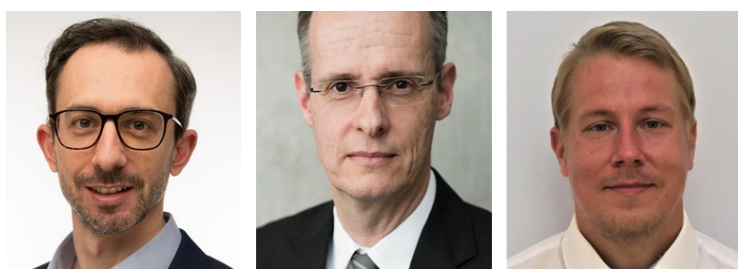


Nothing spreads like technology: Digitalisation and its Interaction with Institutions and Governance*



By Claudio Baccianti, Vincent Labhard, and Jonne Lehtimäki

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JEL codes: E02, O11, O31, O33, O57

"It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change." — Charles Darwin

The increase in digital technologies, goods, and services, commonly referred to as digitalisation, is one of the most important transformations in the history of humankind, affecting economies worldwide. This process of technology diffusion has profound effects and policy implications, but how widely and how intensively those technologies are used appears to depend on factors that are determined at the country level. The results of our analysis indicate that a higher quality of institutions is usually associated with both a greater speed of diffusion and a greater spread of digital technologies. The results also suggest that there are large, policy-relevant differences in the diffusion process depending on the level of development as well as the state of technological change of a country.

*Based on: Baccianti, C., Labhard, V. and Lehtimäki, J. (2022). Digitalisation, Institutions and Governance, and Diffusion: Mechanisms and Evidence. [ECB Working Paper series, 2675](https://www.ecb.europa.eu/press/pr/workingpapers/2022/2675/index.en.html).

Introduction

Since the middle of the 20th century, digital technologies have been spreading into almost every aspect of economic activity, transforming production and consumption patterns. Robots and automation have changed how products are being made, and the internet of things electronically connects appliances. Computers and mobile phones have changed what people consume and how they communicate, and the internet serves as a source of information, a medium of exchange, and as an enabler for many types of transactions. Digital technologies have facilitated processing, storage and exchange of data, and have led to considerable savings in costs, as described in Goldfarb and Tucker (2019).

The increase in digital technologies – referred to in our paper as digitalisation - is an on-going process, affecting economies worldwide through microeconomic allocation (relative prices and preferences as well as the functioning of markets) and macroeconomic outcomes (trends and cycles). The literature has been focussing on the effects digitalisation has on productivity (how much output is produced with one unit of input) and the labour market (including employment and unemployment, for example as a consequence of automation and the introduction of robots). As Milkau and Bott (2015) note: “Digitalisation has not been changing the fundamental laws of economics but has triggered changes in how agents interact in the market or see intermediaries facilitating this interaction.”

An important aspect of digitalisation relates to the dynamics with which new digital technologies are adopted and the role that might be played in that process by a country’s institutions and governance. In our recent work (Baccianti, Labhard and Lehtimäki, 2022), we suggest that the diffusion of digital technologies may be faster and advance further when institutions and governance are of high quality, and this depends only to some extent on how digitalisation, institutions and governance are measured. The basis for this conclusion is an analysis for several country groupings from a set of data for 101 countries for the period 1996-2019.

