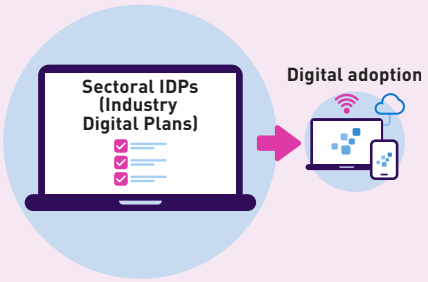
Feature Article

IMPACT EVALUATION OF IMDA'S INDUSTRY DIGITAL PLANS

OVERVIEW

The Industry Digital Plans (IDPs) are sector-specific digitalisation roadmaps developed by the Infocomm Media Development Authority (IMDA) in consultation with sectoral agencies and industry players. The IDPs provide SMEs with sector-specific guidance and a curated set of digital solutions to support their digitalisation efforts. By helping firms identify suitable solutions, IDPs seek to reduce information barriers and in turn, facilitate digital adoption.

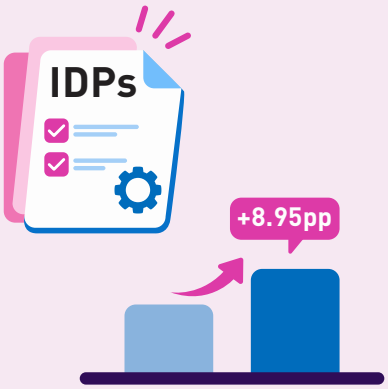


FINDINGS

This study evaluates the impact of IDPs by examining whether the launch of sectoral IDPs is associated with higher adoption of IDP solutions and whether the adoption of digital solutions is associated with improved firm outcomes.

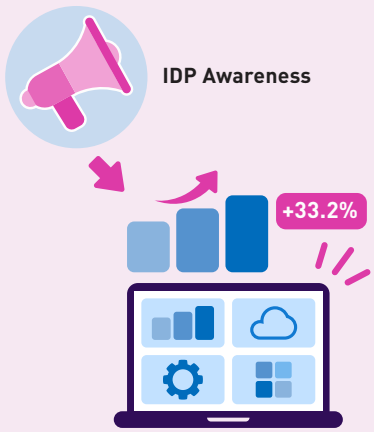
Finding 1:

Sectoral IDPs were associated with an 8.95 percentage-point (pp) higher adoption rate of IDP solutions in the post-launch period compared with the pre-launch period.



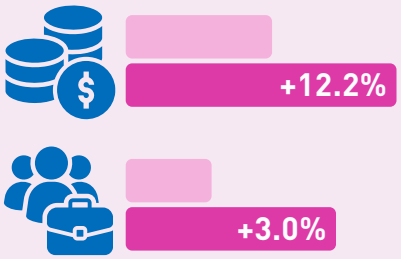
Finding 2:

Firms aware of IDPs were more likely to adopt IDP solutions and adopted 33.2% more solutions than those that were not aware.



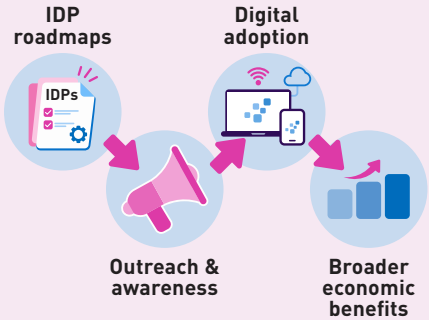
Finding 3:

Adoption of IDP solutions was associated with 12.2% higher revenue and 3.0% higher average wages for local workers. Estimated revenue gains were larger among firms adopting multiple solutions.



POLICY TAKEAWAY

The findings suggest that by providing sector-specific digitalisation roadmaps, the IDPs can be a useful policy tool in supporting firms' digitalisation. Continued outreach and awareness-building efforts are important to encourage wider digital adoption among firms. Deeper digitalisation, alongside complementary support in implementation and workforce capabilities, may help firms realise broader economic benefits.



EXECUTIVE SUMMARY

- The Industry Digital Plans (IDPs) are sector-specific digitalisation roadmaps developed by the Infocomm Media Development Authority (IMDA) in consultation with sectoral agencies and industry players. The IDPs contain a curated set of digital solutions that are relevant to each sector and provide firms with practical guidance for their digitalisation journey.
- Our study found that the launch of sectoral IDPs was associated with an 8.95 percentage-point (pp) increase in the rate of adoption of IDP solutions. Firms that were aware of IDPs were 9.11pp more likely to adopt IDP solutions after the launch and also adopted 33.2 per cent more IDP solutions than firms that were not aware.
- In addition, we found that firms' adoption of IDP solutions was associated with 12.2 per cent higher revenue, as well as 2.2 and 3.0 per cent higher average total wages and local worker wages respectively, compared to firms that did not adopt IDP solutions. Furthermore, revenue gains increased over time and were larger for firms adopting multiple solutions.

