DOI:10.17951/h.2023.57.3.221-239

ANNALES
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN – POLONIA

VOL. LVII, 3 SECTIO H 2023

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Financial Innovations in International Corporations. A Global Perspective

Keywords: financial innovations; international corporations; digital technology

JEL: G15; G2; G23

How to quote this paper: Różański, J., & Voytovych, N. (2023). Financial Innovations in International Corporations. A Global Perspective. *Annales Universitatis Mariae Curie-Skłodowska, sectio H – Oeconomia*, *57*(3), 221–239.

Abstract

Theoretical background: Modernized technology and digital transformation in the economy has changed business paradigms and innovation. The prevalence of contemporary digital financial innovation makes it easier for businesses to grow. New services, processes, or business models made feasible by digital technologies are increasingly referred to as financial innovation. For many firms, the use of information technology (IT) systems and the associated software has progressed from being merely supportive to becoming a cornerstone of daily operations. Big shifts in society's thinking accompany great innovations.

The issues of financial innovations are examined in this research. We assume that financial breakthroughs will lead to a more effective use of resources, which will result in higher levels of capital productivity and economic expansion. This effect has been produced by numerous financial innovations.
Purpose of the article: The main research objective of the study is to examine the effects of financial innovation on development of international corporations in connection with their national environments.
Research methods: The analysis of the accounts of selected companies (case studies) was one of the research methods. We are focused on financial innovations in big Internet companies. There were conducted the macroeconomic comparison of the evolution of financial innovations over time (2010–2021) as well as correlation and regression analysis. The expenditure of financial innovation was used to gauge financial performance. In addition, cases and examples of financial innovations made by a small number of carefully chosen significant worldwide firms while taking into account the particulars of their operations were presented. We analyzed the application of several examples for our study.
Main findings: The results indicate a more nuanced continuum of practices, from unstructured methods through informal to formal decisions. Our findings demonstrate that financial innovations significantly and favourably affect the financial development of international corporations such as Alibaba Group, Amazon, Alphabet, Apple, Meta, Microsoft and Samsung.

Introduction

Modern economy forces innovative activities of entities operating in it. Among many organizations for which innovation is a prerequisite for development, and sometimes also for survival, innovation in enterprises is very important, the correct and modern operation of which is the basis for the success of the economy of each country.

Innovations cover various spheres of the company's activity (from technology, through processes, organization and marketing to financial innovations). However, while financial innovations in banks and the insurance sector are quite well described, financial innovations in enterprises, especially those operating on an international scale, are not an issue that enjoys sufficient attention in the literature on the subject.

The economy has undergone a digital transition that has altered business models and innovation. Modern digital financial innovation is becoming more prevalent, which makes it simpler for businesses to expand. Financial innovation increasingly refers to new services, procedures, or business models made possible by digital technologies. Information technology (IT) systems and the related software have evolved from serving as a purely supporting function to becoming a fundamental tenet of business operations for many organizations. Because digital networks and data services typically allow economies of scale, enabling the provision of higher-quality services at a reduced cost, digitalization presents significant new potential in this regard.

Therefore, the authors concluded that conducting research on financial innovations, which are implemented thanks to advanced digital technologies in international corporations, may constitute a certain supplement to the previous considerations on this subject in Poland and abroad. Examining the various effects of financial innovation on the development while taking into account the top global firms is the study's primary research goal.

Literature review

Financial innovation

The concept of financial innovation is interpreted ambiguously. In the literature, a narrow and broad understanding of financial innovation is distinguished. A narrow approach defines financial innovation as new solutions in the field of financial instruments. A broad approach to financial innovation emphasizes new solutions in every element of the financial system (Stachera-Włodarczyk, 2015). Financial innovations are often treated as necessary activities enabling a given enterprise to adapt to changing conditions in the environment or enabling further development of the entity.

