



# Study on the impact of regulatory environment on digital automation in professional services

## Executive Summary

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## Executive summary

The digital automation transformation that started in the last decade is changing business models by freeing humans from low value-added repetitive tasks and influencing consumers' lives through cheaper online service delivery. Digital automation is also favouring the emergence of brand-new services and transforming the nature of many professional services. These rapid changes have prompted authorities to regulate and incentivise digital automation to guarantee that it improves consumers' welfare.

This report aims at providing relevant information on the interactions between the regulatory environment and the adoption of automated processes in four different professional categories: architects, lawyers, engineers and accountants. These interactions are economically relevant and complex to identify. They are economically relevant because adopting automated processes implies investment in ICT and human capital, which are engines of productivity growth. Higher productivity, coupled with a competitive environment, implies higher benefits for consumers. They are complex because the regulatory environment impacts digital automation adoption through various channels such as competition, finance, skills, investment, costs, and size. They are also complex to identify because both regulation and automation are not easily measurable. The report addresses relevance and complexity by adopting a comprehensive approach.

### **Global digital trends**

The first step in the study's encompassing approach is to build a strong understanding of the general framework of the global digital trends currently adopted by business activities in all sectors and the general regulatory environment that affects them. This broad perspective is crucial to inform policymakers, as some technologies and regulations that affect architects, engineers, accountants and lawyers belong to a much broader context than their specific professional context.

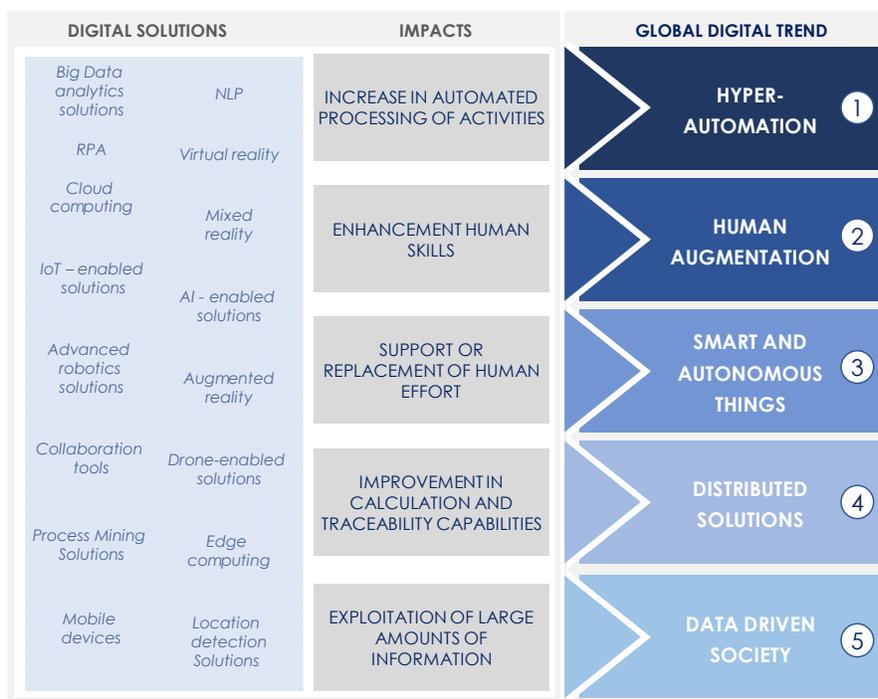
A large body of research classifies the transformation in automation of five macro trends.

- (1) **Hyper-automation** is related to all the technological solutions that contribute to the full or high automation of processes and activities.
- (2) **Human augmentation** is related to the technological solutions that contribute to enhancing human beings' abilities, for example, learning, seeing, communicating.
- (3) **Smart and Autonomous Things** is related to all the technological solutions that provide tangible and physical support to human activities (e.g. drones, driverless car, wearable devices).

- (4) **Distributed solutions** is related to all the technological solutions that enable greater technical capabilities, thanks to a decentralised operating logic.
- (5) **Data-Driven Society** is related to all the technological solutions that make it possible to manage and enhance large amounts of information and/or data.

**Artificial Intelligence (AI)** is integrable with all of these trends. It represents a **combination of different digital technologies** replicating human intellectual functions in using the technologies identified above. These **technological trends pose numerous challenges** that are not only purely technological, but also cultural and organisational in nature.

*The five global digital trends*



The five macro trends also have an influence on the demand and the supply of the professional services industry. They are introducing new players, who place themselves right between supply and demand, such as **new digital platforms** that offer a convenient alternative to the traditional physical services market, exerting pressure on customers to search for online professional help. These challenges are met in different ways by professional services firms experiencing business model transformations, reskilling their human resources and creating new divisions of work for different tasks.

The encompassing view on global digital trends **helps frame the specific interactions of regulation and technology adoption by the four professional categories** of this study. Some technologies and regulations that affect architects, engineers, accountants and lawyers belong to a much broader

sphere than their specific profession. An example is adopting technologies that blend Optical Character Recognition (OCR), Natural Language Processing (NLP), and AI. These technologies process large quantities of documents and create full-fledged reports that inform the decision (or not) of a lawyer and are affected by both the General Data Protection Regulation and future artificial intelligence rules. On the one hand, these regulations might hinder to some extent the adoption of these new technologies. On the other hand, they might be crucial to ensure fair, ethical and transparent decisions.

### **Digital automation in professional services**

**Within the sectors under the scope of the analysis, digital automation affects the whole business model**, from access to markets via the internet to the automation of repeatable tasks that permits refocusing human labour on high-value-added tasks requiring cognitive flexibility and creativity.

For **architects and engineers**, it affects the design processes of their profession, through computational design solutions and Virtual/Augmented Reality solutions, as well as the realisation and maintenance phases of the construction processes through innovative solutions such as drones, 3D printing, and the Internet of Things, generating substantial savings in terms of waste of resources and impacting safety issues. Another significant advance linked to digital automation in the construction sector is the development and maturation of BIM (Building Information Modelling), which is a process standard that, through the use of specific digital technologies, enhances collaboration and the sharing of information between all stakeholders and throughout the life of a project.

For **lawyers**, beyond the blend of OCR, NLP, and AI described above, new digital tools facilitate legal practitioners in making legal analysis, reduce repetitive and time-consuming tasks, speed up judicial processes, and even assist judges in decision-making.