The views expressed in this paper are solely those of the authors and do not necessarily reflect those of the Ministry of Energy, Trade and Industry, the Infocomm Media Development Authority or the Government of Singapore.[1]

INTRODUCTION

Under the Infocomm Media Development Authority's (IMDA's) SMEs Go Digital programme, the Industry Digital Plans (IDPs) are sector-specific digitalisation roadmaps designed to guide firms in adopting digital technologies. Developed by IMDA in consultation with sector agencies and industry players, the IDPs provide curated digital solutions tailored to the needs of firms in different sectors. Earlier IDPs organised solutions into three stages, from foundational to advanced. Following a refresh, recent IDPs take a more problem-centric approach, organising solutions around business functions, so that SMEs can begin with the business problem they wish to solve and be guided to the relevant digital solutions. To-date, IDPs have been introduced across 24 sectors [Exhibit 1].

Exhibit 1: Timeline of sectoral IDP launches

SN	IDP Sector	Launch Month	Refresh Month
1	Logistics	Nov 2017	Aug 2020
2	Retail	Nov 2017	May 2026
3	Environmental Services	Jul 2018	Jun 2026
4	Security	Jul 2018	Nov 2026
5	Wholesale Trade	Nov 2018	-
6	Food Services	Nov 2018	Jul 2025
7	Media	Dec 2018	-
8	Sea Transport (Ship Agency)	Apr 2019	-
9	Sea Transport (Harbour Craft)	Apr 2019	-
10	Accountancy	Aug 2019	-
11	Hotel	Nov 2019	Sep 2025

1 *We would like to thank Ms Yong Yik Wei, Dr Tan Di Song and Mr Kenneth Yeow for their useful suggestions and comments. We are also grateful to Mr Samuel Tan and his team (SMEGD, IMDA) for their support and inputs, and to Ms Jia Hui Ngoh for her contributions to this study. All remaining errors belong to the authors.*

12	Construction & Facilities Management	Mar 2020	Sep 2024
13	Training & Adult Education	Aug 2020	-
14	Air Transport	Aug 2020	-
15	Sea Transport (Bunkering)	Oct 2020	-
16	Early Childhood	Mar 2021	Mar 2026
17	Food Manufacturing	Apr 2021	Feb 2026
18	Marine & Offshore Engineering	May 2021	May 2026
19	Process Construction & Maintenance	Aug 2021	-
20	Precision Engineering	Nov 2021	-
21	Legal	Oct 2023	-
22	Tourism (Attractions)	Nov 2023	-
23	Tourism (Travel Agent)	May 2026	-
24	Tourism (MICE)	May 2026	-

SMEs face various barriers to digital adoption, including cost, infrastructure and talent constraints, limited managerial capacity, and information gaps[2]. In particular, information-related barriers may include a lack of knowledge about relevant digital solutions, difficulties in identifying suitable solutions, as well as uncertainty about the expected benefits of solutions and the credibility of vendors. IDPs seek to reduce information barriers and search costs by curating sector-relevant solutions and providing practical guidance[3] to firms. By making digitalisation more accessible and actionable, IDPs may encourage SMEs to adopt digital solutions, which could in turn contribute to improvements in firm outcomes such as higher revenue and productivity gains.

This study evaluates the impact of sectoral IDPs by examining two questions. First, are sectoral IDP launches associated with a higher rate of adoption of IDP solutions, and does awareness play a role? Second, is the adoption of digital solutions covered by the sectoral IDPs associated with improvements in firm outcomes? The first question focuses on the adoption of solutions following IDP roll-out, while the second question focuses on the outcomes of firms after the adoption of IDP solutions, irrespective of whether the adoption was due to the IDPs.

LITERATURE REVIEW

Existing studies have identified information gaps and uncertainty over the suitability of technologies as barriers to digitalisation among SMEs (Phipps and Fuller, 2022). Studies on information interventions have also shown that providing relevant, tailored and salient information can influence decision-making and behaviour (Cohodes et al., 2025; Du et al., 2025). These findings provide the basis for us to evaluate the effects of IDPs, which seek to reduce information barriers and search costs by curating relevant digital solutions and providing sector-specific digitalisation roadmaps.

