in UK SMEs

Possible examples

- Add-on: Wristband that monitors the health and fitness activity by transmitting the data wirelessly to the smartphone, allowing the wearer to keep track of their training
- Usage-based: Car- or bike-sharing schemes (pay-per-minute or per-kilometre)
- Solution-oriented: Guaranteed availability/utilisation contracts (e.g., power-by-the hour)
- Platform: Dog-walking, dog-sitting apps/platforms matching customer with professional/amateur dog walker



Digital Servitization in UK SMEs

Measure of “degree” of Digital Servitization

✦ Formative index comprising the number of, broadness of, and emphasis on, a portfolio of *digital* services (e.g., Homburg et al., 2002):

1. Remote monitoring of product condition
2. Remote diagnostics
3. Remote control of product operation and usage optimization
4. Remote maintenance, upgrade and/or repair of product
5. Remote provision of access to information (e.g., automated analysis of operational information, predictive analytics), feedback and/or reports
6. Predictive maintenance
7. Cloud services (e.g., Software-as-a-service, Infrastructure-as-a-service, Platform-as-a-service)



Digital Servitization in UK SMEs

Data collection and analysis

- ✦ Pilot (38 respondents – Qualtrics)
- ✦ Main study: N=352 after removing inappropriate responses and outliers (Qualtrics)
- ✦ Established scales for all factors were used
[controls: customer nature, SME age & size, primary industry]

EFA -> removal of bad performing items -> factor scores (means)

Data analysis:

Study 1: Outcome = BM choice (Multinomial logistic regression)

Study 2: Outcome = Business performance (fsQCA)