For **accountants**, the latest technologies encompass automated tax compliance software, document assembly software, Optical Character Recognition (OCR) solutions, in addition to Business intelligence software, e-invoicing, and digital payment systems and, in a small way at the moment, but increasingly in the future, Blockchain and distributed ledger solutions.

### **The regulatory outlook**

The regulatory framework is an important factor in determining the decision of whether to adopt automation, or not. This is one of the reasons why EU institutions launched several initiatives included in the Digital Agenda for Europe (DAE), the Digital Single Market (DSM), and the most recent *A Europe fit for the digital age*

aimed at shaping a coherent, broad framework for the regulations related to digital technology.

The EU institutions also launched various initiatives to evaluate the consequences and the possible need for new regulatory frameworks to address the pervasive adoption of AI solutions. Noteworthy examples of these initiatives' outputs are the *Ethics Guidelines for trustworthy AI* and *Policy and Investment Recommendation* documents that describe how to promote trustworthy AI and provide a series of recommendations for leading AI towards sustainability, growth, competitiveness, and inclusion. Another significant output is the *European ethical Charter on the use of Artificial Intelligence in judicial systems and their environment* document that defines a series of ethical principles to guide the policymakers and legal professionals in using AI in the judicial system. The European Commission, along with the Member States, Norway, and Switzerland, also defined a *Coordinated Action Plan on AI* that is reviewed and updated every year. Finally, on February 19<sup>th</sup>, 2020, the European Commission published the *White Paper on AI* (European Commission, 2020) to promote AI's uptake and address the risks associated with particular uses of this new technology.

All these broader initiatives have direct or indirect impacts on the adoption of digital automation solutions by service providers in regulated sectors, including the four professions focused on in the present study.

Although each Member State decides whether and how to regulate specific professional services at the professional level, the EU has also adopted several initiatives in recent decades. Directive 2005/36/EC lays out the principles of cross-border recognition of professional qualifications in the EU. The Services Directive (2006/123/EC) addresses a range of obstacles to the free movement of services, including regulatory barriers and obstacles of an administrative nature. In 2012, the European Council, the European Parliament, and the European Commission started a process to remove unnecessary or disproportionate barriers to the access and exercise of professional services. With Directive 2013/5/EU, the European legislator introduced a **transparency and mutual evaluation exercise** to assess all regulated professions in each Member State to create a regulatory framework 'fit for purpose.' Each Member State had to report the regulatory requirements imposed on all the professions in the country, review their impact and assess to what extent they contribute to protecting legitimate public interests in a non-discriminatory and proportionate manner. As part of their obligations, each Member State had to submit a **national action plan (NAP)** by January 2016, containing the results of this assessment and the reforms undertaken or planned. As part of the roadmap laid out in the Single Market Strategy, in January 2017 the European Commission published a proposal for introducing a mandatory **proportionality test** for the Member States before adopting a new regulation of professions. The scope of the directive is to create a legal framework for conducting proportionality assessments before introducing new or modifying existing legislative, regulatory or administrative provisions restricting access to or the pursuit of regulated professions. The possibility of changing the rules of access to a profession continues to be the responsibility of each Member State, as long as the principles of non-discrimination and proportionality are respected.

However, Member States are obliged to conduct a proportionality assessment before introducing new provisions or modifying existing ones, restricting access to or the exercise of regulated professions.

The description of the national regulatory environment and the map of the specific restrictions affecting access to and the exercise of the four professional services follows the EC methodology and groups a list of twenty-one specific restrictions into four categories of requirements.

*Classification of regulatory requirements*

<b>Classification of regulatory requirements</b>	
<b>Categories of requirements</b>	<b>Specific Restrictions</b>
<b>Regulatory approach</b>	<ul style="list-style-type: none"> <li>○ Exclusive or shared reserved activities</li> <li>○ Protection of title</li> </ul>
<b>Qualification requirements</b>	<ul style="list-style-type: none"> <li>○ Years of education and training</li> <li>○ Number of pathways to obtain qualifications</li> <li>○ Existence of mandatory traineeship</li> <li>○ Obligation to have professional experience to acquire full rights to exercise the profession</li> <li>○ Existence of mandatory state exam</li> <li>○ Continuous professional development obligations</li> </ul>
<b>Other entry requirements</b>	<ul style="list-style-type: none"> <li>○ Compulsory membership or registration in professional body</li> <li>○ Limitation to the number of licences granted</li> <li>○ Territorial validity of the professional qualification</li> <li>○ Age restriction</li> <li>○ Other authorisation requirements</li> </ul>
<b>Exercise requirements</b>	<ul style="list-style-type: none"> <li>○ Restriction on corporate form/ type of entity</li> <li>○ Shareholding requirements</li> <li>○ Voting rights control</li> <li>○ Prohibitions on joint exercise of professions</li> <li>○ Incompatibilities of activities for a professional</li> <li>○ Professional indemnity insurance</li> <li>○ Tariff restrictions</li> <li>○ Restrictions on advertising</li> </ul>

The multidimensionality of this approach helps give an accurate description of the heterogeneity of the regulatory environment of the four professions across the member states.

The regulatory approach category of requirement shows that lawyers are regulated by reserved activities and protected title in all the 12 countries covered by the present study: Belgium (BE), Croatia (HR), France (FR), Germany (DE),

Ireland (IE), Italy (IT), the Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), Spain (ES) and Sweden (SE). The same regulatory approach category for the other three professions shows a more significant heterogeneity across countries, with Sweden being a clear outlier.

Regulatory Approach				
Specific Restrictions	Architects	Engineers	Accountants	Lawyers
Exclusive or reserved activities	BE, HR, FR, DE (*), IE, IT, PL, PT, RO, ES	BE, HR, IE, IT, PL, PT, RO, ES	BE, FR, IE, IT, PL, PT, RO	BE, HR, FR, DE, IE, IT, NL, PL, PT, RO, ES, SE
Protection of title	BE, HR, FR, DE (*), IE, IT, NL, PT, RO, ES	HR, FR, DE (*), IE, IT, PT, RO, ES	BE, FR, IE, IT, NL, PL, PT, RO	BE, HR, FR, DE, IE, IT, NL, PK, PT, RO, ES, SE
None	SE	NL, SE	HR, DE (**), ES, SE	

(\*) Lander level (\*\*) Except for the title of a qualified accountant.

The qualification requirements category also shows heterogeneity in many specific restrictions such as the number of years in education and training, especially in the requirement of a specific state exam.

