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# Organisational Capital, ICT and Productivity in the Digital Age

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# Introduction

Intangible assets play a crucial role in modern economies:

- Direct effect as production input.
- Interaction with new technologies and spillovers.

The role of intangible assets has been explored both as an aggregate and as individual assets.

R&D – available in NA – and managerial skills have received growing attention in the literature.

Managerial skills are tightly related to broader investments in organisational changes, often referred to as organisational capital.

# Why organisational capital?

Organisational capital includes but also goes beyond managerial skills

- it isn't just about good managers but about a firm's ability to manage organisational changes that new tech is bound to bring about.

Business management literature has identified OC to be highly synergetic with ICT investment (Bryjnolfsson and Hitt, 2000, Li et al 2006).

It is also important to distinguish whether such OC is acquired internally or externally:

- Own account.
- Purchased component.

Finally, OC has a tacit quality that makes spillovers less likely.

# Research question

We exploit the distinction between own-account and purchased OC in our data to test the following hypothesis:

Organisational assets built up in-house is key to extract productivity gains from ICT technologies.

We find that:

1. Stock of OC is positively associated with labour productivity growth

2. This association is stronger for ICT intensive industries.

3. These results are driven by own-account OC.

# Contributions to the literature

1. We provide aggregate evidence complementing a few studies using accounting data to estimate organisational assets (Tronconi et al 2011, Papanikolau and Eisfeldt, 2009).

2. We also complement the growing firm level evidence on the interplay between organisational capital and ICT – (Van Reenen et al. 2010, Crespi et al 2007).

3. We are the first – to the best of our knowledge – to explore the role of own-account vs. purchased organisational capital and its interplay with ICT and labour productivity.

# Data

We use the latest release of the EUKLEMS & INTANProd data.

We split:
- Purchased OC, expenditure for legal, managerial, and accounting services.
- Own account OC, expenditure on workers with managerial positions.

We obtain adjusted value added at constant prices per hour worked as our key measure of labour productivity.

We also compute the stock of ICT assets – communication, IT equipment and Software and Databases – per hour worked.

We group industries on digitalisation intensity following Calvino et al (2018)

We look at: DE, DK, ES, FI, FR, IT, NL, SE, UK, US, 1995-2019.

