

# **Digitalization and Its Impact on the Creation of New Businesses: Case study on Digital Adoption Index (DAI) by the World Bank**

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## **Abstract:**

Digitalization, development and economic growth go hand in hand. Developed countries exhibit higher levels of digital technology adoption as well as higher standards of living. How consistent, nevertheless, is the influence of digital technologies and their adoption on other country performance indicators like commerce, high GDP per capita, freedom of speech, and education? This final project seeks to answer this question by using quantitative methods and applying them in the analysis of the performance indicators data on 104 nations collected in 2016 from open-source websites such as World Bank, United Nations and Our World in Data. The findings of this project revealed that the adoption and widespread usage of digital technologies is a statistically significant determinant of global development and it is correlated with many other vital country-level economic and social performance indicators. The study also discovered the significance of freedom of speech and its relationship to the new business creation rate. It is worth mentioning that the research does not imply or pursue any causal inferences or claims, but it aims to show general correlational trends in data.

## 1. Introduction and Motivation

How the use of digital technologies in the business sector affects the number of new firms that appear across nations is the primary research topic of this project. In other words, how can digital technology, global commerce, and different legal and social settings support the growth of entrepreneurship across nations?

The widespread use of digital technologies, particularly in the business sector, is the main reason behind analyzing the correlation between digital technology adoption, economic and social developments. The academic community commonly acknowledges that commerce and business are the primary forces behind economic growth and development. As a result, studying the data already available on digital adoption and use across nations adds to the body of knowledge on global growth and development.

The 21st century saw a widespread trend toward digitalizing all aspects of human activity. There is no exception in the government sector. The terms "digitalization," "smart city," and "data-driven policies" have lately become a leitmotiv in the vision of the future city and urban development. All governments have been aiming for digitalization and amortization. "The smart city' has drawn increasing interest from academia, business, and government, and presents itself primarily as an influential, technologically sophisticated, green, and socially inclusive metropolis."<sup>1</sup> New technologies and communication tools are now accessible in many places throughout the world because to the rapid growth of information and communication technologies, the development of hardware and software manufacturing, and the lowering of production costs. ICTs were first included into governance due to the ease of use and benefits of their usage in the public sector to improve the comfort and safety of people's lives.

Several widely used indices place nations in order of their technical advancement. International organizations like the United Nations and the World Bank created their evaluation techniques and rankings to gauge how well-performing countries are in terms of ICT adoption and expansion. The positions of the Central Asian nations in these rankings are shown in the table of globally recognized rankings below.

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[https://www.researchgate.net/publication/325304603\\_Smart\\_governance\\_in\\_the\\_context\\_of\\_smart\\_cities\\_A\\_literature\\_review](https://www.researchgate.net/publication/325304603_Smart_governance_in_the_context_of_smart_cities_A_literature_review)

## 2. Background and Literature Review

Entrepreneurship, commerce, and especially international trade are widely acknowledged as economic growth and development factors. The scope of business has also grown dramatically with the rise of globalization, the worldwide division of labor, and technological advancement.<sup>2</sup>

Information systems help the organizational learning process by facilitating and supporting effective learning, information dissemination, information interpretation, and corporate memory, as per studies on the connection between information technology and organizational learning. The information system facilitates increased information transmission throughout the company and flattens the organizational structure. The organization becomes more organic, open, knowledgeable, and adaptable<sup>3</sup>. Intelligence systems assist the company in acquiring crucial competitive and market information. Information technology also enables the company to access, receive, absorb, and use external knowledge by bridging physical and temporal gaps, which broadens the size and breadth of organizational learning.<sup>4</sup>

Information and communication technologies (ICTs) are being used as part of e-Government programs in several nations to transition from predominantly paper-based administrative systems to digital systems. Much has been written about the positive power of technology and information to support greater transparency and accountability and, by extension, development.<sup>5</sup> Lemieux advocated for further research and attention to the ramifications of ICT use in the public sector, namely the effects on the operation of transparency and accountability mechanisms. The consequences of these dangers for the application of right-to-information laws are investigated.<sup>6</sup>

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<sup>2</sup> Taylor, *Globalization, Trade, and Development : Some Lessons from History*

<sup>3</sup> Li, Merenda and Venkatachalam, "Business Process Digitalization and New Product Development: An Empirical Study of Small and Medium-Sized Manufacturers," 49-64