A second strand of literature examines the impact of digital adoption on firm performance. A key empirical challenge faced in studies examining the impact of digital adoption is that firms that adopt digital technologies may differ systematically from non-adopters (i.e., selection bias), and as such, any differences in their outcomes may not necessarily be due to digital adoption. Both local and international studies have thus used a variety of econometric methods to address selection bias and better estimate the causal effects of digital adoption. These studies generally found that digital adoption led to improvements in firm performance, with the extent of the impact varying across outcomes and types of digital technologies (Tan and Ng, 2019; Cirillo et al., 2023).

2 *IMDA's survey findings show that information-related barriers, including difficulties in choosing suitable digital solutions and understanding their applicability to business needs, were among the top five reasons cited by firms for not adopting digital solutions.*
3 *In addition to curated solutions, the IDP includes practical guidance such as AI use cases, cybersecurity best practices, and relevant courses.*

DATA

Our study combines two firm-level data sources. The first is an anonymised dataset from the Department of Statistics' (DOS) integrated Longitudinal Administrative Database (LAD). It provides firm-level variables such as revenue, net profit before taxes, nominal value-added, employees, wages and information on government grants over the period of 2012 to 2022. The second comprises three waves of IMDA's annual IDP surveys[4], which provide data on whether firms were aware of IDPs and, for each sector-specific solution category, whether the firm had adopted it and for how long. The reported duration of adoption is used to derive the timing of first adoption for each IDP solution category. This in turn allows us to identify whether adoption of the solution took place before or after the launch of the relevant sectoral IDP. As IDPs curate existing digital solutions, firms could have adopted these solutions before their respective sectoral IDPs were rolled out.

After merging the survey records with administrative data, the sample used for the analysis comprises 5,270 unique firms spanning 15 IDP sectors[5] covered by the surveys. Firms from Wholesale Trade, Retail, Logistics, Food Services and Environmental Services accounted for the largest share of the sample. Most firms were SMEs[6] [Exhibit 2]. Across the sample, 19.5 per cent of firms reported being aware of IDPs, while 57.5 per cent had adopted at least one IDP solution. On average, adopting firms had adopted 1.66 IDP solutions.

Exhibit 2: Distribution of firms in the sample by sector and firm size

IDP Sectors (Top 5)	Firm Size (Revenue in S$)
Wholesale Trade (18.7%)	Less than 1 million (34.2%)
Retail (14.4%)	1 to 10 million (42.7%)
Logistics (13.3%)	10 to 100 million (18.6%)
Food Services (11.6%)	100 to 500 million (2.5%)
Environmental Services (7.5%)	More than 500 million (2.1%)

EMPIRICAL METHODOLOGY

The empirical analysis is conducted in two parts. The first part examines whether the roll-out of sectoral IDPs was associated with increased adoption of IDP solutions. It also examines whether firms that were aware of IDPs were more likely to adopt IDP solutions and whether they adopted more solutions, after the relevant sectoral IDP had been launched.

To examine the relationship between sectoral IDP roll-out and adoption, we exploit differences in the timing of IDP launches across sectors. The specification compares firms' adoption before and after the launch of the IDP for their sector, while controlling for firms' observable characteristics as well as their unobserved characteristics that do not change over time (i.e., firm fixed effects). The regression model (1) is specified as follows:

$$IDP_Adopt_{ist} = \beta_1 \times PostIDP_{st} + \delta X_{it} + \alpha_i + \theta_t + \varepsilon_{ist} \quad (1)$$

where IDP_Adopt_{ist} refers to whether firm i from sector s ever adopted any IDP solution at year t; $PostIDP_{st}$ indicates if sector s has an IDP in place at year t; X_{it} captures firm i's characteristics that vary over time; α_i and θ_t refer to firm and year fixed effects respectively. Standard errors are clustered at the IDP sector level.

The coefficient of interest β_1 measures the difference in firms' likelihood of adopting IDP solutions following sectoral IDP roll-out, after controlling for their characteristics. At the aggregate level, it could be interpreted as the change in adoption rate between the post- and pre-IDP launch periods.