Qualification Requirements				
Specific Restrictions	Architects	Engineers	Accountants	Lawyers
Years of education and training()	BE(7), FR(6), IE(7), IT(5), NL(7) PL(4-5), PT(6), RO(8), ES(6), SE(5)	BE(4-5), IE(5), IT(5) , NL(5) PL(5-8), PT(6-7.5), ES(4-6), SE(5)	BE(6), FR(8), IT(4.5-6.5), NL(3), PL(3.5), PT(4.5), RO(6) (*)	BE(8), FR(5.5), DE(6), NL(5), PL(8), PT(5.5), ES(5.5), SE(7.5)
Existence of mandatory state exam	HR, IT, PL, RO	HR, IT, PL, RO	FR, IT	BE (**), HR, IT, PL, PT, ES
Continuous professional development obligations	BE, HR, FR, IE, NL, PL, RO	HR, IE, PL	BE, IE, NL	BE, IT, PL, SE

(\*) For chartered, (\*\*) Avocat devant la Cour de Cassation/Advocaat bij het Hof van Cassatie

The category other entry restrictions shows that many countries still require registration in a professional body. While in some countries this is not required for

accountants, engineers and in two cases for architects, all countries demand it for lawyers.

Other Entry Restrictions				
Specific Restrictions	Architects	Engineers	Accountants	Lawyers
Compulsory membership or registration in professional body	BE, HR, FR, DE, IE, IT, PL, PT, RO	HR, DE, IE, IT, PT, ES, NL, PL,	BE, FR, IT, NL, PL, RO	BE, HR, FR, DE, IE, IT, NL, PL, PT, RO, ES, SE
Other authorisation requirements	BE			BE, FR,
None	NL, SE	BE, FR, RO, SE	HR, DE, PT, ES, SE	

The same pattern appears for the Exercise requirements category: lawyers are the most restricted profession.

Exercise Requirements				
Specific Restrictions	Architects	Engineers	Accountants	Lawyers
Shareholding requirements and/or voting rights control	BE, FR, DE, PT, ES	DE, PT, ES	BE, PL, PT, RO	BE, HR, FR, DE, IE, IT, NL, PT, RO, ES, SE
Obligatory professional indemnity insurance	BE, FR, DE	DE	BE, RO	BE, HR, FR, DE, NL, PT, RO, SE
Restriction on the legal and corporate form	DE, SE, PL	DE	FR, PT	BE, HR, FR, PL, RO
None	IE, IT, NL, PL, SE	BE, HR, FR, IE, IT, NL, PL, RO	HR, DE, NL, ES, SE	

### **Survey and interviews**

**The systematic analysis at the professional level of automation and its interaction with the regulatory environment** required novel data. These data were collected **through an online survey** that ran during August and part of September 2020. The survey produced a working sample of 8 157 responses

across the four professions and 12 EU Member States. The survey respondents are, in their majority, self-employed (71%), are registered in an official national register (97%), and have at least started to adopt digital automation (84%). **The survey collected more than one hundred variables for each respondent. It produced a substantial body of information on the adopted technologies, the perceived costs, and benefits of digital automation, the perceptions on the impacts of specific regulations, and the views on the professional services market conditions.**

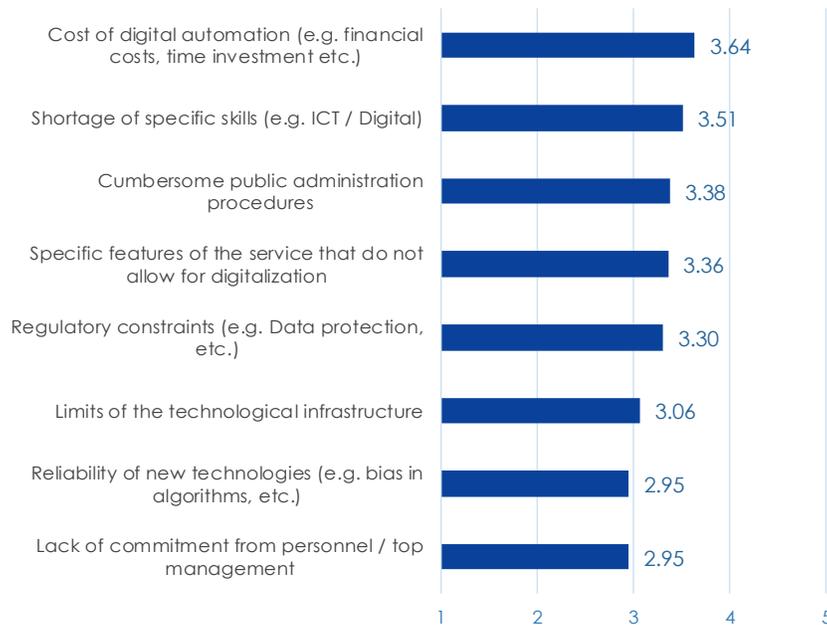
The response rate at the country level was satisfactory, with a few exceptions (Spain, the Netherlands, and Sweden).

The resulting survey database allowed us to pursue two main objectives. The first was to analyse the state of play in digital automation of the four sectors. One relevant observation is that 43% of the respondents declared that digital automation led to a change in the business model, and 79% of those said that it led to the introduction of new services. A second significant observation is that **the most frequent automation occurring across the four professions is related to support processes common to most businesses.** 'Invoice and payments' is the number one activity to be automated. For Accountants, this activity is part of the support processes and is probably the activity with the most added value.

A third result is that **the second most important activity to be automated by the four sectors is related to a core value-added process of each different profession.** This core value-added activity for architects and engineers is 'creating, planning, and designing projects.' For lawyers and, to a lesser extent, for accountants, the core value-added activity is in regard to the acquisition of relevant documentation and its processing.