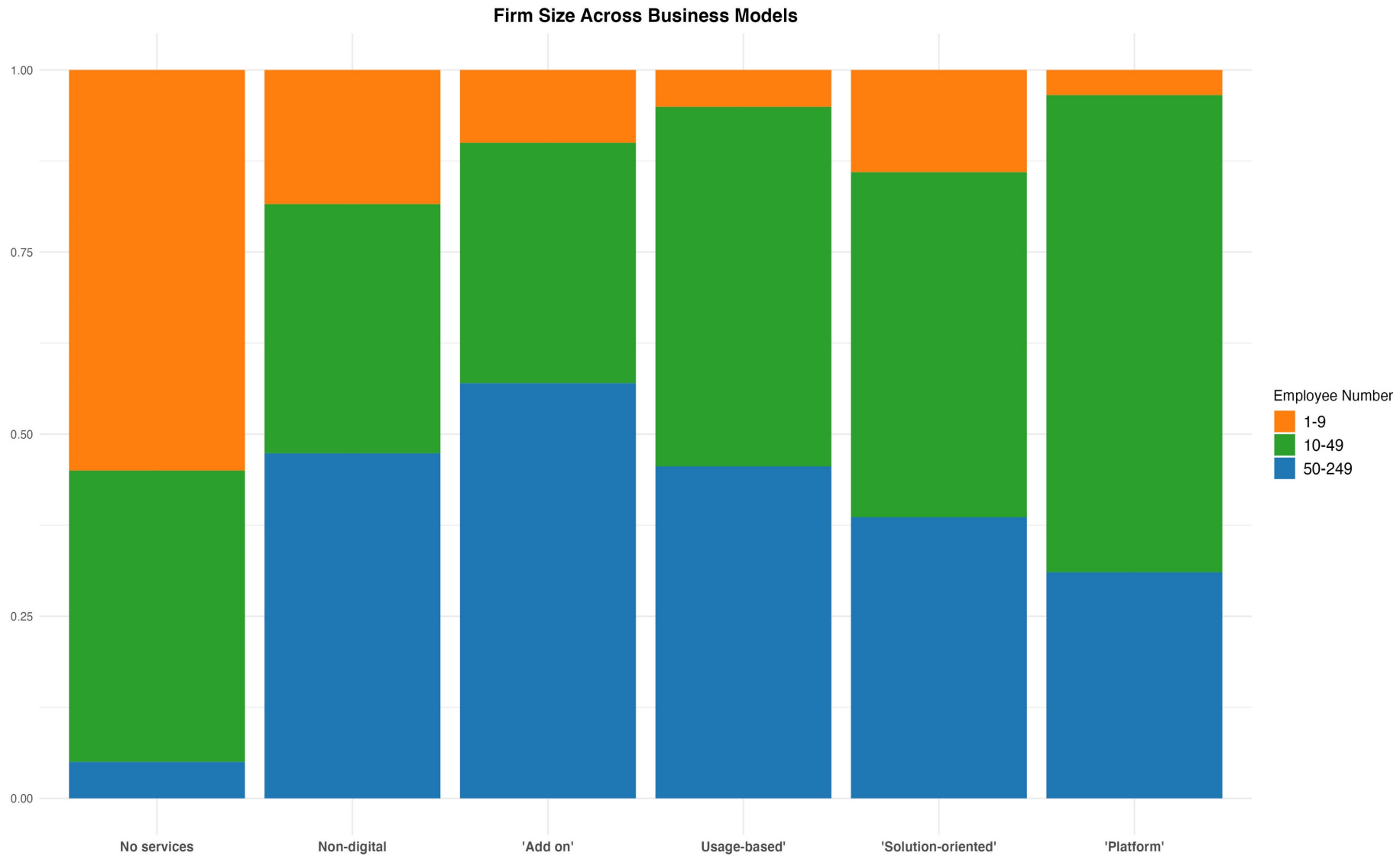
Descriptive Analysis



Digital Servitization in UK SMEs

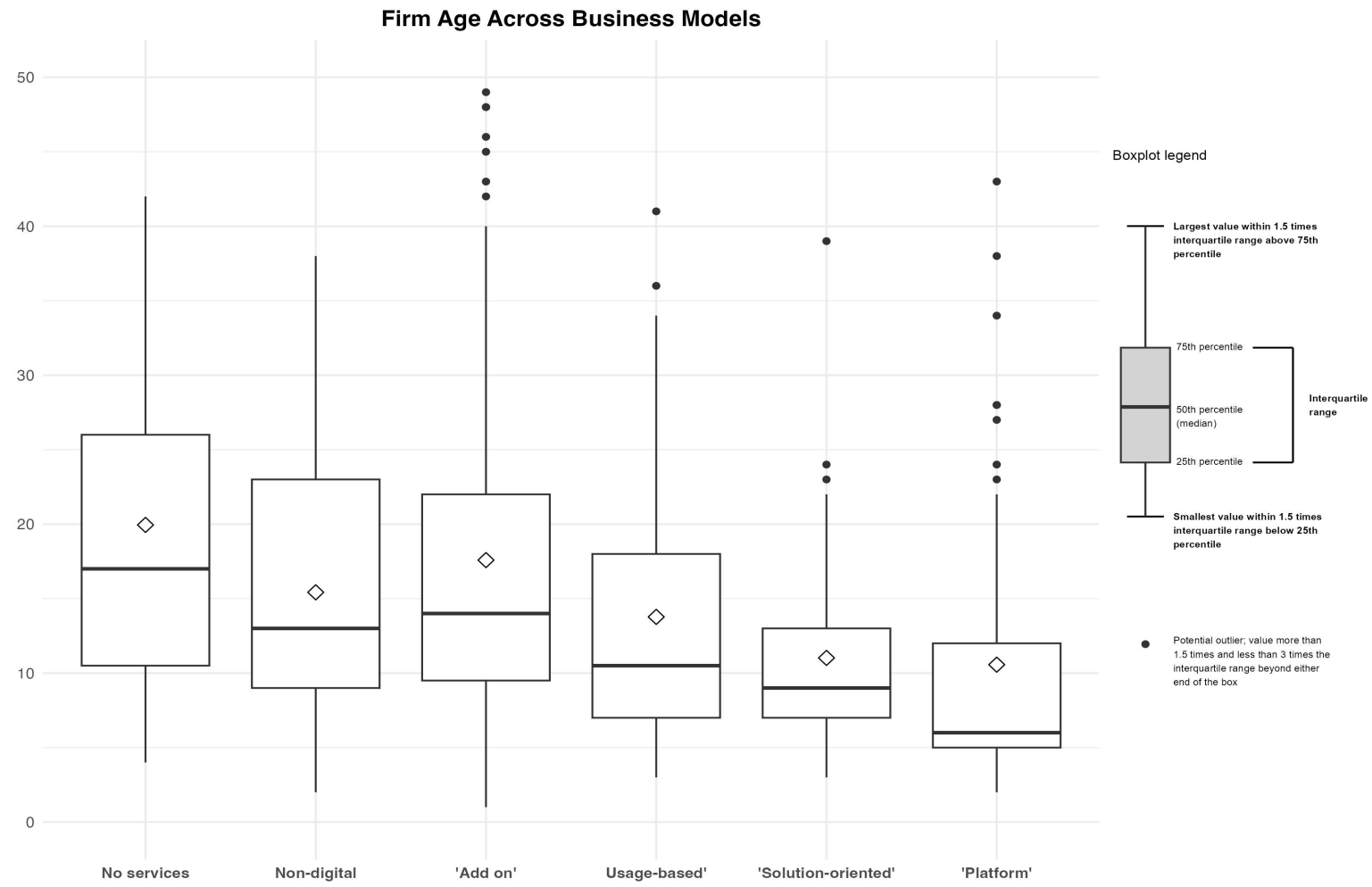
Digital Servitization in UK SMEs

SME Size across Business Models



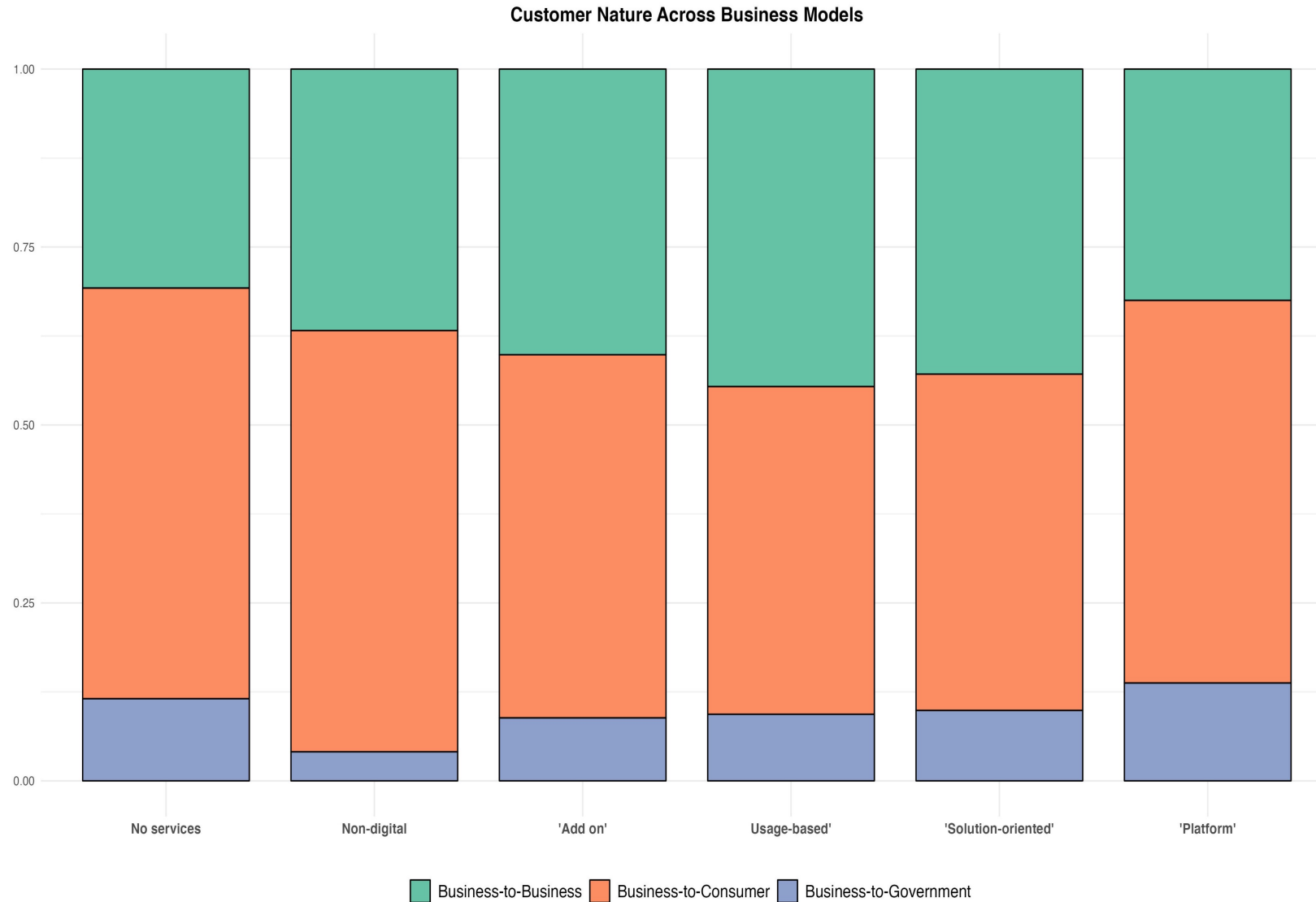