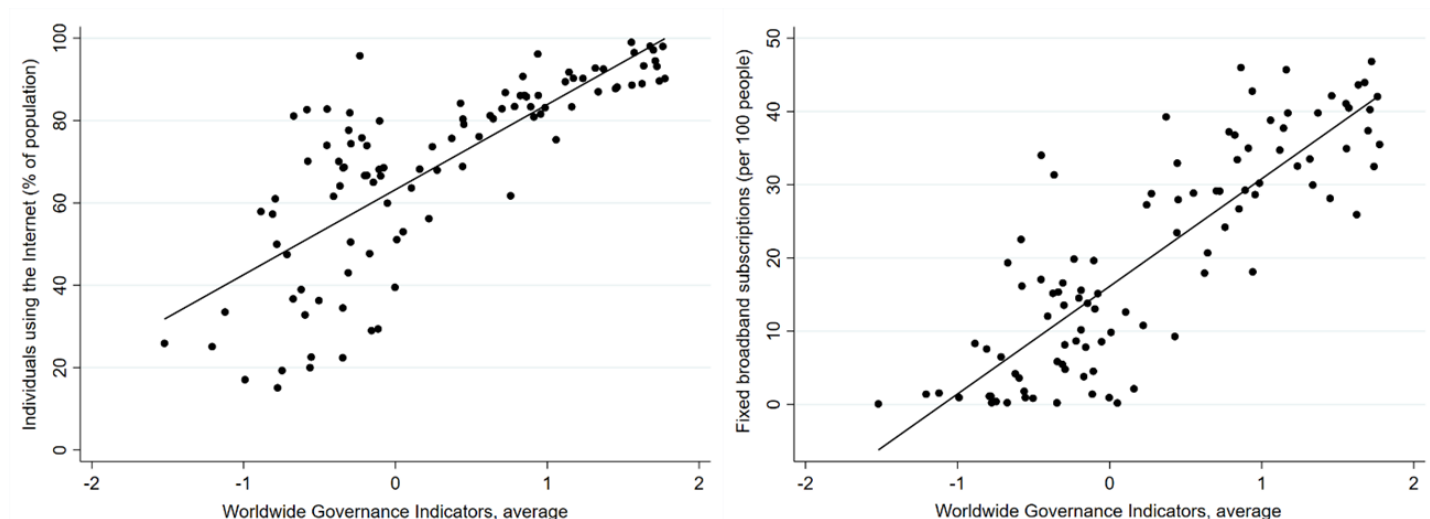
The finding that the diffusion of digital technologies may be faster and go further when institutions and governance are of higher quality is quite robust. This is because the analysis controls for other key factors other than institutions and governance that may play a role in the diffusion of digital technology, such as the level of development of the economy, and how much human capital (brains and ideas) it has.

Role of Institutional Frameworks in the Diffusion process

In our work, institutions are defined as the entities or bodies that are part of the public sector and perform public functions, as for example any public authority, such as the courts and ministries. Institutions can also originate outside the public sector, as for example trade unions. Governance is defined as the set of processes determining how the entities or bodies are run, how well they perform their functions and therefore serve households and firms.

Why are institutions and governance important in the diffusion process of digitalisation? The reason is that they interact, and the rate and level of diffusion depend on this interaction. For example, producers and consumers use the internet as a source of information but, how widely and how intensively, is likely to depend on institutions and governance, as suggested by the empirical evidence in Figure 1. The quality of institutions and governance affect how easy or how hard it is to access digital technologies, for example the internet, mobile phones, or robots.

Figure 1: Relationship between digital technologies and institutions for 101 countries around the world in 2019.
Left: Individuals using the internet (% of population), right: Fixed broadband subscriptions (per 100 people).