Turning to the obstacles to the adoption of digital automation, **the two main obstacles to automation that result from the survey are the cost of investing in digital automation and the shortage of digital skills.**

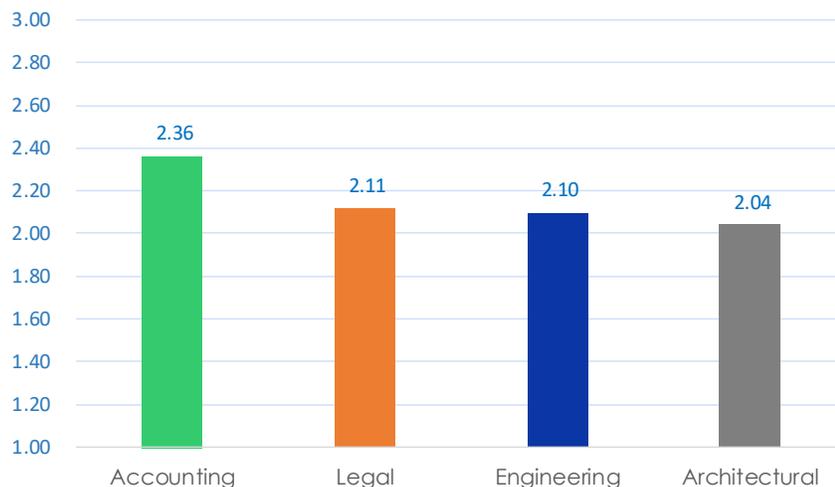
**How do you assess the relevance of the following obstacles that could arise when introducing digital automation solutions? - Average relevance (out of 5) of each obstacle stemming from digital automation according to respondents**



The survey showed that **respondents perceive that regulation can be an obstacle to adopting digital automation solutions**. While several restrictions are mentioned as having an impact, each professional category identifies different aspects of the regulatory environment specific to its activity. For example, **architects identify tariff restrictions, and lawyers identify advertisement restrictions as the primary regulatory obstacles to digital automation**.

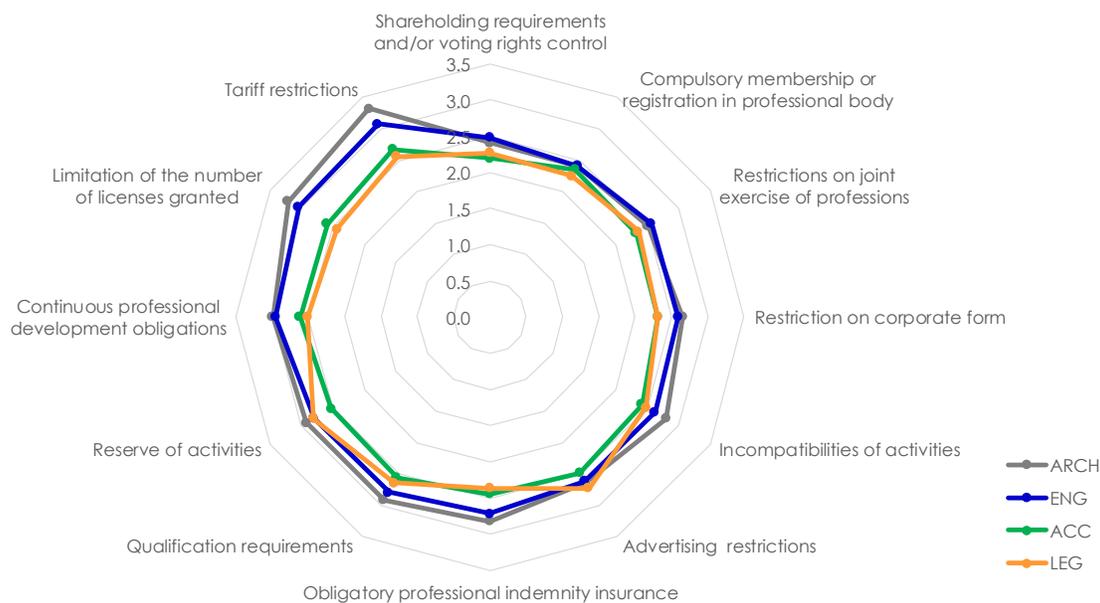
The survey's second objective was to **produce measures of digital automation adoption and perceived regulatory environment to be used in the subsequent quantitative analysis**. The former was constructed by creating a synthetic index of digital automation that combines the professionals' self-assessment of the number and type of automated activities adopted, the number and type of technologies adopted, and the level of ICT expenditure. The resulting index shows that **larger firms have a higher index of automation adoption**. The index also shows that **the accounting profession is the most automated, while architectural services is the least**.

### Synthetic Index of digital automation by professional sectors



The perceived regulation index was constructed by combining the respondents' assessment of specific regulatory restrictions, including qualification requirements, tariff restrictions, and regulatory exclusiveness.

### Average perceived negative impact (out of 5) of regulation on digital automation, by sector



Finally, the **results of interviews** with selected players in each of the four professions revealed some interesting insights. The results of the **interviews show that accountants and architects consider online service providers**

**as direct competitors.** On the other hand, lawyers and engineers consider online players as providing complementary services, not in direct competition with their offering. The interviews with the legal service sector showed that it is important to distinguish between 'strategic legal advice' and 'traditional legal advice' services. This distinction is necessary to assess the impacts of digital automation, which act in different ways:

- 'strategic legal advice' consists of activities with higher added value, which are less standardised and more personalised, therefore less automated, and yet very dependent on human factors,
- 'traditional legal advice' consists of activities such as privacy or anti-money laundering compliance, which are highly automated because they are much more standardised, and generally have a more uniform regulation at an international level as well (thanks also to European standards).

A noteworthy example of a new revenue model that emerged during an interview with a player in the legal sector is the 'no win no fee' model, which consists of a payment linked to the service performance. In the case of the respondent, who offers judicial dispute resolution online through predictive AI models, this translates into fee charges only if the client wins the case. If the case is lost, the provider assumes all the costs. Although it is very incentivising for clients, lawyers that might offer the same services are not allowed to act on this business model in some EU countries.