<sup>4</sup> Li, Merenda and Venkatachalam, "Business Process Digitalization and New Product Development: An Empirical Study of Small and Medium-Sized Manufacturers," , 49-64

<sup>5</sup> Lemieux, *One Step Forward, Two Steps Backward? does E-Government make Governments in Developing Countries More Transparent and Accountable?*

<sup>6</sup> Lemieux, *One Step Forward, Two Steps Backward? does E-Government make Governments in Developing Countries More Transparent and Accountable?* Li, Merenda and Venkatachalam, "Business Process Digitalization and New Product Development: An Empirical Study of Small and Medium-Sized Manufacturers," , 49-64

Bukht R. and Heeks R. examined a definition of the digital economy and a size prediction in their work. They contend that the "digital sector," or the IT/ICT industry that creates fundamental digital goods and services, is the engine of the digital economy. The actual "digital economy," which is "that portion of economic production obtained exclusively or mostly from digital technology with a business model centered on digital goods or services," is made up of the digital sector in addition to emerging digital and platform services. The most inclusive definition of "digitalized economy" is the application of ICTs across all economic sectors. The study reviews measurement issues and calculates that the digital economy, as described here, accounts for around 5% of the world GDP and 3% of global employment. The authors concluded that the potential growth may be considerably more significant and advised more studies to understand better the challenges and effects of the digital economy in developing nations.

Thus, this research contributes to the understanding of the correlation between business, digital adoption, and economic development, hence will make a significant contribution to the existing literature on the influence of technology on the business sector, a number of new businesses occurring, and consistency at which statistical evidence supports the idea around the impact of digital adoption and development on the number of new enterprises.

### **3. Methodology**

I will conduct quantitative research based on open source data to answer the main research question. International organizations such as World Bank (WB) and United Nations (UN) have extensive databases on countries' performances in different sectors. My primary dependent variable is the new business rate across countries. The WB developed the index. The number of newly registered corporations per 1,000 individuals who are of working age (those between the ages of 15 and 64) is known as the new business density. Private, legally recognized businesses with limited liability serve as the units of measurement. The information may be used to study regional and socioeconomic patterns in new business formation. The primary control variable will be the Digital Adoption Index (DAI) created by the WB in 2016. The WB made the DAI a composite index to quantify the depth and breadth of digital technology adoption across every region and income level in 171 countries. It is based on three sectoral sub-indices that account for firms, individuals, and governments, with equal weights for each sub-index. (see Table 1).

$$\text{DAI (Economy)} = \text{DAI (Businesses)} + \text{DAI (People)} + \text{DAI (Governments)}$$

**DAI (Business):** The Business cluster is the simple average of four normalized indicators: the percentage of businesses with websites, the number of secure servers, download speed, and 3G coverage in the country.

**DAI (People):** The People cluster is the simple average of two normalized indicators from the Gallup World Poll: mobile and internet access at home.

**DAI (Governments):** The Government cluster is the simple average of three sub-indices: core administrative systems, online public services, and digital identification. The UN's Online Service Index provides data for online public services. Data for core administrative systems and the World Bank collected digital title.

**Table 1. Business cluster, with weights by component**

Component	Weight	Source
Business websites	1/4	WBG Enterprise Surveys
Secure servers	1/4	Netcraft
Download speed	1/4	Ookla NetIndex
3G coverage	1/4	GSMA

**Table 2. Citizens cluster, with weights by component**

Component	Weight	Source
Mobile-cellular access at home	1/3	Gallup World Poll
Internet access at home	1/3	Gallup World Poll
Cost of internet access	1/3	TBC (this is to be added)

**Table 3. Government cluster, with weights by component**

Sub-index	Component	Indicator	Weight	Source
Core administrative systems	Financial Management Information System	Budget execution	1/20	WBG
		Budget formulation	1/20	
		Treasury Single Account	1/20	
		Source of financial data	1/20	
	Human Resources Information System	HRMIS functionality	1/10	
		e-payroll functionality	1/10	
	e-tax	Tax management functionality	1/10	
		e-filing functionality	1/10	
		e-customs	e-customs functionality	
	e-procurement	e-procurement functionality	1/5	
Digital identification	Access to services	Range of services	1/2	WBG
	Digital signature	Signature functionality	1/4	
	Card features	Card type	1/8	
			Biometric functionality	
Online public services		Online Service Index	1	UNDESA

DAI was developed to be used to improve policymaking in the ICT space.<sup>7</sup> an easy application is to compare the level of digital adoption across countries and the critical agents of each national economy. For example, in many African countries, people are doing reasonably well in accessing digital

technologies, but business adoption seems unusually low. “In the WDR 2016, DAI was juxtaposed with demand-side indicators—level of skills of the labor force, degree of competition in the business sector, and quality of accountability in governments—to identify appropriate digital and ‘analog’ policies that can help to accelerate the digital transformation of the developing world” (WBG, WDR 2016).