Digital Servitization in UK SMEs

SME Age across Business Model



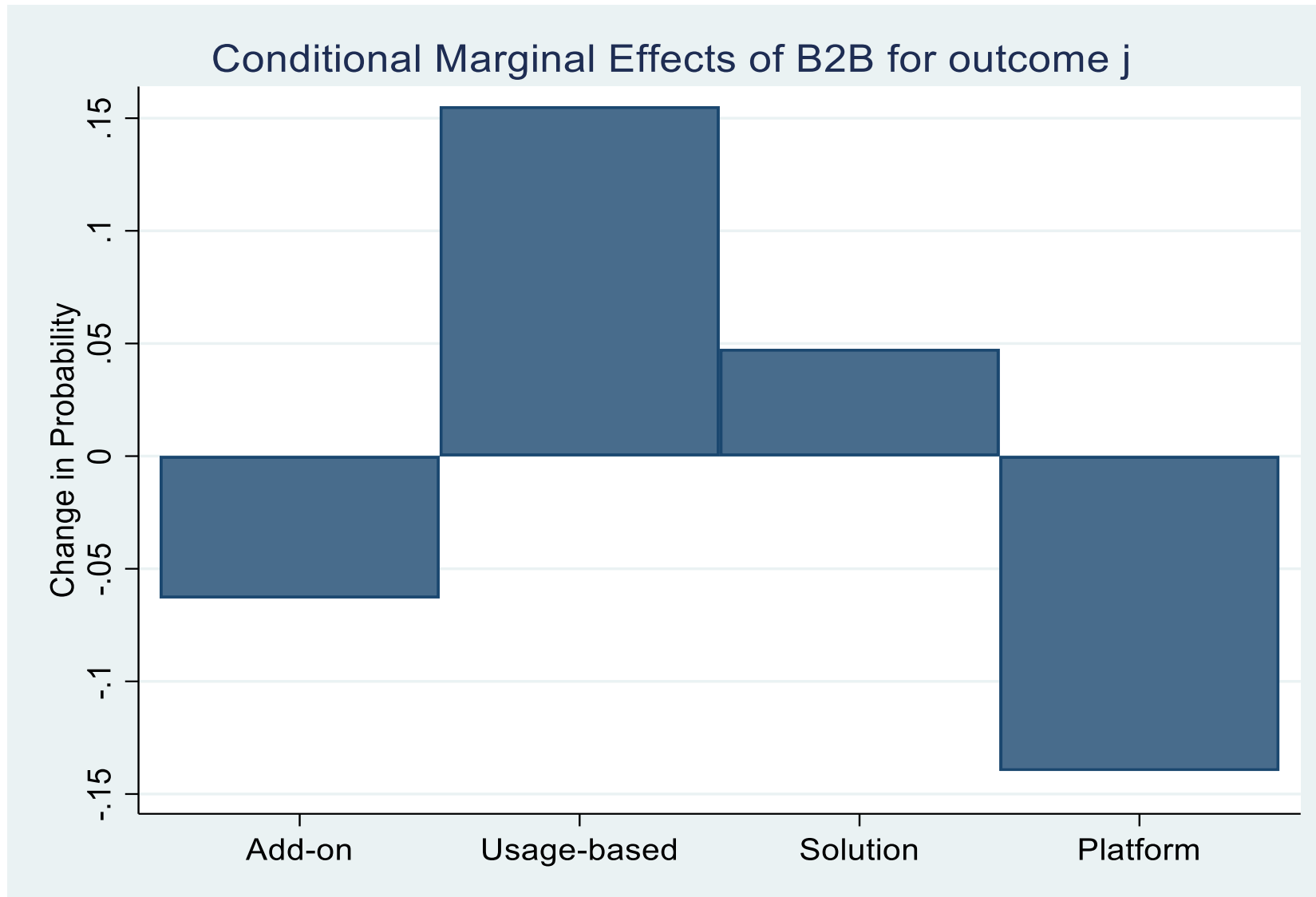
Digital Servitization in UK SMEs

Customer Nature by Business Model



Digital Servitization in UK SMEs

Customer Nature by Business Model (Marginal Effects)