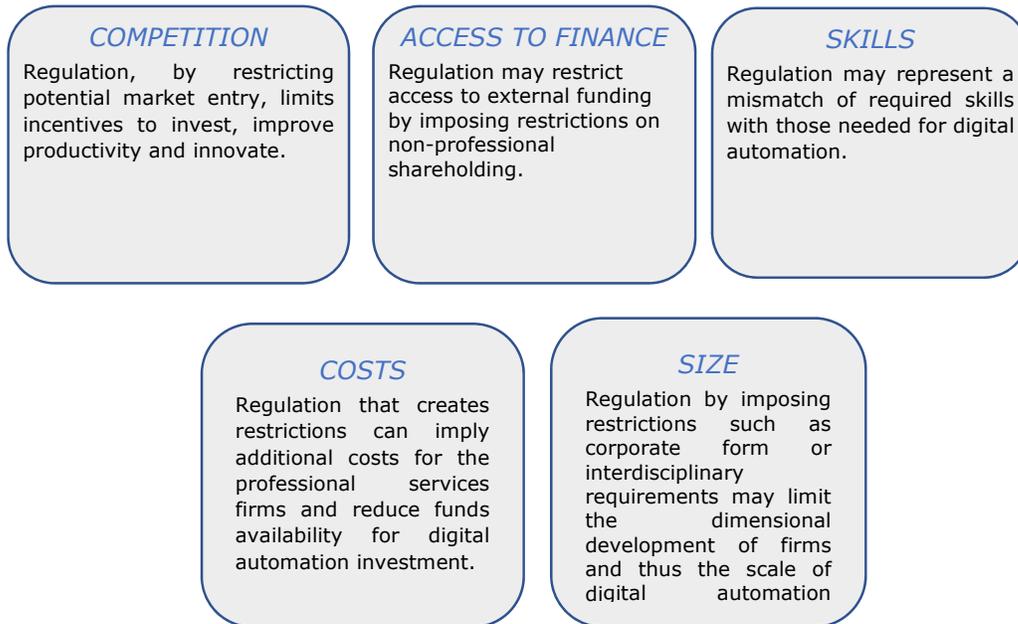
Interviews with the accounting sector highlighted how digital conservation regulation (in the cloud) is potentially critical. Moreover, it is worth noting that although not directly related to regulation, professionals in smaller countries complain that frontier technology is often not available in their native language. Less-spoken languages are also at a disadvantage, considering how digital technologies work (for instance, machine learning works much more effectively with more data available).

Finally, the interviews also showed that **respondents are concerned about the grey area that characterises online professional services.** In particular, the 'country of origin' vs. 'country of destination' issue has a relevant impact on the breadth and nature of online services provided in member countries with different regulatory approaches to online service providers.

### **The impact of relevant factors on digital automation**

**The study adopts a broad spectrum of quantitative approaches to test the significance of the interaction between regulation and digital automation adoption.** The theoretical framework that is behind the econometric analysis consists of two parts. The first part builds on the mapping between the regulatory environment and the specific restrictions it creates.

*Channels of the impact of regulation on digital automation*



*Specific restrictions and related impact channels for digital automation adoption*

<b>Specific regulation</b>	<b>Potential channels of impact on digital automation</b>
<b>Reserves of activities</b>	All channels
<b>Continuous professional development obligations</b>	Skills, costs
<b>Qualification requirements</b>	Skills, costs
<b>Compulsory membership or registration in professional body</b>	Competition, costs
<b>Limitation of the number of licences granted</b>	Competition
<b>Restriction on corporate form</b>	Size, Access to finance, Competition
<b>Incompatibilities of activities</b>	Skills, size, competition
<b>Restrictions on joint exercise of professions</b>	Skills, size, competition
<b>Obligatory professional indemnity insurance</b>	Costs
<b>Tariff restrictions</b>	Competition
<b>Advertising restrictions</b>	Competition
<b>Shareholding requirements and/or voting rights control</b>	Size, Access to finance, Competition

The second part builds on how the specific restrictions impact automation adoption through the six channels listed in the introduction: competition, access to finance, skills, investment, costs, and size.

*The factors that impact the decision to adopt digital automation*

The first quantitative approach uses the survey database and tests two propositions, in particular, whether or not:

- (1) a more restrictive regulatory environment deters the decision to adopt digital automation;
- (2) once adopted, a more restrictive regulatory environment diminishes the degree of digital automation adoption.

The variable to be explained in the first proposition is the response to the question, 'If digital automation were a journey, where would your practice be on that journey as of today?' This variable is transformed into a 1 if the respondents had started and a 0 if they had not started the journey, in other words, whether they had adopted digital automation.

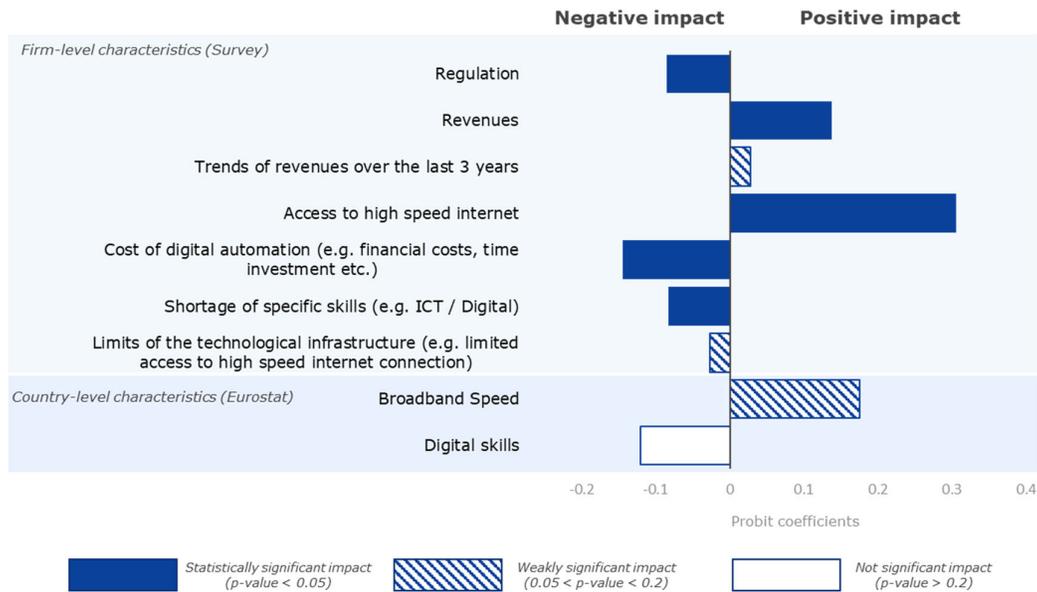
The primary explanatory factor of interest is the regulatory index, shown above, built using the response 'To what extent might the following rules of access and conduct constitute an obstacle to digital automation?' It is important to note that the regulatory index is a subjective index that measures regulation as perceived by the respondents and is not built from the *regulatory environment's de jure situation*.

The econometric model, here a probit model, shows that regulatory obstacles measured with the index significantly reduce the probability of adopting digital automation.

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*Coefficients resulting from the regression analysis of the effect of perceived regulation and other variables on the adoption of Automation*



The same regression shows that:

- larger firms have a higher probability of adopting automation,
- costs are an obstacle to the adoption of automation,
- high-speed internet access increases the probability of the adoption of automation,
- the shortage of specific ICT and digital skills also are an obstacle to the adoption of automation.