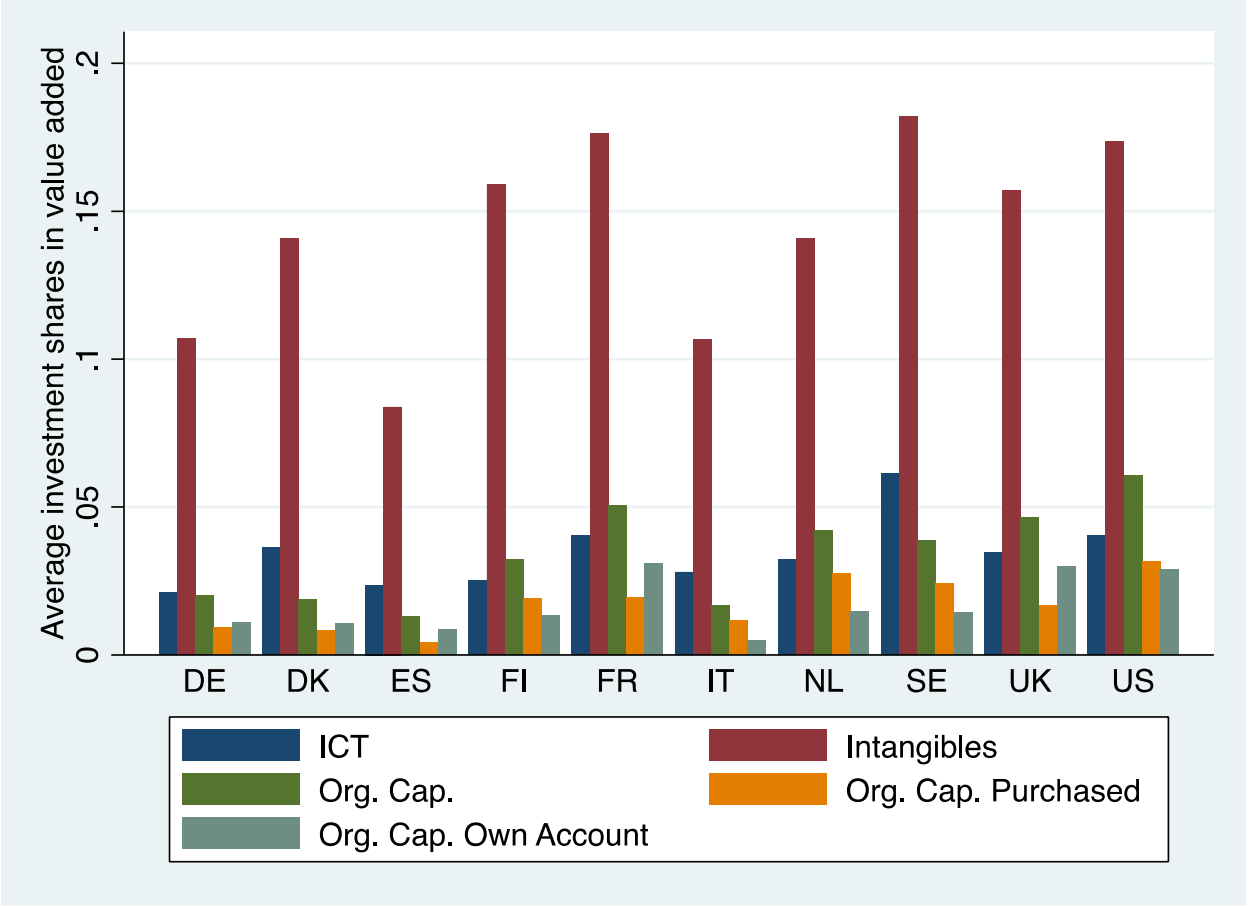
# Descriptives

## Investment in intangible and ICT assets as a share of adjusted value added

Investment in intangibles account for a rather large share of value added.

Positive association between ICT and intangible investment

Own-acc. and purchased OC are positively related but follow different patters across countries.