The table 1. explicitly describes each composite of the indexes and their weight in calculating indexes of each country. Since technological development is closely associated with education, the research will include the average years of education as an additional control variable. The variable will divide countries into two categories: countries with high average years of schooling and countries with low average years of education.

It was decided to include the Freedom of the Expression index developed by the V-Dem to see the correlation between the rate of new businesses and how free people feel. The Freedom of expression is calculated on a scale from 0 to 1 and includes countries worldwide.

Another control variable of this research project is “time spent to open new businesses.” This variable was included to test whether the ease of business opening is correlated with the number of new businesses in a country. The unit of account is given in days.

The World Bank data on DAI was collected only for 2014 and 2016; therefore, it was decided to collect all the data for 2016 and conduct analyses based on that year.

The following regression model is proposed for this research project based on the above variables.

$$\text{Regression: } Y = \alpha + \beta_1 X + \beta_2 Z + \beta_3 \delta + \beta_4 \eta + e$$

Y - New Business Rate

X - DAI Business

Z - Log Adult Pop.

$\delta$  - Years of Schooling

$\theta$  - Freedom of Expression

#### 4. Analysis

Interpret your empirical results about the question you initially posed. Explain the magnitudes of the critical coefficient estimates and the implications.

	DAI Business Ranking	New Business Rate	Adult population	Years of schooling	Freedom of expression	Trade share of GDP	Time to start new business in days
Number of observations	104	104	104	104	104	104	104
Mean	.6078643	3.498741	2.59e+07	8.963462	.7338173	85.67795	18.05
Min	.1300374	.0549812	220678	1.9	.061	20.72252	.5
Max	.9739523	20.09059	8.78e+08	14.1	.986	348.4374	99
SD	.2093173	4.763784	8.87e+07	3.269157	.2474016	51.02986	18.06272

Table 1 Statistic of variables

As we can see from the table all of the variable have a number of observation of 104. Which means that they are all applicable to 104 countries. DAI business is a value between 0 and 1, where 1 means the highest score for digital adoption in the business sector.