Financial innovation is defined also in broad terms as "the act of creating and then popularising new financial instruments as well as new financial technologies, institutions and markets" (Tufano, 2003). Tufano argues that innovations can be categorised into process and product innovations, where new financial instruments denote product innovations, while process innovations are epitomised by innovative methods of distributing the financial products, dispensing transactions or pricing them. The same author (2003) observes that although innovation fluctuates, with some periods exhibiting high levels of innovation and others low, in the long run financial innovation is a distinct part of a growing economy.

Financial innovation is an area of economics that has attracted significant research interest in academia as well as in corporate circles (Lerner, 2006; Lopez & Roberts, 2002). For instance, Laeven and colleagues argue that new financial arrangements have historically emerged following the successful introduction of technological innovations (Laeven et al., 2015). The financial arrangements include new financial instruments, the emergence of new financial institutions, or application of new reporting techniques (Laeven et al., 2015). These assertions are consistent with Frame and White's work, which observes that technological developments have significantly changed commercial business in the last 30 years (Frame & White, 2014). Financial innovation involves the creation of new financial products, enhanced processes and well-organized systems within "the financial system to meet the emerging needs of stakeholders" (Tufano, 2003). It involves finding new mechanisms to deliver financial services that address the ever-changing socio-economic and cultural needs of the populace.

The majority of research on financial innovation has focused on financial products in industrialized nations; in contrast, process innovation research appears to have received less attention, particularly in developing nations (Chipeta & Muthinja, 2018). The focus of this study is on the advances in a method employed to supply financial innovations. Financial innovation's ability to deliver financial goods should boost business performance.

In recent times, there has been a significant increase in the number of alternative channels available for the delivery of financial services; traditional delivery methods have given way to new delivery technologies that include e-banking products such as

Internet banking, mobile banking and various automated teller machine (ATM) products (Domeher et al., 2022). Financial innovations give firms a competitive advantage that is central to their survival. Indeed, Damanpour and others (2009) confirm that innovation affects a firm's performance positively. With the combination of the risk and transaction cost reduction benefits, financial innovations promote broader financial development that spirals into economic growth through its positive impact on saving, investment, and output.

After analyzing the research of various authors, we came to the conclusion that the process of developing new financial instruments, investment products, services, or processes is financial innovation that company needs to grow. Modernized technology, risk management, risk transfer, transfer financial innovation between coutries, the creation of credit and equity, as well as several other advances, can all be part of these changes.

Categories of financial innovation

There are 3 categories of financial innovation: institutional, product, and process. Institutional innovations relate to the creation of new types of financial firms such as specialist credit card firms like Capital One, electronic trading platforms such as Charles Schwab Corporation, and direct banks. Product innovation relates to new products such as derivatives, securitization, and foreign currency mortgages. Process innovations relate to new ways of doing financial business, including online banking and telephone banking (Kara & Molyneux, 2017).

For example, the emergence of new payment systems, which mainly use mobile phones to transfer funds electronically (electronic money), has significantly altered banking services in Europe. The focus on Poland is motivated by several factors. Firstly, mobile payments in Poland have overtaken all electronic card payments combined, in terms of the number of customers and the overall value of the payment transactions. In addition, mobile payment platforms are being employed in every aspect of human life. These aspects include utilising mobile phones to transfer money in deposit accounts held with commercial banks, withdrawing cash from bank accounts, payment of insurance premiums, payment of utility bills, air ticketing, retail outlets, and many more. The many uses of mobile financial innovations underline the importance of research in the field.

Poland is a modern payments market. It recently became completely contactless, thanks to increased mobile payment penetration driven by banks on Apple Pay and Google Pay, as well as corporations embedding payments into their retail customer applications (*Poland payments market…*, 2022). Real-time payments in the form of BLIK are driving growth in non-card payments in e-commerce while also simplifying payments across all channels. Over the last few years, the Polish payments market has seen increased innovation in both issuance and acceptance.