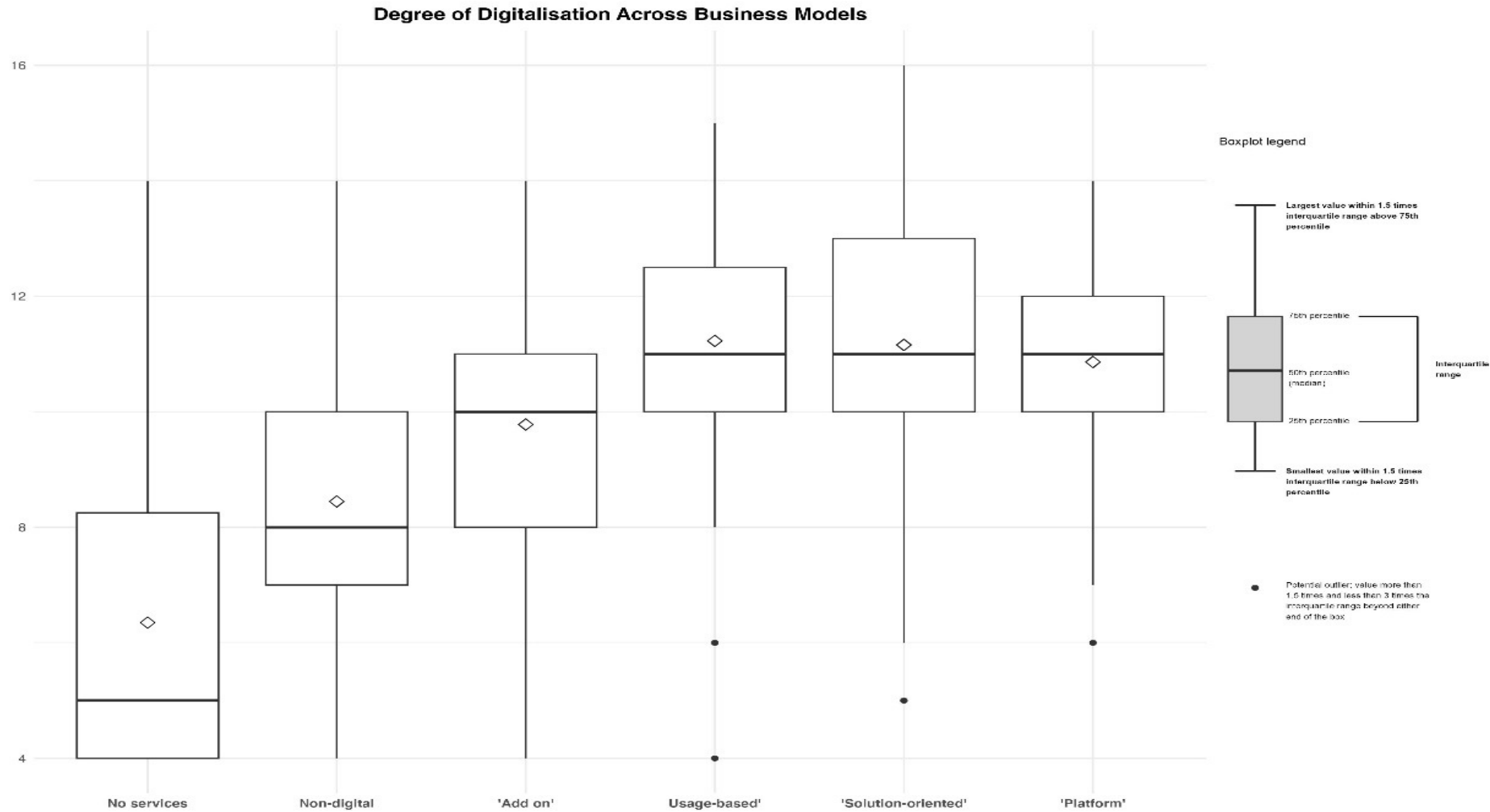


Chi2(3)=13.42***



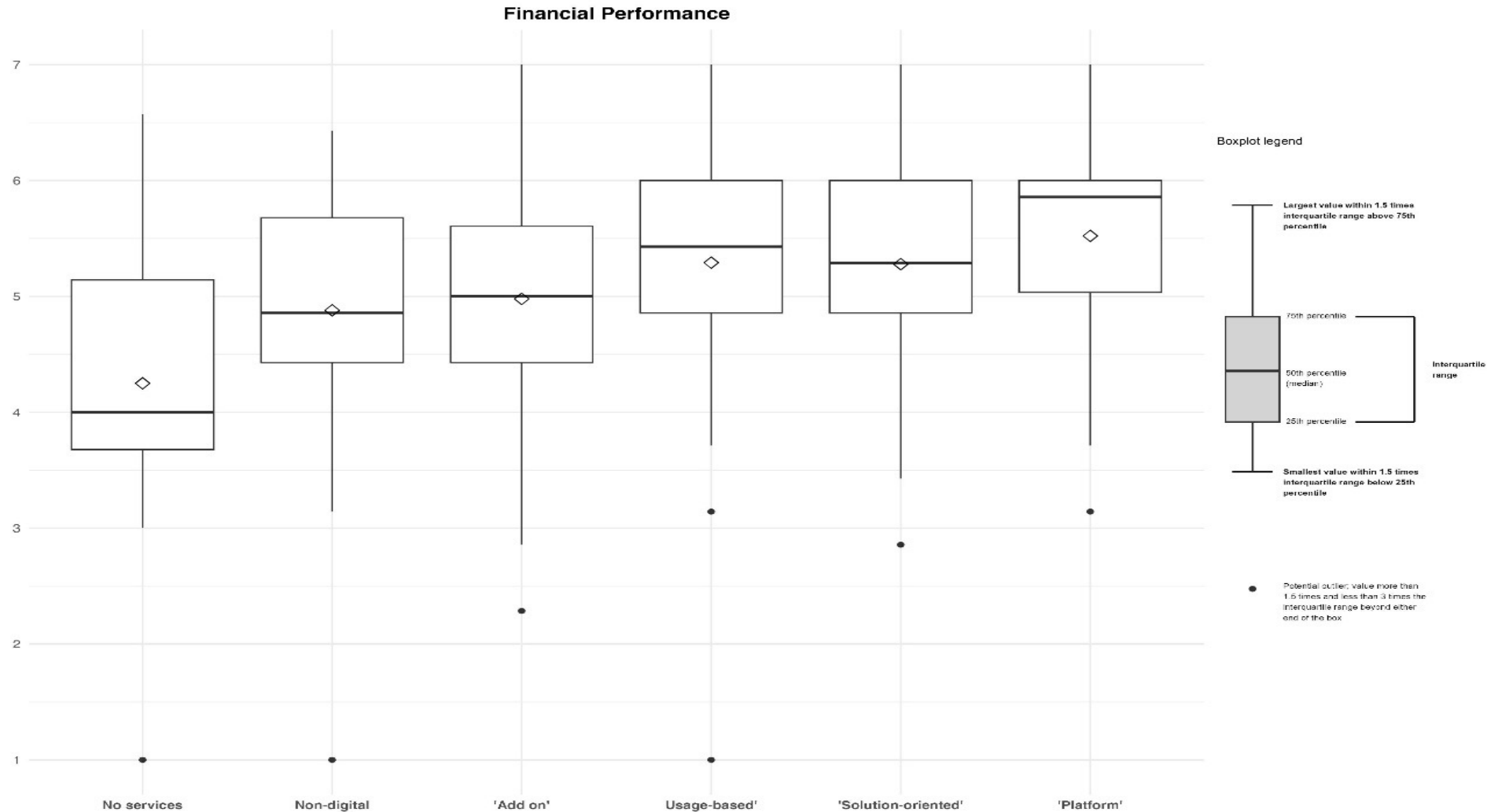
Digital Servitization in UK SMEs

Degree of digitization



Digital Servitization in UK SMEs

Business performance



Results (1)