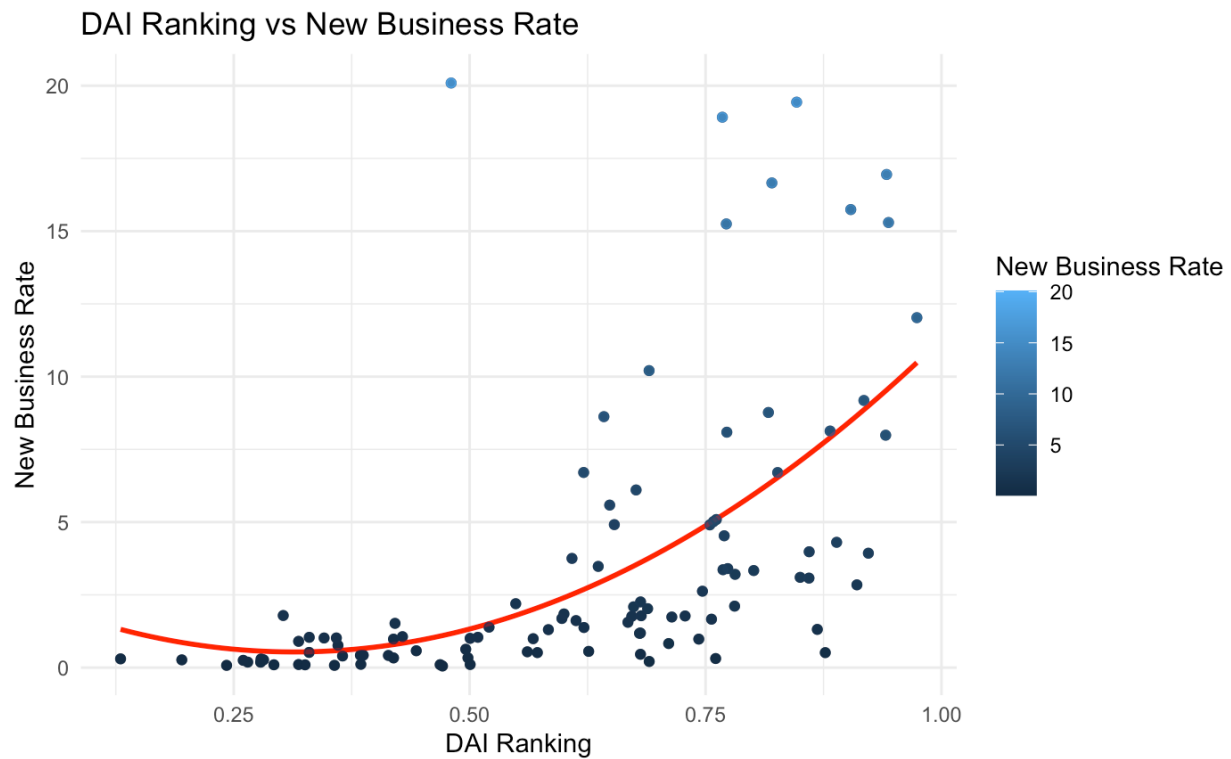


Figure 1. DAI ranking and New Business Rate.

Adult population is quite dispersed in value, ranging from 220 thousand to 80 million; since these are great values it will be log-transformed to conduct analysis.

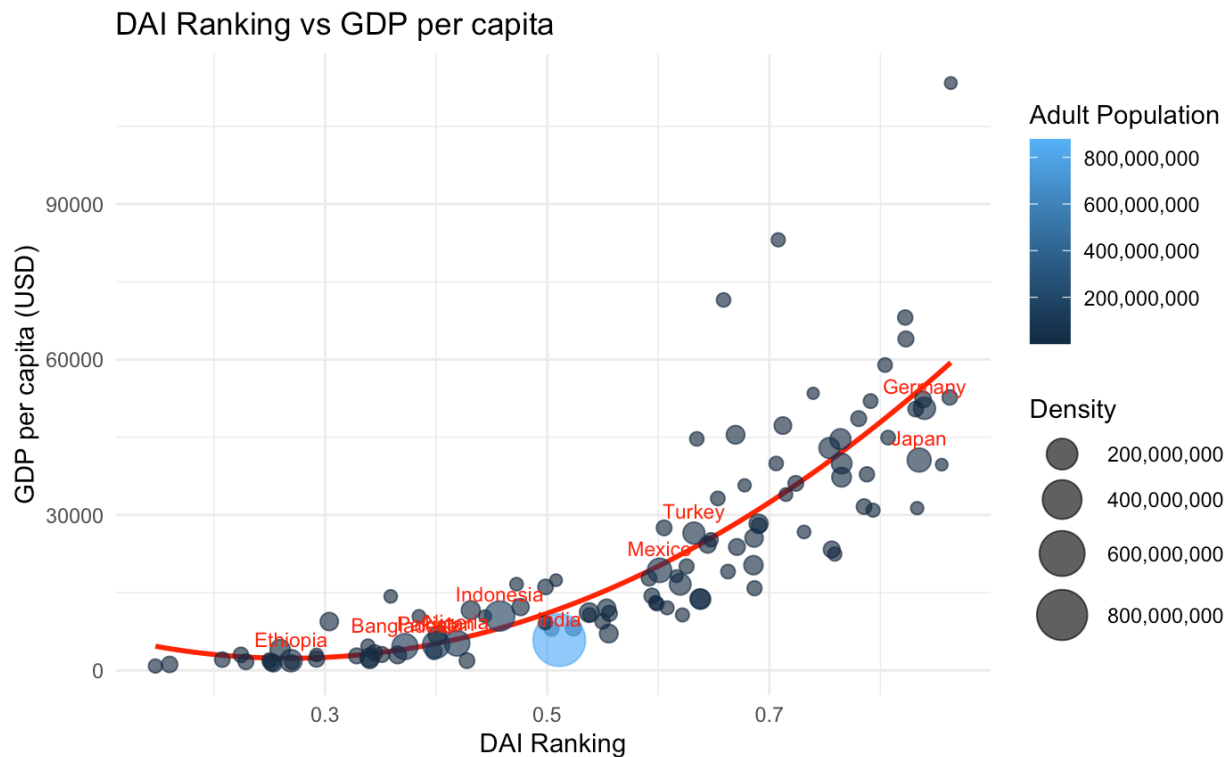


Figure2. Adult Population, GDP per capita and DAI Ranking Correlations

Years of schooling is the average years of education in each country. According to the United Nations data, the average years of education in the world is 8.7 years.<sup>8</sup> As a result, the dummy variable will be built using this value. Countries with less years of education will be designated 0, while those with more than eight years will be marked 1.