Poland can be said to be 100% contactless in issuance and acceptance with the majority of transactions, not only low value transactions. Cashless transactions represented over 50% of the total volume in 2020 (Diemko, 2021). The govern-

ment-sponsored Cashless Poland Program, which subsidises costs of POS hardware and merchant service charges for new merchants, has pushed the number of POS terminals to over 1 million – of which nearly 385,000 were subsidised (Diemko, 2021).

Multi-directional impact of financial innovations

Financial innovation can have multidirectional impacts.

"They include tasks in the field of:

1) making payments – facilitating the transfer of capital, increasing liquidity and reducing transaction costs (e.g. payment cards, automatic transaction systems),

2) investing – increasing the variety and availability of investment opportunities (e.g. hedged financing, structured products),

3) financing – facilitating access to financing sources and reducing the cost of capital (e.g. hybrid instruments, private equity finance),

4) valuation – streamlining the process of valuation of financial instruments and estimation of financial risk (e.g. complex models of valuation of instruments, credit scoring),

5) risk transfer – innovations facilitating the risk management process (e.g. derivatives, structured instruments)" (Błach, 2012).

Introducing financial innovations involves certain costs. Therefore, it is necessary to conduct an efficiency account, where on the one hand, there will be the necessary costs related to the introduction of innovations, and on the other – hypothetical effects accompanying the application of specific financial investments. Such an account should be a multi-year account, where it would be important to set a time horizon that would allow the enterprise to consume the effects of the introduced financial innovations.

Błach (2012), on this occasion, draws attention to the possibility of harmful financial innovations, i.e. those that are beneficial for the enterprise that introduces them, but much less beneficial for other participants in the financial system. In this situation, it is possible to recall the postulate related to the principles of sustainable development, i.e. such a development of the company that not only in the financial sphere, but also in other spheres of the company's operation, would not collide with the ideas of the broadly understood environment of the company.

Research methods

The description of the research methods

A comparative analysis of the development of financial innovations over time (2010–2021) on a macro scale and presentation of financial innovations of a few selected large international corporations, taking into account the specificity of their operations, were provided.

Particular attention was paid to the financial performance which was measured by expenditure incurred for financial innovation by leading Internet purpose companies from the world. For this study the 7 world's largest international corporations cases operating were used. Data was drawn from a period of ten (11) years, i.e. 2010–2021. The secondary data was obtained from published information. The data was analyzed using descriptive statistics.

The choice of the corporation was not accidental. Selected corporations are world leaders in implementing financial innovations, world-renowned corporations. We will analyze the countries from which famous multinational corporations come. For this purpose, we will conduct correlation and regression analysis.

The description of the material selection

The research is a case study in order to develop target research on a larger scale based on a few selected global corporations, i.e. using the case study method. Therefore, it has been limited to a few major global corporations that use financial innovations.

Research questions

Do financial innovations have a positive effect on the development of the country and, in particular, of large international corporations?

How have expenses in the sphere research and development affected the use of financial innovations?

The purpose of research

The main research objective of the study is to examine the effects of financial innovation on development of selected international corporations in connection with their national environments. The use of this type of selection made it possible to identify the basic trends in the major global corporations and especially in FinTech based on financial innovations. On the other hand, accepting only a small sample for the research does not allow drawing conclusions of a more general nature. It is difficult to formulate any recommendations for Polish enterprises at this stage of the research. Another limitation is also focusing only on financial innovations of a technical nature.

Results

The main consequences of digital transformation were the emergence of alternative sources of financial innovations. Based on the body of literature that exists on the subject of financial development, we used a set of control indicators, including

research and development, economic growth, trade openness, and foreign direct investment.

According to Nyasha and Odhiambo (2017), there is a strong and positive correlation between financial development and economic growth. Nieminen (2020) claims that financial development expands with trade openness, while Alsmadi and Oudat (2019) state that Bahrain's financial development and foreign direct investment have a beneficial association. According to Aibai et al. (2019), foreign direct investment has a favorable impact on financial development and can advance the growth of the financial sector, particularly financial markets.