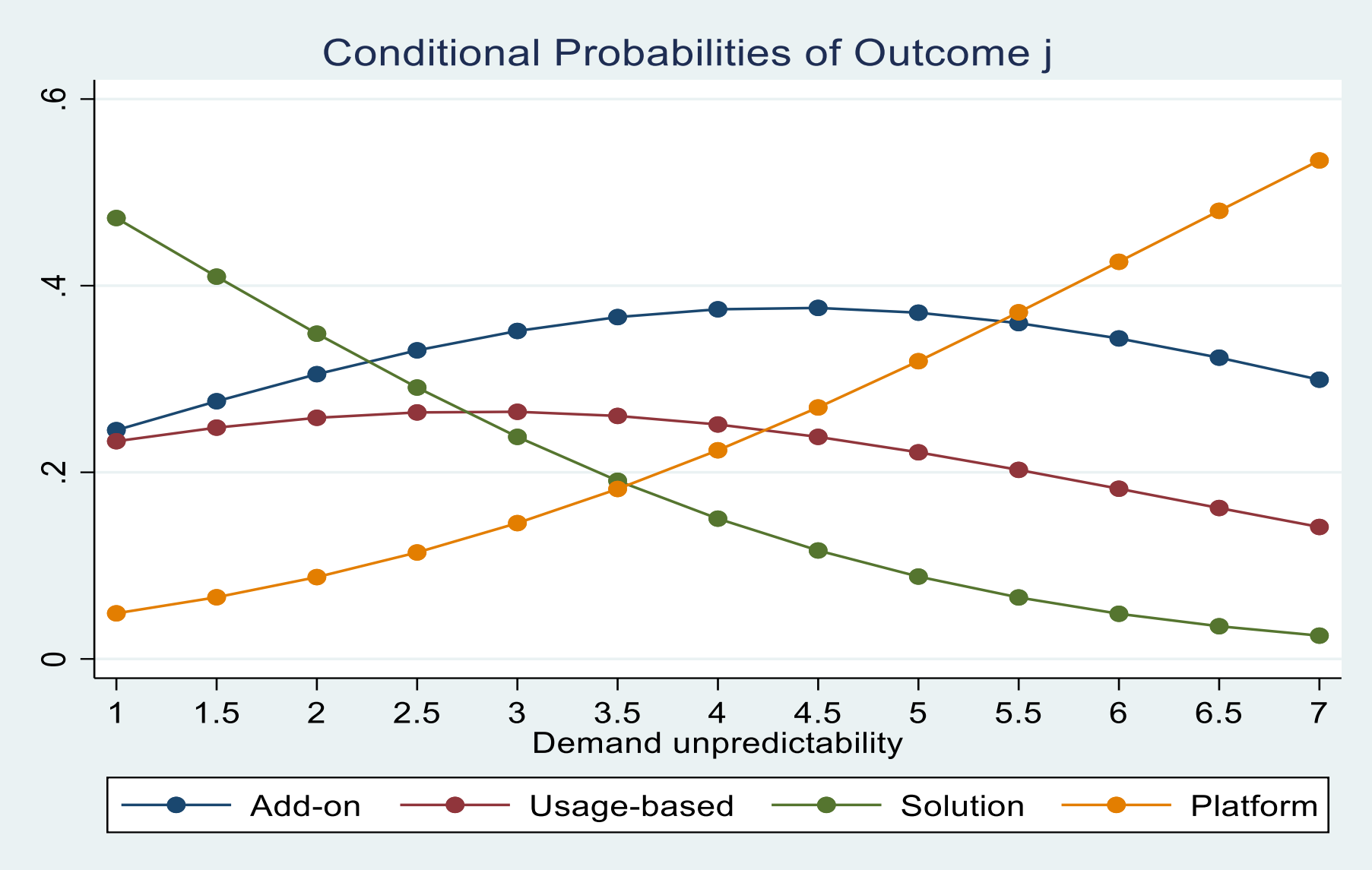
Digital Servitization in UK SMEs

Digital Serv. Business Model Choice

Add-on vs Usage-based vs Solution-oriented vs Platform

Digital Servitization in UK SMEs

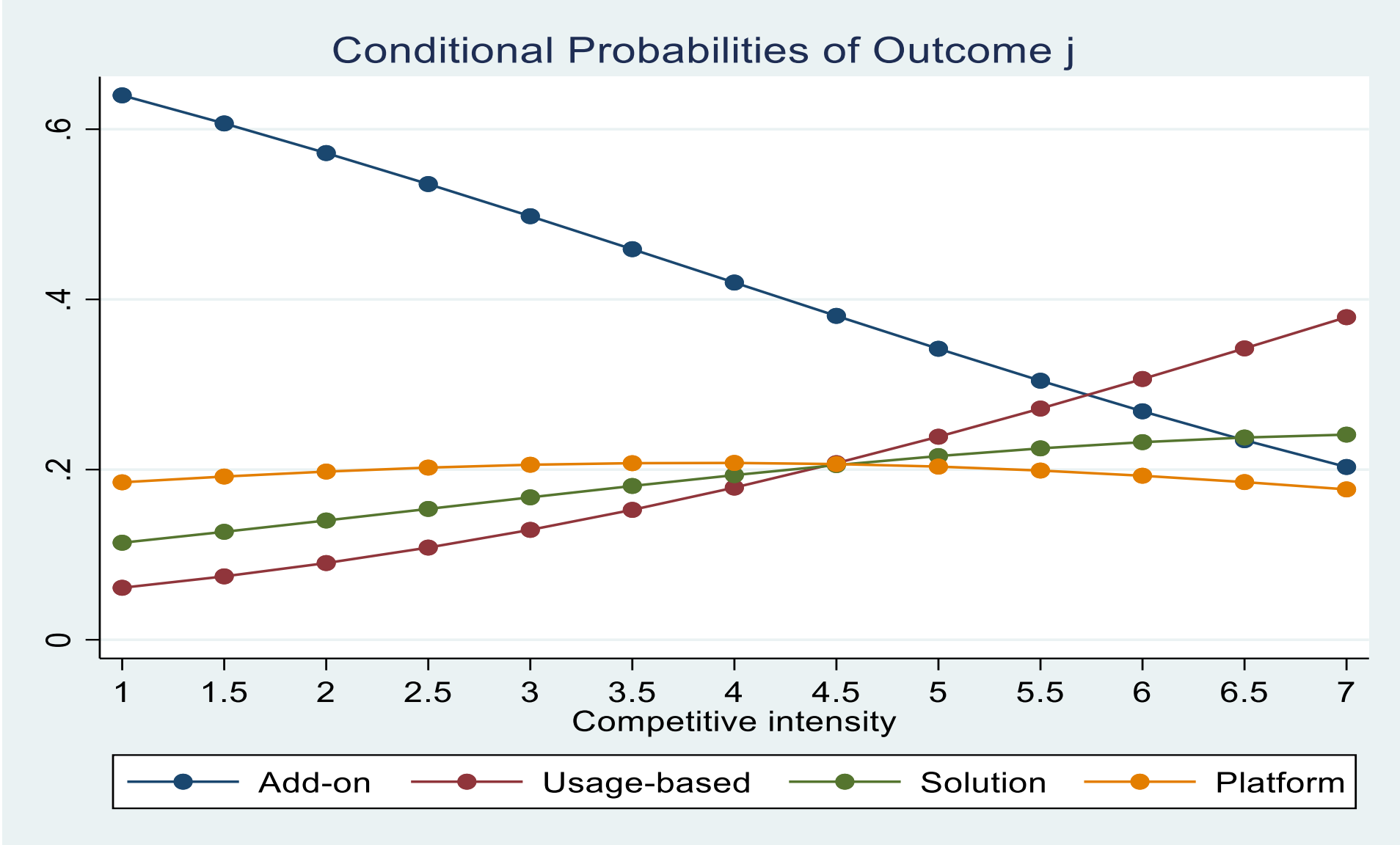
Demand Unpredictability



Chi2(3) = 23.02***

Digital Servitization in UK SMEs

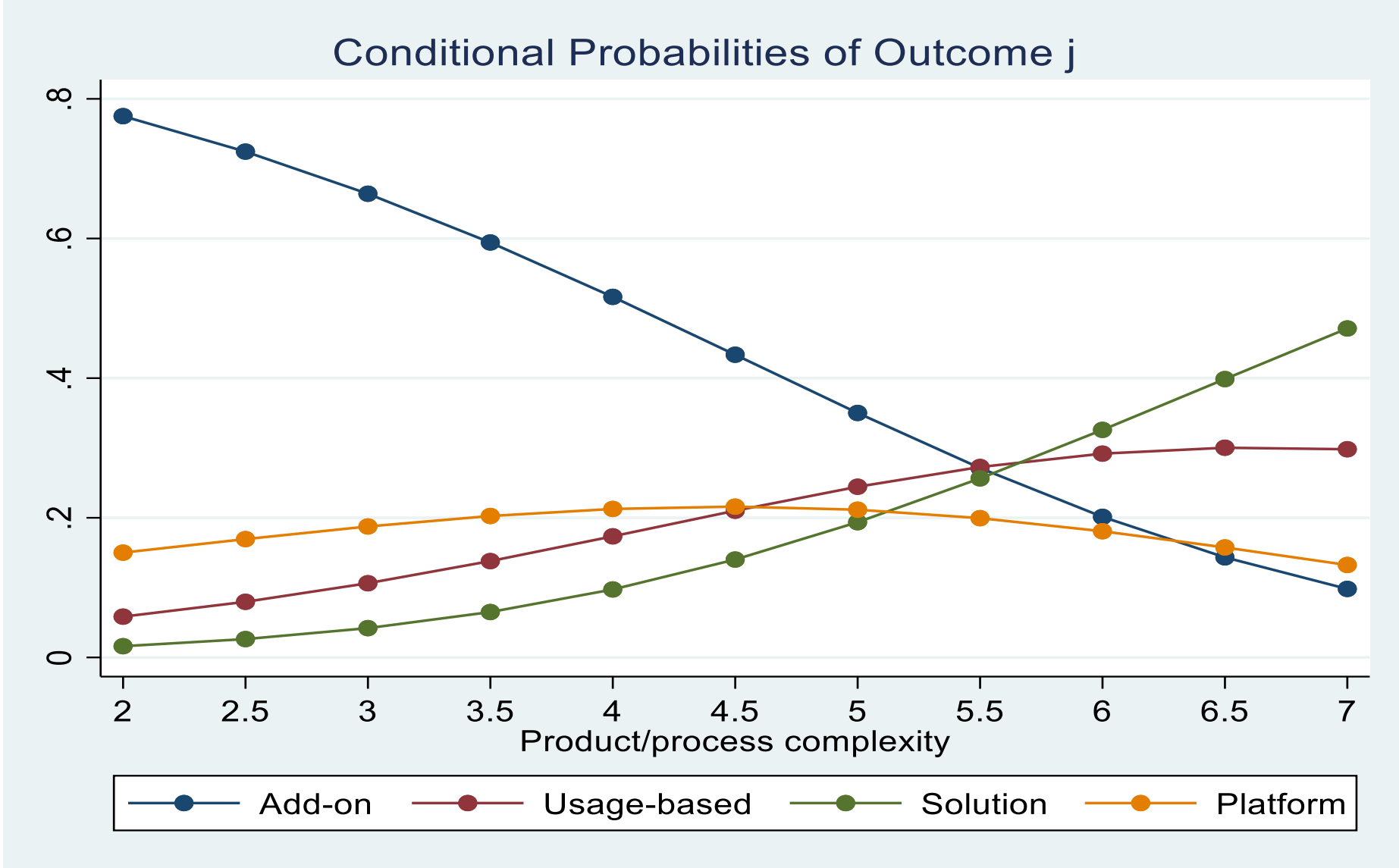
Competitive Intensity



Chi2(3)=8.17**

Digital Servitization in UK SMEs

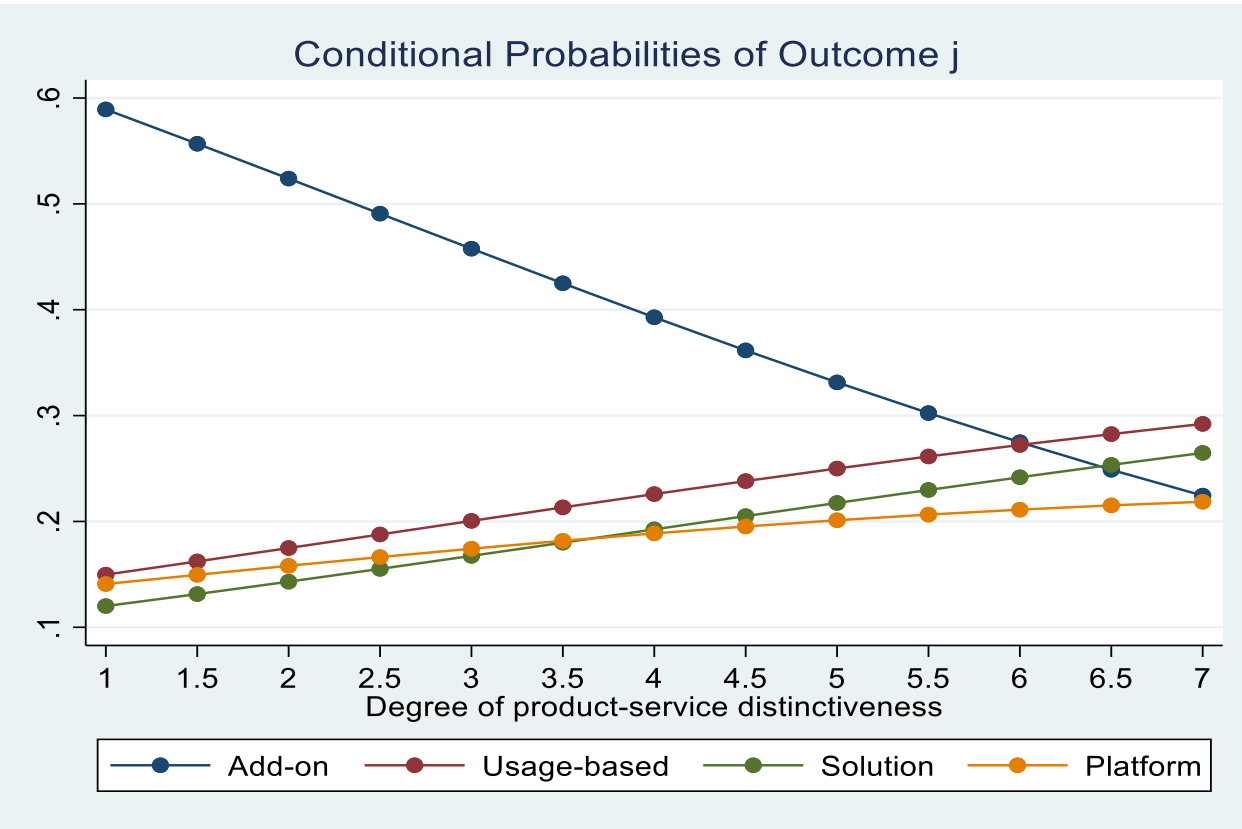
Product-process complexity



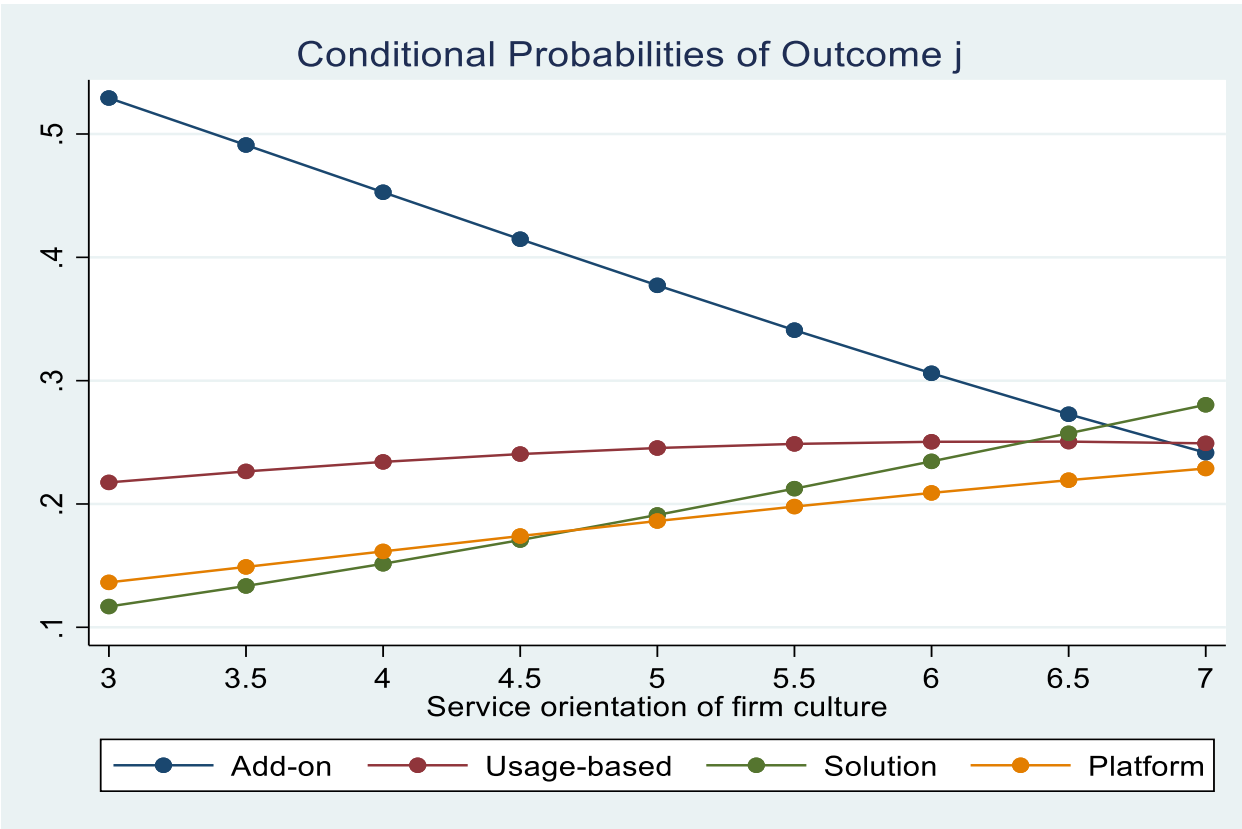
Chi2(3)=21.13***

Digital Servitization in UK SMEs

Organisational distinctiveness & service orientation of employee culture



Chi2(3)=5.78

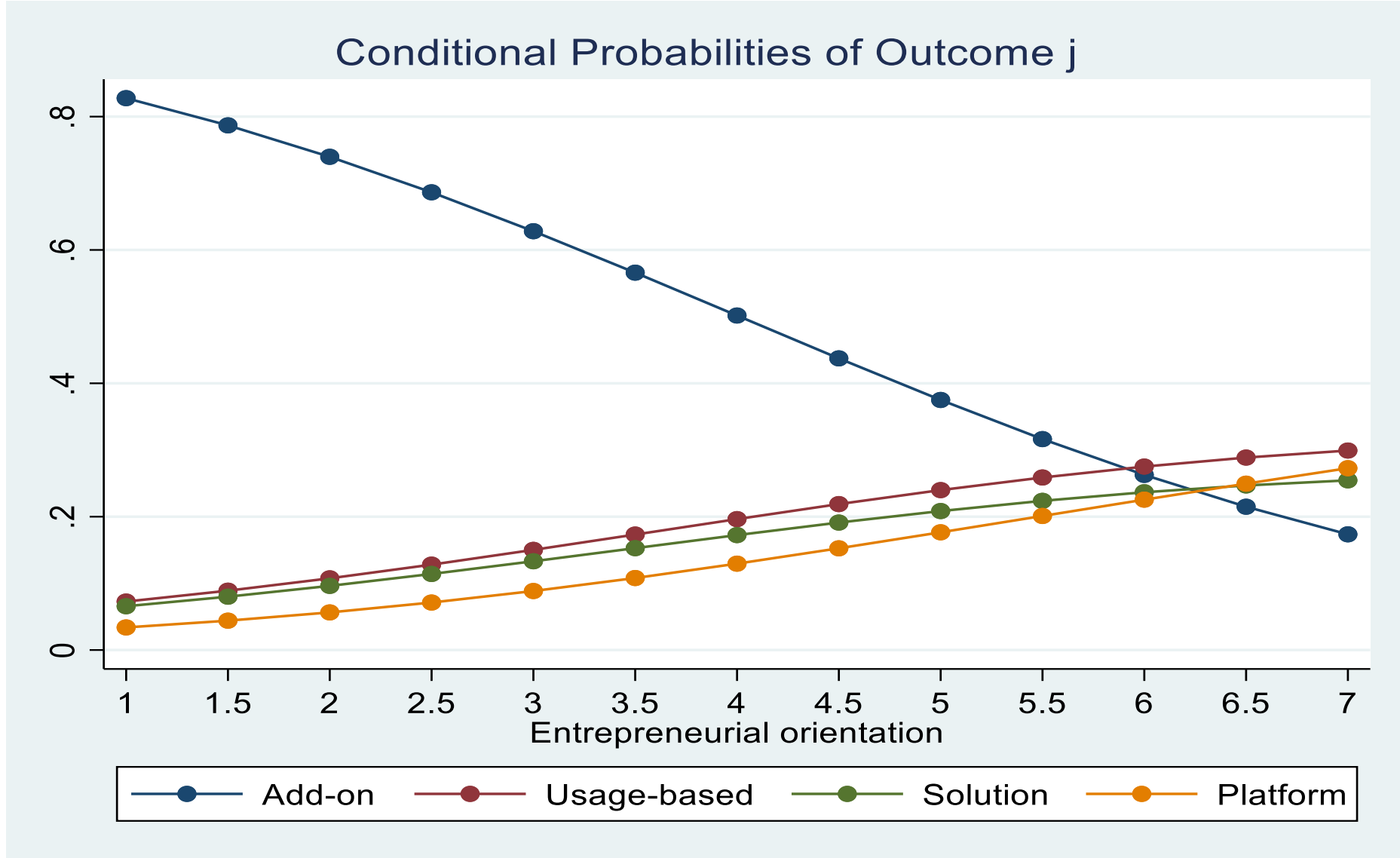


Chi2(3)=4.55

Digital Servitization in UK SMEs

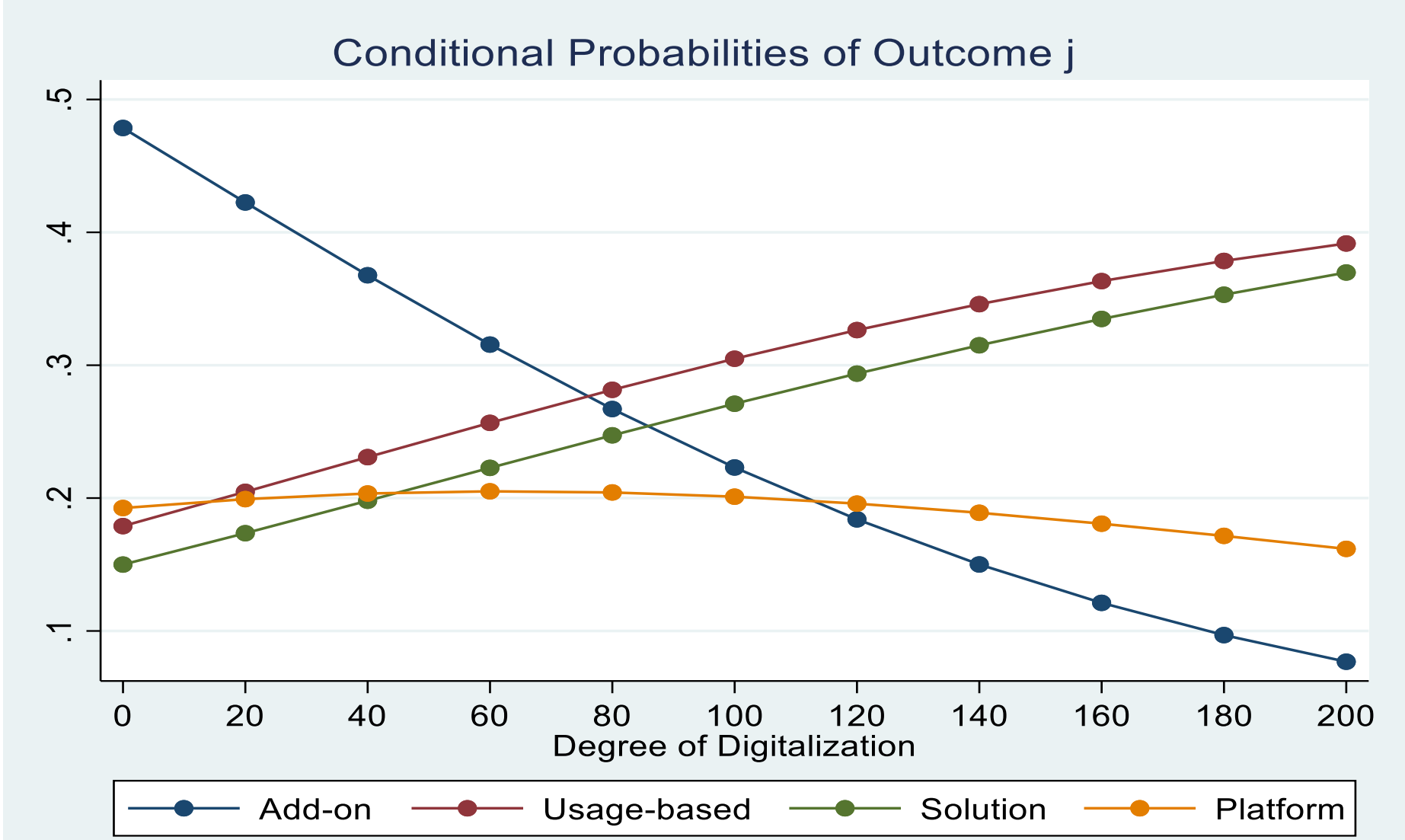
Entrepreneurial Orientation

Chi2(3)=13.24***



Digital Servitization in UK SMEs

Digital maturity



Chi2(3)=12.76***

Results (2)

Digital Servitization in UK SMEs

**Configurations associated with superior business performance
of SMEs choosing different business models**

Digital Servitization in UK SMEs

Add-on BM

A. Add-on Business Model

Configurations for Achieving High Performance

	Solution		
	1a	1b	2
Context			
Demand Unpredictability			
Competitive Intensity			
Product Complexity			
Technological Turbulence			
Organisation			
P-S Distinctiveness			
Service Culture			
Digitalisation Maturity			
Consistency	0.852	0.890	0.897
Raw Coverage	0.327	0.247	0.268