Additionally, the degree of freedom of speech can range from 0 to 1, with 1 denoting the most freedom and 0 denoting the least. Since the mean of this variable is 0.73, as shown in the table above, a dummy variable will also be produced using this value. Higher indication nations will be referred to as 1, and lower indicator countries as 0.

Figure 2 Freedom of Expression Heat Map

<sup>8</sup> <https://www.worlddeconomics.com/Indicator-Data/ESG/Social/Mean-Years-of-Schooling/>



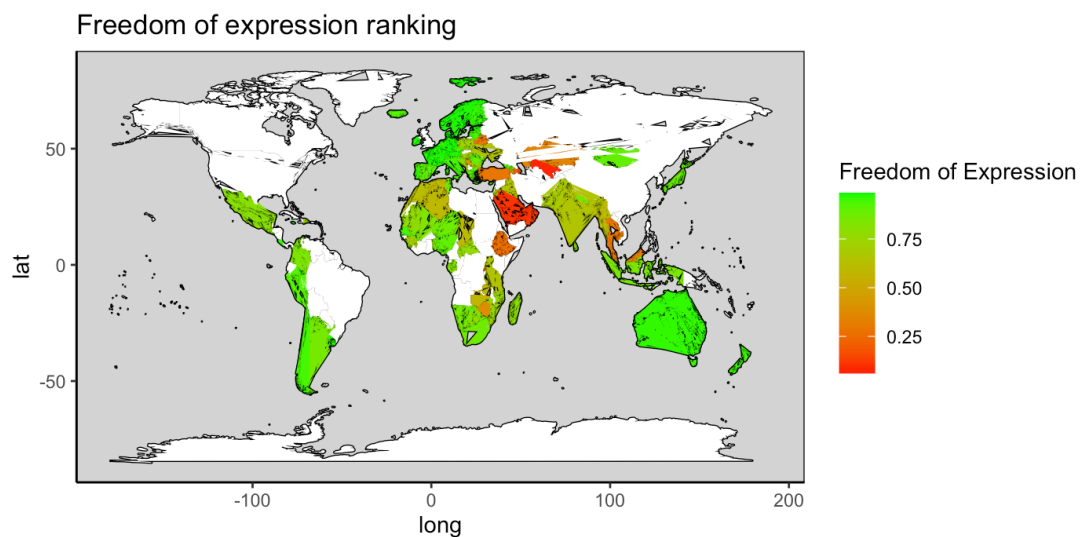


Figure 3. Heatmap of Freedom of Expression on 104 countries.

The trade share of GDP is a percentage and is not restricted to values between 0 and 1. Some

VARIABLES	(1) New businesses rate	(2) New businesses rate	(3) New businesses rate	(4) New businesses rate	(5) New businesses rate
DAI Business	3.608*** (0.793)	2.188** (1.051)	2.126** (1.039)	2.059* (1.043)	2.016* (1.054)
Log Adult Pop.	-1.145*** (0.268)	-1.097*** (0.265)	-1.040*** (0.263)	-1.017*** (0.265)	-0.968*** (0.298)
Years of Schooling		2.237** (1.108)	2.325** (1.096)	2.198** (1.107)	2.169* (1.115)
Freedom of Expression			1.894* (1.019)	1.994* (1.027)	2.063* (1.048)
Time to open new business (low)				0.707 (0.821)	0.742 (0.830)
High GDP trade share					0.332 (0.895)
Constant	19.75*** (4.324)	18.26*** (4.323)	15.77*** (4.477)	15.17*** (4.536)	14.21*** (5.243)
Observations	104	104	104	104	104
R-squared	0.306	0.333	0.356	0.360	0.361

Figure 4. Regressions Table

nations' commerce as a percentage of GDP is relatively high.

We will however produce a dummy variable based on the median value of the GDP trade %.

Days are used as the unit of measurement for the variable "Time necessary to start a new business." The dummy variable was created using the average number of days for 104 different nations to launch a new firm.