In view of these suggestions, the following indicators have been selected in terms of influence on financial innovations:

1. *Research and Development Expenditure* (% of GDP). Total domestic intramural expenditure on R&D during a given period as a percentage of the GDP.

2. *Economic Growth in the Country* – an indicator of GDP growth (annual %). It is estimated without taking into account the deterioration and depletion of natural resources or the depreciation of manufactured assets.

3. *Trade Openness* – an indicator of Trade Value (% of GDP). Exports and imports expressed as a percentage of gross domestic product.

4. *Foreign Direct Investment* – an indicator of Foreign direct investment, net inflows and net outflows (% of GDP). This indicator shows net inflows and outflows in the economy – from foreign investors into the reporting economy and from domestic investors investing abroad is divided by GDP.

Statistical analysis of actual data makes it possible to make sound assumptions about the relationships between these parameters. In order to reveal the variability of such relationships, we will perform a regression analysis, taking research and development expenditure as the objective function, and the other indicators mentioned above as independent variables.

For practical calculations, we will select statistical data for the years 2010–2021 in such countries as the USA, South Korea, and China because these are the countries where the multinational companies under study come from (World Bank, 2022; World Development Report, 2022). The choice of countries is determined by the subject of our research. Note that the last years of the indicated period fall on the period of the COVID-19 pandemic, which can be interpreted as a crisis moment, and, therefore, it should be expected that taking into account or not taking into account the data of the last two or three years can qualitatively change the dependencies. The data for the studies are shown in Table 1.

Table 1. Indicators of affecting financial innovation

Indicator	Country*	Years																	
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021						
Foregn direct investment, net inflows (% of GDP) / Inl	USA	1.75	1.69	1.54	1.71	1.44	2.81	2.54	1.96	1.05	1.47	0.71	1.92	1.72	33%				
	KOR	0.83	0.78	0.74	0.93	0.62	0.28	0.81	1.10	0.71	0.58	0.53	1.22	0.76	33%	1.60	56.2%		
	CHN	4.00	3.71	2.83	3.04	2.56	2.19	1.56	1.35	1.69	1.31	1.72	1.88	2.32	39%				
Foregn direct investment, net outflows (% of GDP) / InO	USA	2.32	2.80	2.32	2.33	2.21	1.66	1.60	2.10	-0.64	0.49	1.29	1.81	1.69	56%				
	KOR	2.47	2.37	2.39	2.07	1.89	1.62	1.99	2.10	2.22	2.13	2.12	3.64	2.25	22%	1.67	48.4%		
	CHN	0.95	0.64	0.76	0.76	1.18	1.58	1.93	1.12	1.03	0.96	1.05	0.72	1.06	35%				
GDP growth (annual %) / GDP	USA	2.71	1.55	2.28	1.84	2.29	2.71	1.67	2.24	2.95	2.29	-2.77	5.95	2.14	90%				
	KOR	6.80	3.69	2.40	3.16	3.20	2.81	2.95	3.16	2.91	2.24	-0.71	4.15	3.06	55%	4.16	70.0%		
	CHN	10.64	9.55	7.86	7.77	7.43	7.04	6.85	6.95	6.75	5.95	2.24	8.11	7.26	28%				
Trade (% of GDP) / Tra	USA	28.22	30.84	30.68	30.00	30.00	27.81	26.59	27.28	27.61	26.45	23.38	25.48	27.86	8%				
	KOR	91.40	105.57	105.46	97.95	90.61	79.13	73.60	77.12	78.99	75.76	69.03	80.49	85.43	15%	51.68	50.5%		
	CHN	50.72	50.74	48.27	46.74	44.91	39.46	36.89	37.63	37.57	35.89	34.75	37.47	41.75	15%				
Research and development expenditure (% of GDP) / RDE	USA	2.73	2.76	2.68	2.71	2.72	2.79	2.85	2.86	2.96	3.18	3.45	3.45	2.93	10%				
	KOR	3.47	3.74	4.03	4.15	4.29	3.98	3.99	4.29	4.52	4.63	4.81	4.82	4.23	10%	3.08	30.8%		
	CHN	1.71	1.78	1.91	2.01	2.03	2.06	2.10	2.12	2.14	2.23	2.40	2.40	2.07	10%				

* USA – United States of America; KOR – South Korea; CHN – China.