These results are robust for the overall sample. In the profession-specific analysis, statistical significance is not confirmed by the data for some of the professions (although the indicative direction of the explanatory variables' effects is preserved). The results are interesting and indicate the importance of professional regulation for automation. More conclusive evidence will require further research to understand how precisely each restriction prevents automation in the interplay with other factors and would probably need to include more qualitative and legal analysis.

When the different specific regulations are used in place of the regulatory index as explanatory variables, the direction of the effects is preserved while significance varies across regulations and professions.

# Study on the impact of regulatory environment on digital automation in professional services

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Coefficients resulting from the regression analysis of the effect of each regulation on the adoption of automation by professional service

Specific regulations	Architects	Engineers	Accountants	Lawyers
Reserve of activities	-0.14	-0.06	-0.07	-0.25
Qualification requirements	-0.14	-0.05	-0.08	-0.10
Continuous professional development obligations	-0.09	-0.03	-0.03	-0.13
Compulsory membership or registration in professional body	-0.20	-0.02	0.01	-0.06
Limitation of the number of licenses granted	-0.04	-0.04	0.00	-0.14
Restriction on corporate form	-0.16	0.00	-0.04	0.00
Shareholding requirements and/or voting rights control	-0.15	-0.01	-0.05	-0.02
Restrictions on joint exercise of professions	-0.10	-0.03	-0.01	-0.10
Incompatibilities of activities	-0.14	-0.05	-0.01	-0.09
Obligatory professional indemnity insurance	-0.26	-0.04	-0.02	-0.06
Tariff restrictions	-0.20	-0.03	0.02	0.02
Advertising restrictions	-0.15	0.05	0.03	0.06

 Statistically significant impact (p-value < 0.05)
  Weakly significant impact (0.05 < p-value < 0.2)
  Not significant impact (p-value > 0.2)

This last set of results **could be of particular interest to the policymaker. It identifies which specific regulation decreases the probability of automation adoption for each specific profession.**

The results are especially strong for architects, as almost all regulation items represent an obstacle to embarking on the digital automation journey. 'Obligatory professional indemnity insurance,' 'tariff restrictions,' and 'compulsory memberships or registration in professional body' appear to be the most significant restrictions to the adoption of automation. One possible explanation for the negative impact of 'obligatory professional indemnity insurance' and 'compulsory memberships or registration in professional body' is that they might be perceived as burdensome expenses that drain resources that could be allocated to investment in automation. Architects also perceive tariff restrictions as a significant obstacle to automation. Here, the explanation could be that minimum tariffs allow prices to remain above the competitive levels, limiting price competition and the incentive to innovate. Advertisement restrictions also appear to prevent digital automation, perhaps by preventing investment. Incompatibilities of activities and restrictions on corporate forms also appear to be negatively related to the incentive to innovate. Both these restrictions can prevent growth in size and access to finance, limiting the investment scope on digital automation.

The results for engineers are weaker, with reserve of activities showing the highest negative coefficient although weakly significant. This result might suggest that countries reserving activities to engineers might encounter more difficulties in the automation process than others.

The results for accountants show that qualification requirements appear strongly negative in relation to the choice to opt-out from digital automation and therefore represent a significant obstacle.

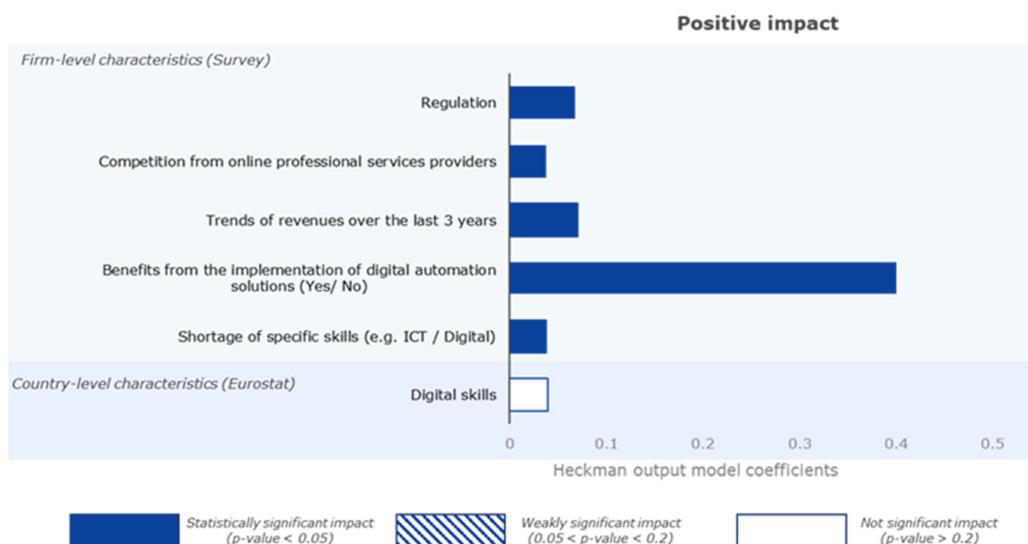
The results for lawyers reveal that reserves of activities are a factor that significantly inhibits the adoption of digital automation. In this case, the reserve

of activities may lead to difficulties in providing online legal consultations and the digital automation of legal documents by non-lawyers. In all the Member States under scrutiny, the legal profession is regulated through the reserve of activities, thus representing a cross-cutting issue.

The factors that impact the intensity of digital automation adoption

The variable to be explained in the second proposition is the **synthetic index of digital automation**. The econometric model, here a Heckman model, estimates the relationship between the perceived regulation level and the degree of digital automation as measured by the synthetic index. Somewhat counterintuitively, the model finds a positive and significant relationship between the intensity of adoption and the perceived regulation and the shortage of specific skills. The interpretation could be that professionals that have adopted automation to a significant extent are more aware of the potential obstacles to automation stemming from regulation, which projects into the perceived regulation index or skill shortage.

*Coefficients resulting from the regression analysis of the effect of perceived regulation and other variables on the intensity of Automation*



When the different specific regulations are used in place of the regulatory index as explanatory variables, the results are more qualified.