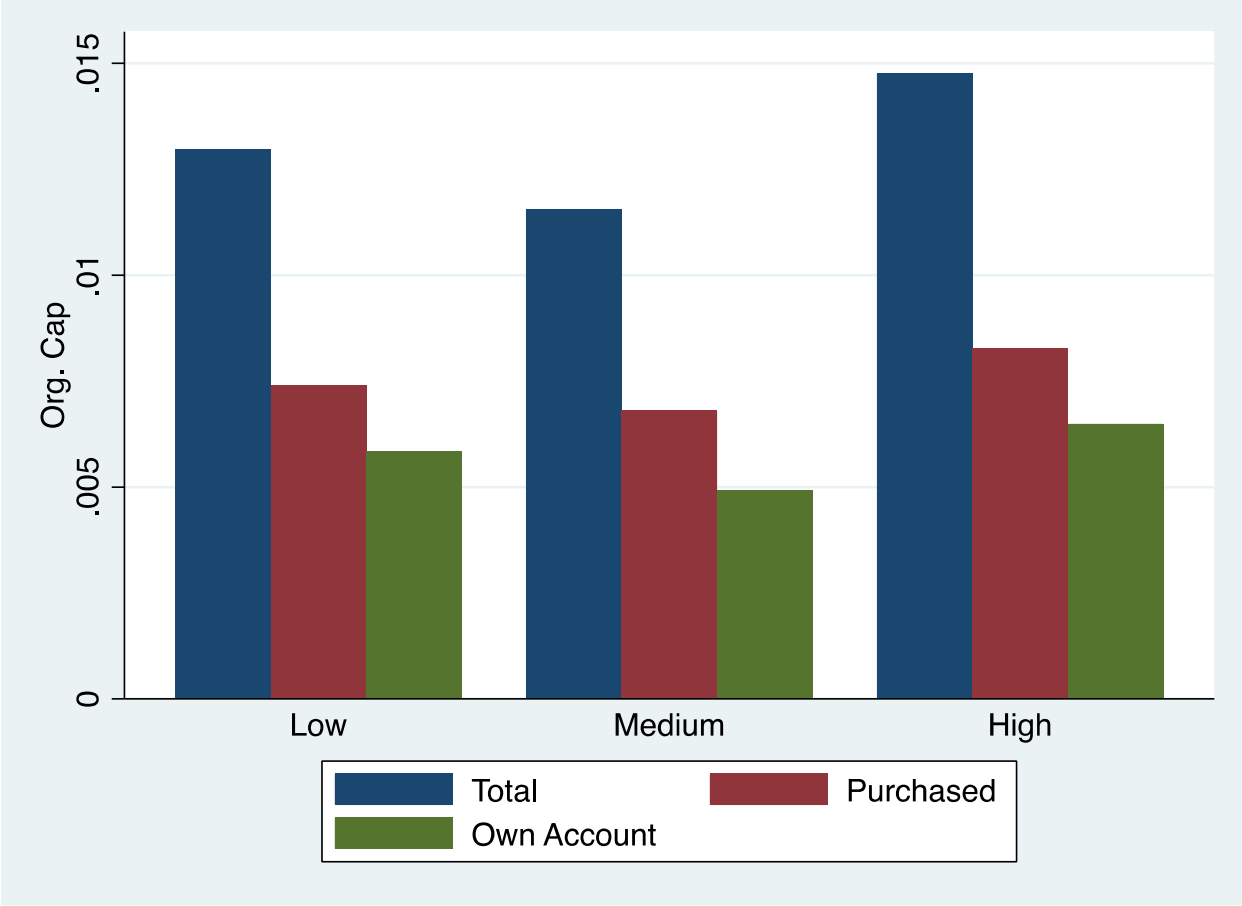
# Descriptives

## OC stock across industries with digitalisation intensity

High-digital industries have higher stocks.

Interesting that low-digital industries have larger stock than medium digital ones.

There is more to digitalisation than capital stocks?



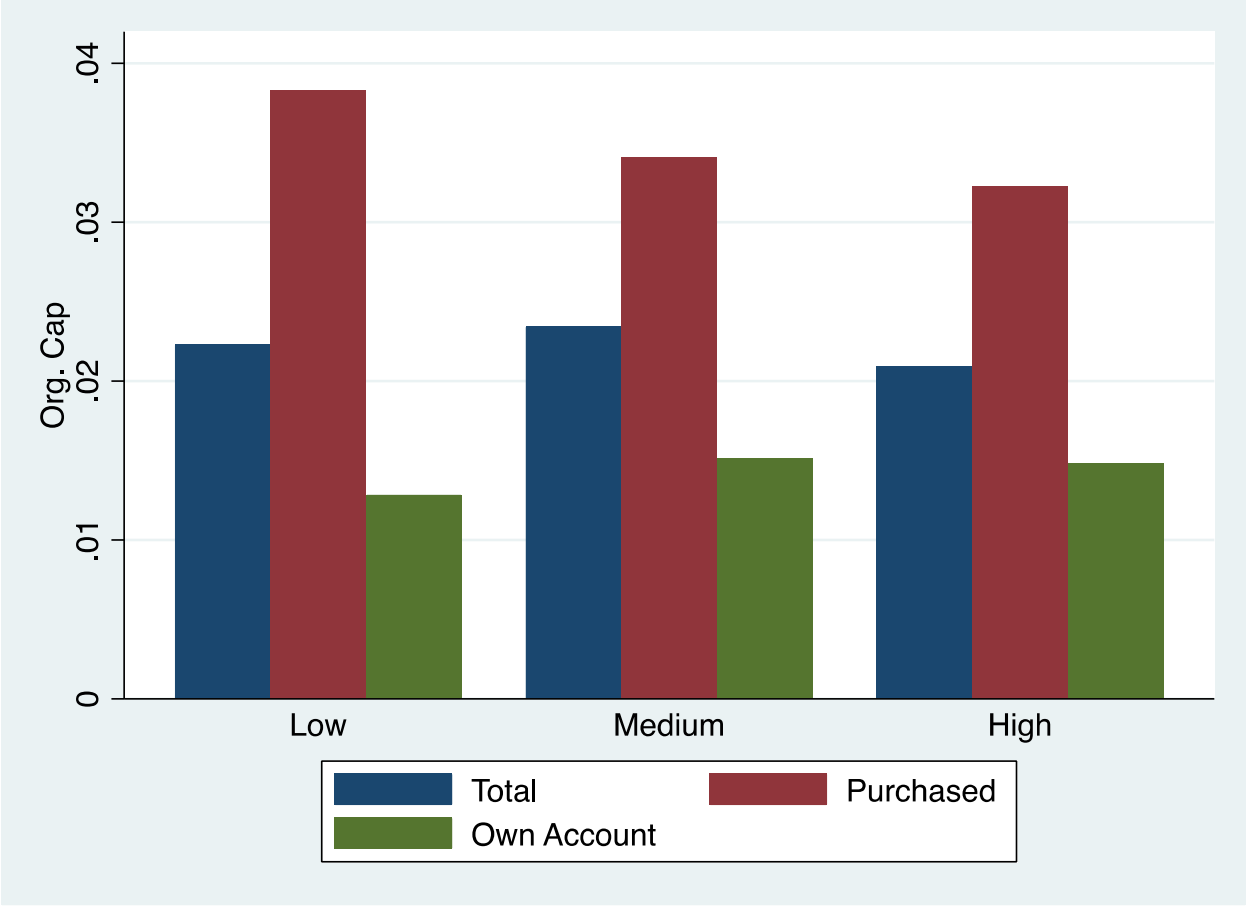
# Descriptives

## OC stock *growth* across industries with digitalisation intensity

High-digital industries have a lower average growth rate.