Rounding to two decimal places is performed.

Source: (The World Bank, 2022a, 2022b; R&D expenditure – Statistics…, 2022).

We provide a brief description of the data we work with. As can be seen from the data in Table 1, the average inflow of foreign investment is 1.60% with a coefficient of variation of 56%, with the lowest inflow in South Korea (0.76%, cv = 33%), significantly higher in the USA (1.72%, cv = 33%) and the highest in China (2.32%, cv = 39%). Instead, the flow of investments abroad is the highest in Korea (2.25%), followed by the USA (1.69%) and China (1.06%). Thus, in this time period, South Korea shows clear signs of being an exporter.

After normalizing the data,

$$y[n] = (y - y[min]) / (y[max] - y[min])$$

we will illustrate the dynamics of all indicators for each country, in particular graphically (Figures 1, 2, 3).

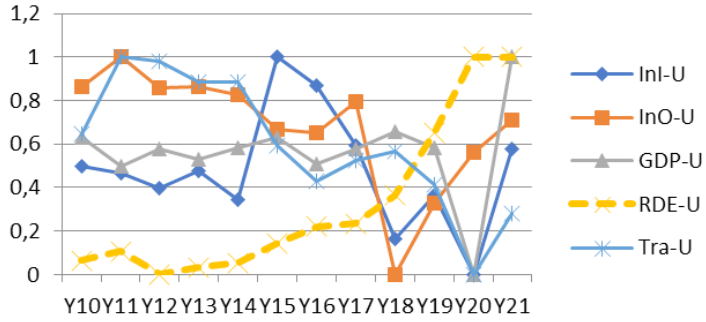


Figure 1. The dynamics of the analyzed USA indicators

Source: Authors' own study.

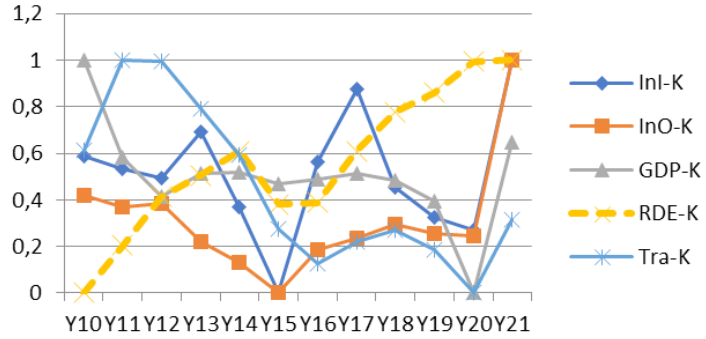


Figure 2. The dynamics of the analyzed South Korea indicators

Source: Authors' own study.

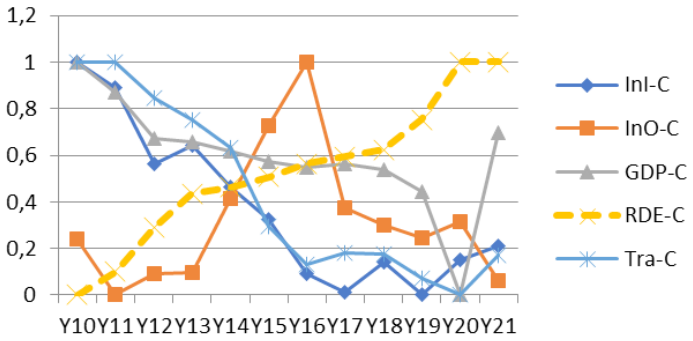


Figure 3. The dynamics of the analyzed China indicators

Source: Authors' own study.