Coefficients resulting from the regression analysis of the effect of each regulation on the intensity of automation by professional service

Specific regulations	Architects	Engineers	Accountants	Legal
Reserve of activities	-0.09	0.01	-0.01	0.06
Qualification requirements	-0.08	0.02	0.01	0.00
Continuous professional development obligations	-0.05	0.01	0.00	-0.04
Compulsory membership or registration in professional body	-0.04	0.02	0.01	0.00
Limitation of the number of licenses granted	-0.03	0.03	0.01	0.00
Restriction on corporate form	0.01	0.02	0.00	0.10
Shareholding requirements and/or voting rights control	0.01	0.01	0.01	0.08
Restrictions on joint exercise of professions	0.00	0.02	0.01	0.08
Incompatibilities of activities	0.03	0.00	0.01	0.10
Obligatory professional indemnity insurance	0.00	0.01	0.00	0.03
Tariff restrictions	0.05	0.05	0.03	0.01
Advertising restrictions	-0.01	0.02	0.00	0.05



In particular, it appears that tariff restrictions drive the positive relationship, as they are perceived as the most salient among specific regulations, displaying a significant coefficient for Architects, Engineers and Accountants. An explanation could be that minimum tariffs prevent professional service providers from competing on price, protect less efficient competitors, and limit the incentive to improve quality and innovate. Conversely, maximum tariffs can discourage investment in automation by reducing profitability and prospects of profits. For architects, the results also show a negative relationship between the perception of reserves of activities and qualification requirements as limiting factors on automation intensity. This kind of restrictions, focusing more on entry barriers, might indeed be perceived less as obstacles by those already automating.

Overall, the first model results explaining the binary decision to adopt automation are the strongest. **A potential second wave of the survey would add a time dimension to the analysis, which would allow for even more robust identification and enable e.g. the identification of a possible acceleration in digital automation adoption due to the pandemic.**

### **The macroeconomic impacts of adoption EC recommendations on profession regulations**

The study also measures the potential economic effects of implementing the EC reform recommendations from (COM(2016) 820 final) to the Member States. The latest regulatory index *Product Market Regulation index for professional services* published by the OECD benchmarks the reforms. The objective is to **obtain a new**

**value of the PMR index<sup>(1)</sup> that would reflect the recommended reforms' hypothetical implementation** and to use this new value in a macroeconomic model. In short, the results show how the regulatory index would change across professions in each of the EU Member States if the recommendations were fully implemented and what would be the consequent macroeconomic impact.

**Overall, the PMR measurement exercise illustrates the current heterogeneity in the level of professional regulation across the Member States, and as a result, it shows that various degrees of ambition for reforms would be required across countries and professions to achieve the desired outcomes.**

The macroeconomic evaluation consists of two sequential steps. The first step estimates two microeconomic econometric models that measure the impact of the PMR index reform on productivity and on the professions' price-cost markups. The data used are firm-level data from the ORBIS database.

*Coefficients resulting from the regression analysis of the effect of regulation and other variables on TFP*

Impact on Total Factor Productivity				
	Architects	Engineers	Legal	Accounting
Regulation (PMR)	-0.239	-0.682	-0.487	-0.137
Turnover	0.461	0.317	0.292	0.206
Labour Cost	-0.143	-0.125	-0.058	0.003
Share Funds	0.058	0.066	0.105	0.073
Share of intangible assets on total assets	0.212	0.062	0.000	0.026
Country effects	Yes	Yes	Yes	Yes
Observations	4 225	13 713	2 894	19 449



Statistically significant impact (p-value < 0.05)



Weakly significant impact (0.05 < p-value < 0.2)



Not significant impact (p-value > 0.2)

<sup>(1)</sup> It is worth noting that although among the regulation indices the “natural” candidate is the European Commission Restrictiveness Indicator (2016), the choice has fallen on the OECD PMR (2018) index, in order to provide the most up-to-date representation of the regulatory framework and to be consistent with other sections of the report.

# Study on the impact of regulatory environment on digital automation in professional services

## Executive Summary

Coefficients resulting from the regression analysis of the effect of regulation and other variables on Markup

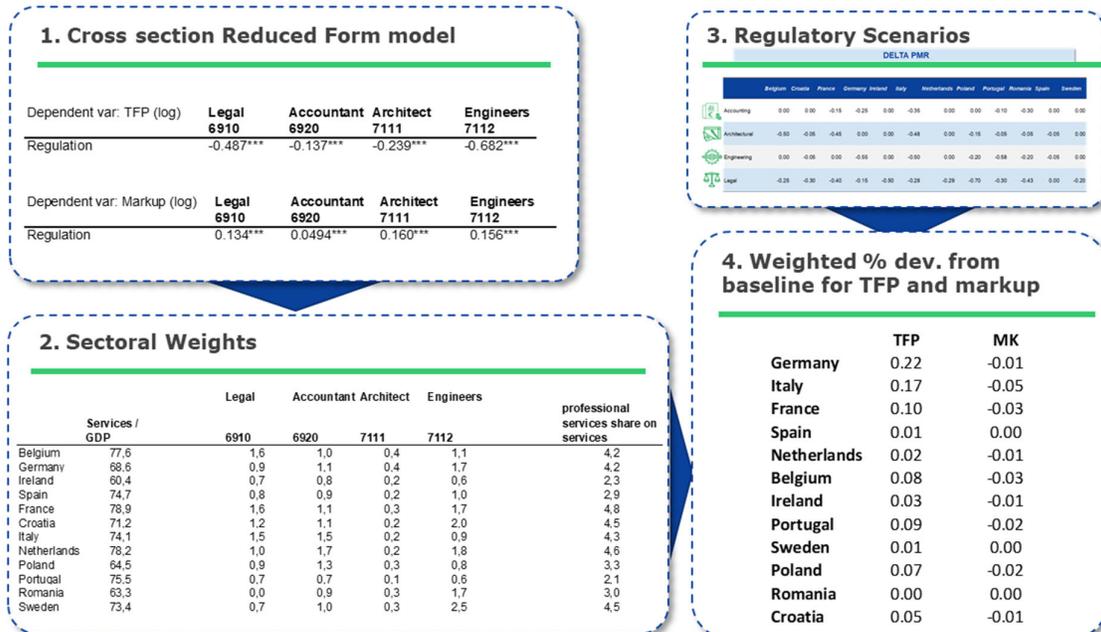
Impact on Markup				
	Architects	Engineers	Legal	ACCOUNTING
Regulation	0.160	0.150	0.134	0.049
Enterprise size				
(1 <sup>st</sup> quantile)	Ref.	Ref.	Ref.	Ref.
(2 <sup>nd</sup> quantile)	-0.211	-0.147	-0.095	-0.152
(3 <sup>rd</sup> quantile)	-0.339	-0.261	-0.209	-0.248
(4 <sup>th</sup> quantile)	-0.417	-0.318	-0.236	-0.304
(5 <sup>th</sup> quantile)	-0.438	-0.324	-0.245	-0.304
Turnover growth	0.001	0.000	0.000	0.001
TFP	-0.064	-0.041	-0.028	-0.078
Share of intangible assets on total assets	-0.300	-0.055	-0.029	-0.036
Share of share funds on total assets	0.022	0.015	0.005	0.003
Country effects	Yes	Yes	Yes	Yes
Observations	2 312	8 556	1 165	9 169

Statistically significant impact (p-value < 0.05)
Weakly significant impact (0.05 < p-value < 0.2)
Not significant impact (p-value > 0.2)

The results show **that a decrease in regulation improves productivity and decreases markups in the four professional categories.**

The second step feeds the results of the first step into two multi-country macroeconomic models and simulates their macroeconomic impact.