Low-digital acquire organisational assets through purchases rather than in-house investment.

Additional evidence on the importance of distinguishing between the two.



# Descriptives

## OC stock and labour productivity growth in the market sector.

Positive relationship across all OC types.

The endowment in organisational assets does appear to be positively associated to growth in labour productivity.

More analysis is necessary at a finer level of aggregation.

ap. O.A. (log)

# Econometric approach

$$\Delta \ln\left(Y/H\right)_{ict} = \alpha_1 \Delta \ln\left(K^I/H\right)_{ict} + \alpha_2 \Delta \ln\left(K^T/H\right)_{ict} + \alpha_3 \ln\left(K_j^{OC}/H\right)_{ict-1} +$$
$$+ \alpha_4 \ln\left(K^{ICT}/H\right)_{i,avg} + \alpha_5 \ln\left(K_j^{OC}/H\right)_{ict-1} * \ln\left(K^{ICT}/H\right)_{i,avg} +$$
$$+ \lambda_c + \lambda_t + \tau_i + \eta_{ict}$$

- Labour productivity growth is our outcome variable.
- $\ln\left(K^{ICT}/H\right)_{i,avg}$ is the ICT intensity of each industry.
- $\ln\left(K_j^{OC}/H\right)_{ict-1}$ is the stock of OC.
- We expect $\alpha_5$ to be positive and significant, confirming our hypothesis that endowment in organisational assets is positively mediated by ICT intensity.
- We test our model both with GLS and GMM, the latter to reduce the risk of endogeneity and simultaneity.

# Main results

Both GLS and GMM result find the stock of OC have positive coefficient.

Particularly strong for own-account.

Interaction is positive and significant too, OC is mediated by ICT capital intensity.

| | GLS | | | GMM | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| VARIABLES | Total | Purchased | Own Acc. | Total | Purchased | Own Acc. |
| $\Delta \ln(K^{I}/H)_{i,c,t}$ | 0.193*** | 0.194*** | 0.185*** | 0.507*** | 0.472*** | 0.277* |
| | (0.0182) | (0.0182) | (0.0181) | (0.163) | (0.166) | (0.162) |
| $\Delta \ln(K^{T}/H)_{i,c,t}$ | 0.187*** | 0.183*** | 0.187*** | 0.432* | 0.510** | 0.413* |
| | (0.0217) | (0.0217) | (0.0214) | (0.232) | (0.228) | (0.231) |
| $\ln(K^{OC})_{i,c,t-1}$ | 0.0168*** | | | 0.0422*** | | |
| | (0.00594) | | | (0.0135) | | |
| $\ln(K^{OCPur})_{i,c,t-1}$ | | 0.00761 | | | 0.0260** | |
| | | (0.00493) | | | (0.0116) | |
| $\ln(K^{OCOwA})_{i,c,t-1}$ | | | 0.0251*** | | | 0.0435*** |
| | | | (0.00495) | | | (0.00961) |
| $\ln(K^{OC})_{i,c,t-1} * \ln(K^{ICT}/H)_{c}^{avg}$ | 0.00216** | | | 0.00670*** | | |
| | (0.000850) | | | (0.00185) | | |
| $\ln(K^{OCPur})_{i,c,t-1} * \ln(K^{ICT}/H)_{c}^{avg}$ | | 0.00137* | | | 0.00457*** | |
| | | (0.000777) | | | (0.00169) | |
| $\ln(K^{OCOwA})_{i,c,t-1} * \ln(K^{ICT}/H)_{c}^{avg}$ | | | 0.00287*** | | | 0.00610*** |
| | | | (0.000713) | | | (0.00144) |
| Observations | 3,608 | 3,608 | 3,608 | 3,160 | 3,151 | 3,148 |
| Country Trend | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry Trend | Yes | Yes | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

# Conclusions and ways forward

We find that endowment in organisational capital is indeed associated to higher productivity growth and that it positively interacts with digital intensity. This lends support to policies aiming at increasing economies' endowment in OC – especially so for *own-account* OC, developed within companies.

Further research:

1. On the interplay between digitalisation, OC and productivity, especially across industries and countries - we do find that our results are stronger among high-digital industries but more analysis is required.
2. The interaction between OC and other intangibles, e.g. R&D, Brand, Data.
3. Which policies to develop OC are most effective.