These figures show that:

– the flow of foreign investments reached a minimum in the USA in 2018, in South Korea – in 2015, and in China – in 2011, but in the latter it approached the minimum value even in 2021,

– in the surveyed countries, the majority of indicators "decreased" in 2010–2020 (probably manifestations of the economic crisis); in 2019–2020 – the beginning of the pandemic COVID-19, but already in 2021, we will see a recovery,

– research and development expenditure are the only parameter that shows a convincing growth in all three cases, although the nature of the growth is different in particular countries.

The conducted correlation analysis shows that, with the exception of China, only Research and Development Expenditure has a negative correlation (in the case of the USA – with all other parameters, in the case of South Korea – with GDP and Trade). In China, we observe an almost complete correlation (ρ = 0.954) between Foreign Direct Investment inflows and Trade, as well as a rather high negative correlation of Research and Development Expenditure with Foreign Direct Investment inflows (= -0.828), GDP (ρ = -0.770), and Trade (ρ = -0.890) (see Figure 4).

InI-U	1.000	0.336	0.445	-0.359	0.150
InO-U	0.336	1.000	0.005	-0.430	0.486
GDP-U	0.445	0.005	1.000	-0.097	0.242
RDE-U	-0.359	-0.430	-0.097	1.000	-0.863
Tra-U	0.150	0.486	0.242	-0.863	1.000

USA

1.000	0.700	0.416	0.086	0.146
0.700	1.000	0.327	0.281	0.106
0.416	0.327	1.000	-0.628	0.397
0.086	0.281	-0.628	1.000	-0.583
0.146	0.106	0.397	-0.583	1.000

South Korea

1.000	-0.433	0.712	-0.828	0.954
-0.433	1.000	-0.264	0.128	-0.451
0.712	-0.264	1.000	-0.770	0.760
-0.828	0.128	-0.770	1.000	-0.890
0.954	-0.451	0.760	-0.890	1.000

China

Negative values of Pearson's ρ linear correlation coefficient are marked with color.

Figure 4. Correlation analysis

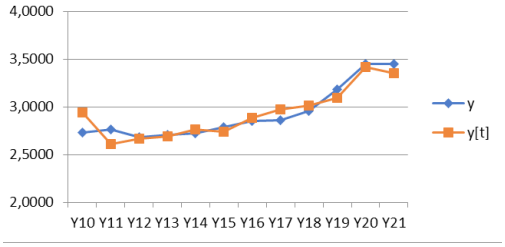
Source: Authors' own study.

And then we will apply the method of regression analysis to study statistically significant relationships between these parameters.

Applying the method of least squares to the data in Table 1 for the years 2010–2021, we obtain the following multifactor linear regression equations, graphs that make it possible to compare the real data *y* and the theoretical forecast *y[t]*, and the values of the coefficients of determination R^2, which describe how well the obtained dependence explains the variance of the analyzed data (Figure 5).

USA:

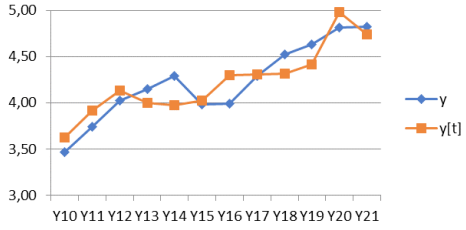
RDE = 6.425 – 0.204 InI + 0.053 InO + 0.047 GDP – 0.120 Tra



$R^2 = 0.875$

South Korea:

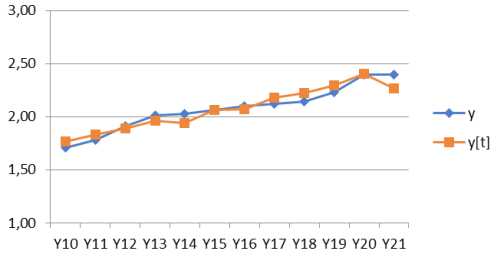
RDE = 4.814 + 0.137 InI + 0.406 InO – 0.166 GDP – 0.013 Tra



$R^2 = 0.785$

China:

RDE = 3.904 + 0.046 InI – 0.186 InO – 0.016 GDP – 0.039 Tra



$R^2 = 0.900$

Figure 5. Multifactor linear regression equations

Source: Authors' own study.