Unique Coverage	0.080	0.030	0.066
Overall Solution Consistency		0.862	
Overall Solution PRI		0.760	
Overall Solution Coverage		0.446	



Digital Servitization in UK SMEs

Usage-based BM

B. Usage-based Business Model

Configurations for Achieving High Performance

	Solution			
	1	2	3	4
Context				
Demand Unpredictability				
Competitive Intensity				
Product Complexity				
Technological Turbulence				
Organisation				
P-S Distinctiveness				
Service Culture				
Digitalisation Maturity				
Consistency	0.863	0.892	0.869	0.933
Raw Coverage	0.541	0.188	0.270	0.195
Unique Coverage	0.269	0.020	0.044	0.030
Overall Solution Consistency		0.848		
Overall Solution PRI		0.773		
Overall Solution Coverage		0.668		



Digital Servitization in UK SMEs

Solution-oriented BM

C. Solution-oriented Business Model

Configurations for Achieving High Performance

	Solution		
	1a	1b	2
Context			
Demand Unpredictability			
Competitive Intensity			
Product Complexity			
Technological Turbulence			
Organisation			
P-S Distinctiveness			
Service Culture			
Digitalisation Maturity			
Consistency	0.884	0.895	0.892
Raw Coverage	0.441	0.412	0.402
Unique Coverage	0.085	0.055	0.046
Overall Solution Consistency		0.899	
Overall Solution PRI		0.843	
Overall Solution Coverage		0.542	



Digital Servitization in UK SMEs

Platform BM

D. Platform Business Model

Configurations for Achieving High Performance

	Solution				
	1a	1b	2a	2b	2c
Context					
Demand Unpredictability					
Competitive Intensity					