The regression analysis results revealed that the Digital Adoption Index is statistically significant in all five models. In the first model, where only two independent variables were included, the DAI is statistically significant at a 1% level, with a coefficient estimate of 3.6. This implies that keeping all other variables constant, a high DAI (over the average) is associated with 3.6 more businesses per 1000 adult people.

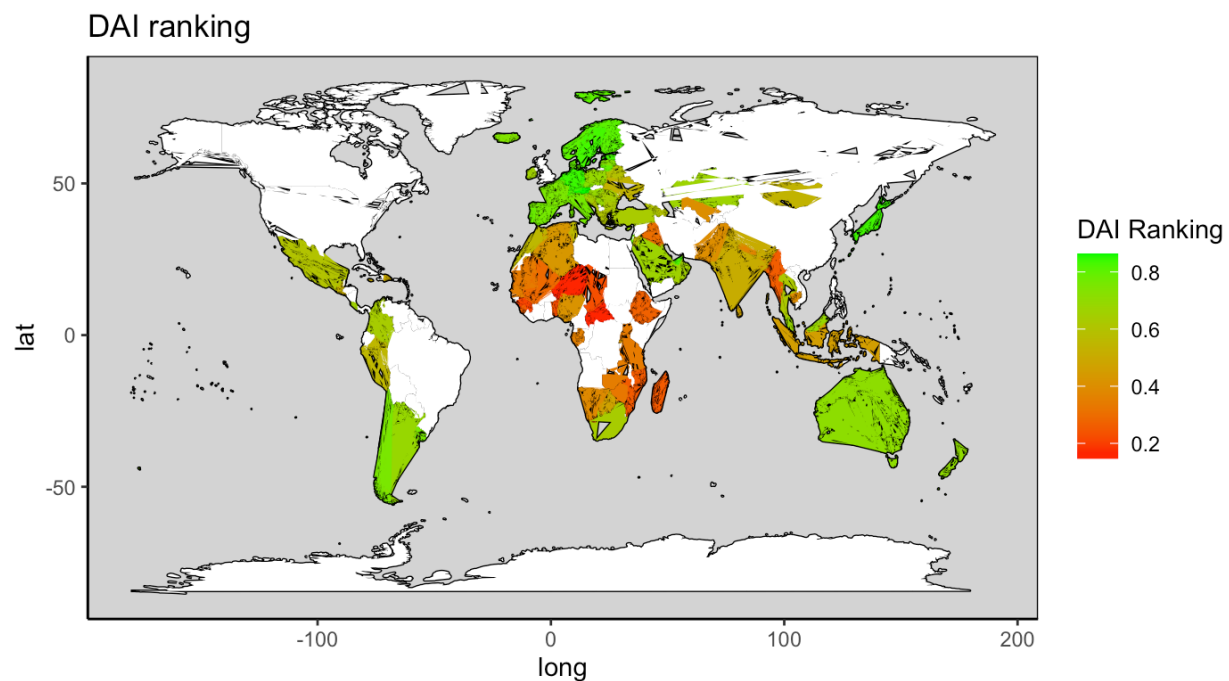


Figure 5. Heatmap of DAI ranking on 104 countries.

Years of education and freedom of speech were incorporated as additional control variables in the second and third models. However, they remained constant throughout the fourth and fifth models and were both statistically significant at 5 and 10% confidence levels, respectively. It was decided to incorporate them into the first regression as a result.

Two further control variables—GDP share of trade and time to create new businesses—were also included to evaluate the consistency of the statistical significance of the DAI, years of schooling, freedom of speech, and adult population. These factors, however, lacked statistical significance. They did, however, lessen the other factors' statistical significance.

**The regression will be as follows:**

$$Y = 15.77 + 2.12X - 1.04Z + 2.32 \delta + 1.89 \eta$$

Y - New Business Rate

X - DAI Business

Z - Log Adult Pop.

$\delta$  - Years of Schooling

$\theta$  - Freedom of Expression

## **5. Discussion and implications**

To assess the consistency of the statistical significance of the DAI, years of schooling, freedom of expression, and adult population, two additional control variables were included: "GDP share of trade" and "time to develop new firms." These variables, however, were not statistically significant. They did, however, reduce the statistical importance of the other components.

The primary policy conclusion of this research is that governments must put more effort into commercial sector digitalization and offer a suitable regulatory framework to allow enterprises to adopt new technologies. Trade will grow, as will the countries' economic potential.

Future studies should pay more attention to how freedom of expression affects digitalization, the growth of new industries, and the economy.

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