Despite the general similarity of the obtained regression ratios, it should be noted that in all three countries a different distribution of the signs of the coefficients of the constructed regression ratio was obtained: in the case of China, we have a positive coefficient in the expression for Research and Development Expenditure only at Foreign Direct Investment inflows, in the case of Korea – at Foreign Direct Investment inflows and Foreign Direct Investment outflows, and in the case of the USA – at Foreign Direct Investment outflows and GDP. To answer our research questions, we move on to the analysis of international corporations. We report the main research questions results in Table 2 and Figure 6.

Table 2. Analysis of expenditure incurred and effects for financial innovation by international corporations

International Corporation	R&D Expenditure	Financial Innovations
Alibaba	Alibaba Group Holding is one of the leading e-commerce giants in China. Over the last few years, the company has transformed itself from being a traditional e-commerce company to a conglomerate that has businesses ranging from logistics and food delivery to cloud computing. Cloud segment is comprised of Alibaba Cloud and DingTalk. For 2022, total revenue from Cloud segment before inter-segment elimination, which includes revenue from services provided to other Alibaba businesses, was RMB 95,752 million (USD 14,296 million). Revenue after intersegment elimination was RMB 70,685 million (USD 10,540 million) 2022, an increase of 10% year-over-year. Year-over-year revenue growth of Cloud segment reflected recovering growth of overall non-Internet industries, driven by financial services, public services, and telecommunication industries.	Alibaba Group is represented by three businesses: Alibaba.com, Taobao, and Tmall. The company's businesses account for more than half of all online retail sales in China, which is one of the world's fastest-growing e-commerce markets. Taobao is one of Alibaba Group's most profitable marketplaces that generates for more than 80% of its sales, thanks to soaring demand for high-quality imported brands in China. The company is well positioned in the New Retail space. In this space, it aims to bring together digital payments, e-commerce, food delivery and other parts of the business into one big ecosystem. Alibaba Cloud Highlights of proprietary technologies include: Data Centers and Hardware: During Alibaba Cloud Summit 2022 in June, Alibaba Cloud unveiled a proprietary cloud infrastructure system designed to power its cloud-native data centers. The new system, Cloud Infrastructure Processing Unit (CIPU), will help Alibaba Cloud deliver performance improvements in networking, storage, security and computing power by offloading virtualization functions from servers to dedicated hardware. Coupled with the Apsara Cloud operating system, the CIPU system is expected to become the core of next generation of cloud computing infrastructure.
Alphabet (GOOGL)	Alphabet spent USD 27.57 billion on R&D, which is equivalent to 15.1% of its revenue of USD 182.57 billion during fiscal 2020. The company's R&D expenditures have more than doubled since fiscal 2016. It was granted 1,817 patents in 2020.	The investments in the development of AI and AI-enabled devices and software continue to drive progress across the company's portfolio actions, futures, standardized credit swaps, spot currency transactions, investment grade bonds, non-standardized credit swaps, high yield bonds.