4 *The three surveys were conducted in January 2019 to March 2019, October 2019 to December 2019, and February 2021 to October 2021 respectively.*
5 *The 15 IDP sectors covered are Logistics, Retail, Environmental Services, Security, Wholesale Trade, Food Services, Media, Sea Transport (Ship Agency), Sea Transport (Harbour Craft), Accountancy, Hotel, Construction & Facilities Management, Training & Adult Education, Sea Transport (Bunkering), Air Transport. The remaining nine IDPs are excluded from this study as they were launched after the survey period of the last IMDA survey covered in the study.*
6 *SMEs are defined as firms with annual operating revenue of not more than S$100 million or employment of not more than 200 workers.*

To determine whether awareness could be a channel through which IDPs influence digital adoption, we use pooled cross-sectional regressions to examine whether firms that reported being aware of IDPs were more likely to adopt at least one IDP solution after roll-out and whether these firms adopted a larger number of solutions. A linear probability model (2) is used for the former, while a Poisson model (3) is used for the latter:

$$ANYIDPaft_i = \beta_2 \times IDPaware_i + \gamma IDPbef_i + \lambda GenericSol_i + \delta X_i + \varepsilon_i \quad (2)$$

$$logE(IDPaft_i \mid \cdot) = \beta_3 \times IDPaware_i + \gamma IDPbef_i + \lambda GenericSol_i + \delta X_i + \varepsilon_i \quad (3)$$

where $ANYIDPaft_i$ indicates if firm i adopted any IDP solution after its sectoral IDP roll-out; $IDPaft_i$ indicates the number of IDP solutions that firm i adopted after its sectoral IDP roll-out; and $IDPaware_i$ denotes firm i's awareness of the IDP. Both regression models control for $IDPbef_i$, which refers to the number of IDP solutions adopted before the sectoral IDP launch, and $GenericSol_i$, which is the number of generic solutions adopted that serves as a proxy for firms' general digital capabilities. Other control variables include firm characteristics, survey waves, and the receipt of government ICT grants.

The coefficient β_2 captures the difference in the likelihood of adoption between firms that were aware and unaware of IDPs, while coefficient β_3 is used to derive the percentage difference in the average number of IDP solutions adopted[7] between firms that were aware and unaware of IDPs.

The second part of our analysis examines whether firm outcomes improved following their first adoption of an IDP digital solution. We also examine how the estimated effects evolve over time, and whether deeper adoption, as proxied by the number of IDP solutions adopted, is associated with larger improvements in firm outcomes. We compare changes in adopting firms' outcomes following their first adoption with changes over the same period among firms that had not yet adopted IDP digital solutions. Conceptually, this can be represented by the following difference-in-differences specification:

$$Y_{it} = \beta \times D_{it} + \gamma X_{it} + \alpha_i + \theta_t + \varepsilon_{it} \quad (4)$$

where Y_{it} denotes the outcome of firm i in year t; D_{it} is a treatment indicator equal to one from the year of the firm's first adoption of an IDP solution onwards; X_{it} represents firm i's characteristics that vary over time; and α_i and θ_t denote firm and year fixed effects, respectively. The coefficient β represents the treatment effect. In practice, we employ the staggered difference-in-differences approach with the estimator developed by Callaway and Sant'Anna, 2021 (CSDID).[8] To mitigate selection bias, comparison firms are weighted to be more comparable to adopters in terms of observable characteristics such as firm size, age, ICT grant receipt and general digital capabilities. Firm outcomes examined include revenue, value-added (VA), productivity (VA per worker), total and local employment, as well as average total and local worker wages. Robustness checks were conducted using alternative comparison groups and specifications, and our main findings are generally robust to these checks.

7 *In Poisson model (3), the percentage difference in the expected number of IDP solutions adopted is given by* $e^{\beta_3} - 1$.