Product Complexity					
Technological Turbulence					
Organisation					
P-S Distinctiveness					
Service Culture					
Digitalisation Maturity					
Consistency	0.921	0.928	0.942	0.962	0.956
Raw Coverage	0.204	0.185	0.304	0.430	0.387
Unique Coverage	0.037	0.026	0.011	0.087	0.032
Overall Solution Consistency		0.948			
Overall Solution PRI		0.931			
Overall Solution Coverage		0.646			



Digital Servitization in UK SMEs

'Just' servitized

E. Non-DS Business Model

Configurations for Achieving High Performance

	Solution		
	1a	1b	2
Context			
Demand Unpredictability			
Competitive Intensity			
Product Complexity			
Technological Turbulence			
Organisation			
P-S Distinctiveness			
Service Culture			
Digitalisation Maturity			
Consistency	0.835	0.902	0.702
Raw Coverage	0.409	0.370	0.229
Unique Coverage	0.142	0.071	0.058
Overall Solution Consistency		0.764	
Overall Solution PRI		0.621	
Overall Solution Coverage		0.582	



Digital Servitization in UK SMEs

Pure product provider BM

F. Non-servitized Business Model

Configurations for Achieving High Performance

	Solution
	1
Context	
Demand Unpredictability	
Competitive Intensity	
Product Complexity	
Technological Turbulence	
Organisation	
P-S Distinctiveness	
Service Culture	
Digitalisation Maturity	
Consistency	0.833
Raw Coverage	0.266
Unique Coverage	-
Overall Solution Consistency	0.833
Overall Solution PRI	0.764
Overall Solution Coverage	0.266



Digital Servitization in UK SMEs

Discussion

- ✦ Determinants of BM *choice*