Simulation approach



The results show that the recommended reforms in the four professional services would significantly affect the macroeconomic variables. The **simulation shows that the EU's three largest economies could increase their combined GDP by more than 14 billion euro during the three years following the reforms.**

**Simulation results: main macroeconomic variables (Absolute deviation from the baseline, levels)**

Abs dev. from baseline		years	GER	ITA	FRA	BEL	CRO	POR	IRE	NED	POL	ROM	SPA	SWE
Chain linked volumes (2010), million euro	<b>GDP</b>	2020	4 443	3 122	2 770	408	25	328	172	188	440	1	102	38
		2021	5 411	3 956	3 523	510	27	363	191	238	497	1	128	47
		2022	5 303	3 863	3 439	500	25	325	190	232	491	1	126	46
Chain linked volumes (2010), million euro	<b>Final Consumption</b>	2020	2 701	1 958	1 644	243	14	190	70	96	300	0	58	21
		2021	3 030	2 248	1 911	276	15	199	74	112	318	0	67	24
		2022	3 021	2 240	1 902	275	14	189	74	112	318	0	67	24
Thousand persons	<b>Employment</b>	2020	18	11	5	1	0	2	0	0	1	0	0	0
		2021	21	15	7	1	0	3	0	0	2	0	0	0
		2022	22	18	7	1	0	3	0	0	3	0	0	0

**Conclusions**

The study found that the existing global technological trends pose numerous challenges and opportunities to the four professional categories under scrutiny. These trends influence the demand and the supply of the professional services industry by introducing new players such as digital platforms that offer a convenient alternative to the traditional physical services market. Professional services firms meet these challenges and opportunities by transforming their business model, reskilling their human resources, and creating a new division of work. In this broad technological context, the new general regulatory frameworks that impact data protection, AI and digital transformation are also impacting the adoption of automation in the four specific sectors.

The specific professional regulatory frameworks are also an important factor in determining whether to adopt automation, or not. Here too, while Member States are free to determine the rules of access and conduct for professions as long as non-discrimination and proportionality principles are respected, the EU made progress during the last decades with several initiatives that resulted in:

- improved mutual recognition under the revised PQD of 2013; mutual evaluation exercise and guidance on reform recommendations,
- ensuring that Member States conduct a proportionality assessment before introducing new provisions or modifying existing ones, restricting access to or the exercise of regulated professions.

The current outlook of the four professions’ regulatory environment across the member states shows a certain degree of restrictiveness in all four categories: the regulatory approach, the qualification requirements, entry restrictions and exercise requirements. Lawyers are the most strictly regulated profession across countries because they appear to be the most regulated and restricted profession. For the other three professions, the degree of restrictions changes, also reflecting

different initial historical conditions. In certain countries, the result is that the regulatory environment creates a high cumulative burden of multiple restrictions, for example, France for accountants and Italy for architects.

A novel data base, collected through an online survey and several interviews across the four professions in the 12 Member States, made it possible to quantitatively explore the interaction between digital automation and the regulatory environment. This exploration produced various results:

- 43% of the survey respondents declared that digital automation led to a change in the business model, and for 79% of those, it led to the introduction of new services. An interesting example of a new service is the 'no win, no fee' model in online judicial dispute resolution.
- The survey respondents indicated that the reduction of the service delivery time and the improvement in the quality of the services were the most relevant benefits in adopting digital automation. Efficiency in personnel utilisation and cost reductions were also perceived as relevant benefits.
- The survey respondents pointed to the costs of digital automation and the shortage of specific skills as the two most significant obstacles to automation adoption.
- Cumbersome public administration and regulatory constraints are also perceived as obstacles.
- The survey respondents identified tariff restrictions, limitation in the number of licenses granted, continuous professional development obligations, and the reserve of activities as the main rules of access and conduct that deter digital automation adoption. In the case of lawyers, the most relevant restriction constituting an obstacle is advertising restrictions.
- The results of the *interviews show that accountants and architects consider online service providers as direct competitors*. On the contrary, lawyers and engineers consider online players as providing complementary services, not in direct competition with their offering.
- *The most frequent automation occurring across the four professions is related to support processes common to most businesses*. 'Invoice and payments' is the number one activity to be automated.
- *The second most important activity to be automated by the four sectors is related to a core value-added process of each different profession*. This core value-added activity for architects and engineers is 'creating, planning, and designing projects.' For lawyers and, to a lesser extent, for accountants, the core value-added activity is related to the acquisition of relevant documentation and its processing.

The data collected in the online survey made it possible to build synthetic indices of digital automation that showed that:

- the level of digital automation is positively correlated with revenue size; the larger firms have adopted more digital automation processes,
- accountancy is the profession that shows the highest digital automation index and architects the lowest; engineers and lawyers are practically tied in the intermediate position.

The empirical analysis shows that across the four professions:

- The regulatory index of perceived regulation by the survey's respondents significantly deters the adoption of digital automation.
- Costs also deter the adoption of digital automation.
- The shortage of specific skills deters digital automation adoption except for lawyers, who appear to be more deterred by limits of the technological infrastructure.
- For architects, the specific regulations that negatively impact automation are compulsory membership or registration in a professional body, restrictions on corporate forms, incompatibilities of activities, obligatory professional indemnity insurance, tariff restrictions, and advertising restrictions.
- For engineers, no specific regulation appears to significantly affect the automation choice.
- For accountants, the qualification requirements are the regulation that negatively impacts the automation choice.
- For lawyers, the reserve of activities is the regulation that negatively impacts the automation choice.

Finally, a simulation exercise that constructs a counterfactual index of product market regulation at the country and professional level to reflect the EC proposed reforms for each of the four professions shows that implementing those reforms could have a substantial positive impact on economic activity.

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