Diffusion of Digital Technologies

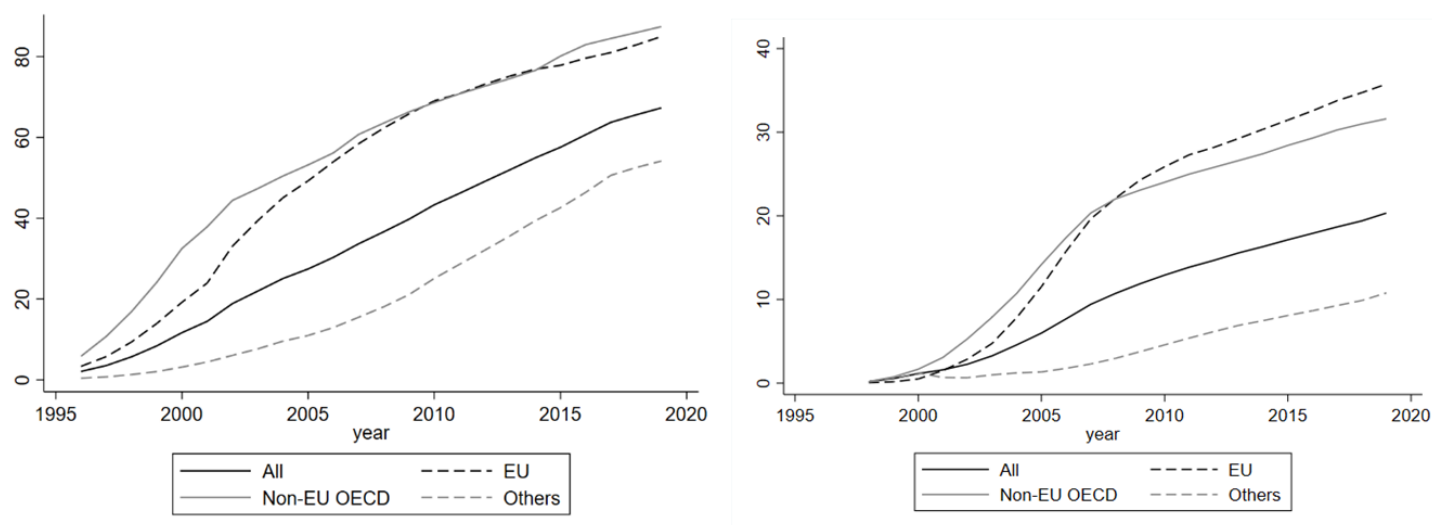
Technology can take time to diffuse to widespread use, and the heterogeneity of agents may be one of the key reasons for that, as pointed out for example by Young (2010). This applies also to digital technologies - not all agents are equally exposed to digital technology (for example due to different educational or professional backgrounds) and not all agents feel the same pressure or face the same learning curve (depending on socio-economic characteristics). Also, the social context and personal preferences are not the same across all agents and the reference above notes contagion, social influence, and social learning as sources of heterogeneity and the resulting diffusion patterns. It could be argued that because digital technologies are particular in nature, the diffusion process may simultaneously be different from other technologies as well as be more important for development.

To assess the process of diffusion, we use the contagion model, in other contexts sometimes called the 'epidemic' model of diffusion. As the name suggests, the other contexts are in the medical sciences, specifically epidemiology where it is used to predict contagion, endemics and pandemics given certain parameters (such as infection and recovery rates). It is the model most often used in the analysis of technology diffusion in economics.¹ The model is based on the logic that exposure or contact to technology is going to entail adoption of technology, with the speed of the process and its final point depending on past exposure and several other factors.

The diffusion of digital technology for different country groups is illustrated in Figure 2. The speed of adoption picks up in the early stages of adoption and in the later stages falls back as the adoption rate approaches the long-term saturation level. A key factor in the diffusion process is the exposure to the technology, which is initially limited, and then increases, up to the point where exposure has no further effects as the technology has already been adopted by most of the agents who are not "immune" to it. The pattern of diffusion depicted in Figure 2 is also consistent with network effects - the fact that the benefits of a technology are higher with a greater spread of that technology. These network effects do not have any obvious analogy in the other contexts in which the model is being used. However, they are important in the context of technology diffusion and support the logic of an S-shaped (non-linear) adoption process over time.

¹ For example Geroski (2002).

Figure 2: Digital Technology adoption. Left: Individuals using the internet (% of population), right: Fixed broadband subscriptions (per 100 people). All = 101 countries around the world.



Results and Discussion

The empirical evidence in our work comes from a large cross-section of 101 countries from all around the world. The large dataset allows us to make the assessment more robust and identify potential differences across different sets of countries. Such differences could emerge, for example, for countries at different stages of development if institutions and governance are intrinsically linked to advancement.

The results point to a fundamental difference in how institutions and governance affect the introduction of technologies at a country level. Advanced institutions can positively affect the speed at which basic means of access to digital technologies are adopted, but in some cases high levels of governance might potentially slow down the process of adopting digital technology. This implies that policymakers could potentially reap higher benefits from the process of digitalisation by adjusting institutions and governance to better suit the introduction of new technologies.

The process of digitalisation tends to be faster when the quality of institutions and governance is high, and even faster by virtue of the interaction between the level of digitalisation and the quality of institutions and governance. This is a result which would lend support to calls for institutions and governance to be designed and managed in line with best international practices, at least when it comes to questions of introducing and adopting new technology. ■

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