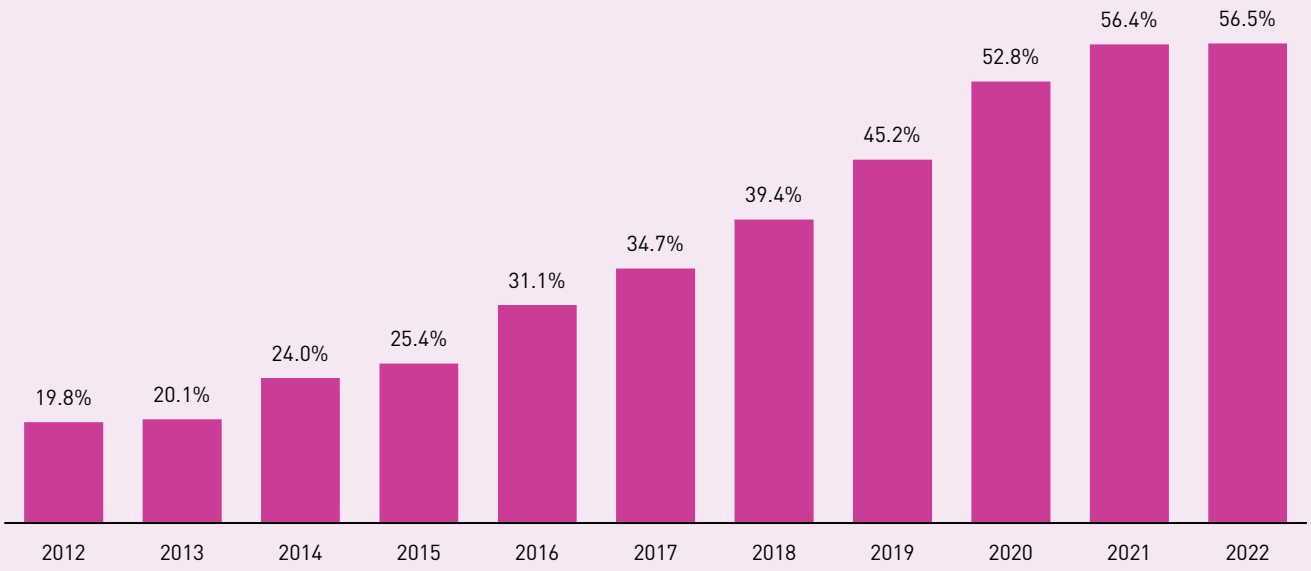
8 *Under the conditional parallel trends assumption, CSDID estimates the average treatment effect on the treated ATT(g,t) separately for each adoption cohort g in each year t. The overall treatment effect, corresponding to β in equation (4), is obtained by aggregating the cohort-year estimates, i.e.,* $\Sigma_g \Sigma_t (g,t) \cdot ATT(g,t)$ *using known or estimable weighting functions w(g,t). Dynamic effects over time are similarly obtained by aggregating ATT(g,t) across cohorts at each relative time since adoption. This bottom-up approach allows treatment effects to vary across adoption cohorts and over time, and avoids the bias that can arise in conventional two-way fixed effects regressions when already-treated firms could be used as comparisons.*

RESULTS AND DISCUSSION

Sectoral IDP roll-out and adoption of IDP solutions

Summary statistics show that the adoption of IDP solutions had picked up over the study period. Specifically, the share of firms that adopted at least one IDP solution rose from 19.8 per cent in 2012 to 56.5 per cent in 2022 [Exhibit 3]. This descriptive trend reflects broader changes in firms' adoption of digital technologies over time and may not be associated with the roll-out of sectoral IDPs. After accounting for firm characteristics and fixed effects, our regression results suggest that the launch of a sectoral IDP was associated with an 8.95 percentage-point (pp) increase in the rate of adoption of IDP solutions in the period after the roll-out.[9]

Exhibit 3: Share of firms that adopted at least one IDP solution, 2012-2022



Awareness of IDPs and adoption

To explore a potential channel through which IDPs may influence digital adoption, we next examine the role of firms' awareness of IDPs. By making relevant digital solutions more visible and actionable, IDPs may help firms identify suitable solutions and make informed adoption decisions more easily.