 - Marked difference between 'Add-on' and 'Usage'/'Solution', 'Platform'...
 - Why? Product-centredness:
 - Focus *primarily* on the product vs. focus on the service, the result or the experience
- ✦ Notable variation within 'successful' configurations of BMs
 - E.g. configurations for 'Usage-based'
- ✦ ..and between
 - Compare 'Platform' to 'Solution-oriented'
- ✦ Pervasiveness of product complexity
 - Does it even make sense for 'simple' products...?
- ✦ Digitalisation should take precedence
- ✦ Improving service orientation can only help...



Digital Servitization in UK SMEs

Discussion and conclusions

✦ We answered calls for:

- ✦ Developing quantitative DS measures (and operationalising a BM typology)

- ✦ Large-N study in the under-researched context of SMEs

- ✦ Identified the configurations of conditions (organisational and environmental) that lead to superior performance of SMEs following different business models

✦ Next steps:

- ✦ Finish the website!

- ✦ Construct one more sample (to compare and cross-validate) using InterAct and NAAME contacts

- ✦ Need to tease out the theoretical implications to the DS domain

- ✦ Limitations (Qualtrics data...)



Thank you!

Please e-mail me:

1) if you can give me examples of SMEs following the different models

2) if you want to be informed when the project report is out, and/or;

3) to be invited in a webinar we will host to disseminate our findings and 'toolkit' to SME practitioners.

a.karatzas@uea.ac.uk