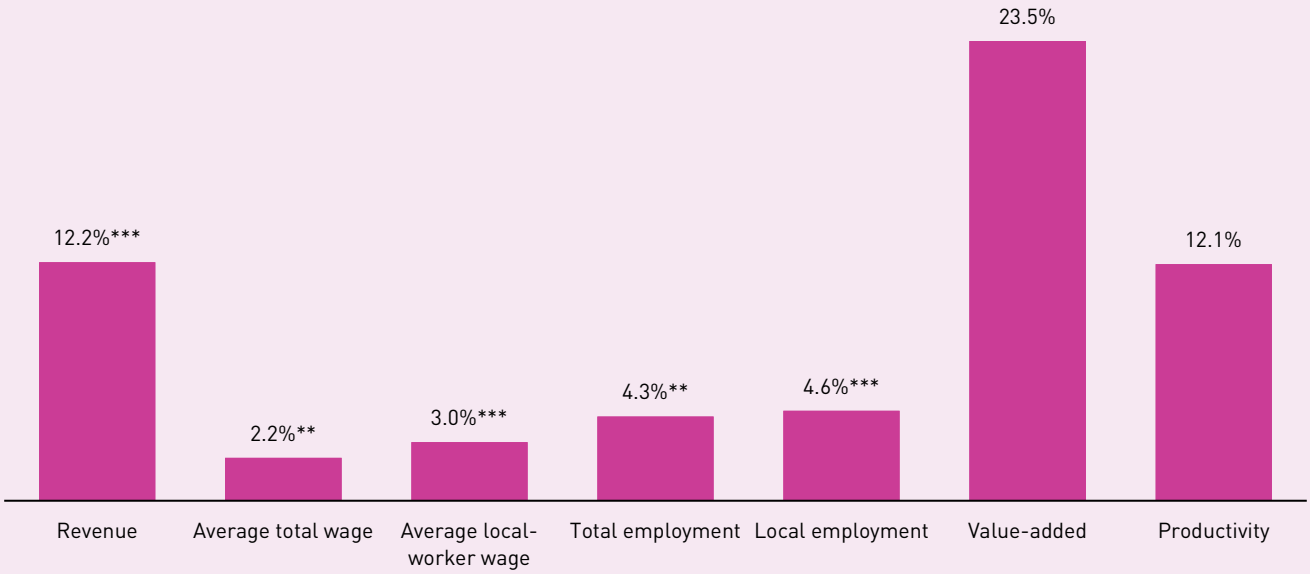
After accounting for the prior adoption of IDP solutions, receipt of ICT grants, general digital capabilities as well as other firm characteristics, our regression results suggest that firms that were aware of IDPs were 9.11pp more likely to adopt at least one IDP solution after IDP roll-out than firms that were not aware. These firms also adopted 33.2 per cent more IDP solutions. Our findings are consistent with the hypothesis that IDPs help support digital adoption by reducing information gaps.

Adoption of IDP solutions and firm outcomes

Our regression analysis shows that adoption of IDP solutions was associated with improvements in selected firm outcomes [Exhibit 4]. Following their first adoption of IDP solutions, firms' revenue was estimated to be 12.2 per cent higher, while average total wages and average local worker wages were 2.2 per cent and 3.0 per cent higher, respectively. Total and local employment were also estimated to be 4.3 per cent and 4.6 per cent higher, respectively, although these estimates should be interpreted with caution as pre-adoption trends differed between adopting and comparison firms. Meanwhile, the estimated effects on VA and productivity were positive but not statistically significant.

9 *Additional event-study analysis indicated that the outcomes of adopting and non-adopting firms did not pass pre-trend tests, and hence the estimated effect should be interpreted as an association rather than a causal impact.*

Exhibit 4: Impact of IDP adoption on firm outcomes



Note: *** and ** indicate statistical significance at the 1 per cent and 5 per cent levels, respectively. Total and local employment outcomes did not pass the pre-trend test.

We further find that revenue gains strengthened over time after IDP adoption. In the year of adoption, revenue was estimated to be 6.9 per cent higher, and this impact rose to 9.6 per cent one year after adoption, 12.8 per cent after two years and 17.0 per cent after three or more years. This suggests that the benefits of digital adoption may build up gradually as firms implement solutions, adapt their business processes and translate adoption into commercial gains.

We also examine how revenue outcomes varied with the depth of digital adoption as proxied by the number of IDP solutions adopted. We find that estimated revenue gains were larger among firms that adopted more solutions. Firms adopting one solution recorded an estimated revenue increase of 2.7 per cent. By comparison, firms adopting two solutions and three or more solutions had estimated revenue gains of 16.2 per cent and 19.6 per cent, respectively. These results suggest that deeper digital adoption may be associated with larger commercial gains.

CONCLUSION

Our study found that the launch of sectoral IDPs was associated with higher adoption rates of IDP solutions. In addition, firms that were aware of IDPs were more likely to adopt IDP solutions after the IDP roll-out and also tended to adopt more solutions than firms that were not aware. These findings are consistent with the objective of IDPs to reduce information barriers and search costs, thereby supporting digital adoption.

In terms of firm outcomes, the adoption of IDP solutions was associated with higher revenue, average wages and employment, while the effect on VA and productivity was positive but not statistically significant. Estimated revenue gains increased over time and were larger among firms adopting multiple solutions.

Taken together, the findings suggest that sectoral IDPs have been effective in increasing awareness of sector-specific digitalisation roadmaps and curated solutions, which has in turn supported firms in adopting relevant digital solutions. The findings thus highlight the value of strengthening outreach and awareness-building efforts to support wider digital adoption among firms. More broadly, while IDPs provide guidance on digital adoption, complementary support in implementation, process redesign and workforce capabilities may also be needed to help firms translate digital adoption into broader productivity gains.

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