International Corporation	R&D Expenditure	Financial Innovations
Amazon (AMZN)	Amazon reveals a whopping expenditure of USD 42.74 billion in fiscal 2020 (11.1% of net sales) on "technology and content" as compared to USD 35.93 billion in fiscal 2019. During 2020, it was granted 2,244 patents, the majority of which were in advanced technologies such as clouds computing, voice-based virtual assistant pay.	Amazon launched its own crowdfunding platform. From payments and lending to insurance and cash deposits, Amazon is attacking financial services from every angle without even applying to be a conventional bank. In parallel, Amazon has made several FinTech investments, mostly focused on international markets (India and Mexico, among others), where partners can help serve Amazon's core strategic goal.
Apple (AAPL)	During fiscal 2020, Apple spent USD 18.75 billion on R&D, equivalent to 7% of its net sales. In the first six months of fiscal 2021 (October 2020 – March 2021), Apple reported its R&D spending at USD 10.42 billion. The company has a good patent profile; it was awarded 2,791 patents in 2020.	Apple Financial Innovations builds in the future value upfront. A handful of technology giants – including Apple, Amazon, Google, Facebook, and Intuit – have announced a partnership in the formation of the Financial Innovation Now coalition (via Re/code). The group aims to promote tech-friendly policies and changes within the financial innovations. Thanks to the growing popularity of mobile payments solutions like Apple Pay, Google Wallet, and PayPal. The partnership also intends to work together to achieve blanket improvements for like user security and authentication, faster payment processing.
Meta	Meta (formerly known as Facebook) has been actively involved in financial innovation through its various ventures and initiatives. Financial innovation typically requires substantial investments in research and development, technological infrastructure, partnerships, acquisitions, and regulatory compliance. Meta allocates significant resources towards building and expanding their financial services and products. During fiscal 2020, it allocated USD 18.45 billion equal to 21% of its revenue towards R&D spending.	Due to acquisitions, the company's portfolio of apps expanded from a single Facebook app to numerous apps including the photo- and video-sharing app Instagram and the messaging service WhatsApp. These applications currently make up Meta's family of products, which are utilized by billions of people each month along with internally built Messenger. Facebook's user base is quantified by Meta using measures like daily active users (DAUs) and monthly active users (MAUs). Because of its large user base, Meta has a considerable market share in the advertising sector, where it competes fiercely with Snap, the parent company of Snapchat, Google, Twitter, and Amazon. Meta invests in developing cutting-edge technologies, such as blockchain, artificial intelligence, and data analytics, to enhance its financial offerings and improve customer experiences. Meta leverages their vast user base and technological capabilities to provide financial services to underserved populations. This can improve financial inclusion and offer previously unbanked individuals access to banking, payments, and other financial tools.

International Corporation	R&D Expenditure	Financial Innovations
Microsoft (MSFT)	During fiscal 2020, the company reported an R&D expenditure of USD 19.27 billion (Microsoft's fiscal year runs from July 1 to June 30). During the first nine months of the current fiscal year (till Match 2021), its R&D allocation had reached USD 15.03 billion. During 2020, Microsoft Technology Licensing LLC (MLT) was awarded 2,905 patents, the fourth highest globally.	MLT is a subsidiary that manages the company's patents and technology transfer activities. In addition to its main R&D operations, the company runs Microsoft Research, which is one of the world's largest corporate research organizations and works in close collaboration with top universities around the world. Multi-directional impact of financial innovations Microsoft Research include: 1. Enhanced remote customer service and productivity. 2. New containerization models that will work more smoothly between on-premises, cloud, and multi-cloud environments. 3. Azure Synapse Link is a cloud-native implementation of HTAP (hybrid transactional analytical processing). 4. Azure Machine Learning, together with explainable AI, can help financial services organizations evaluate and improve the trustworthiness of their AI systems, better manage, and mitigate risk, and make fairer loan decisions faster, all while building confidence with customers and regulators.
Samsung	Samsung spent KRW 21,229.2 billion (equivalent USD 18.75 billion) in fiscal 2020, which constituted 9% of its sales. Samsung was granted 6,415 patents during 2020, placing it at the second spot. However, in terms of cumulative patent holdings, Samsung is the world leader with 80,577 active patent families.	Samsung expands its internal venture incubation program, C-Lab, which was introduced in 2012, to support external start-up projects. The platform will benefit 500 projects in the next five years to implement financial innovations. Samsung's innovations include: FinTech capabilities, solutions, services. Blockchain – DApps, Smart Contracts and bespoke development. Erlang and Elixir rapid development. The Erlang VM is used across the FinTech industry as well as traditional banking and is a better way to build for FinTech scalability. Erlang's soft-real time distributed systems can be updated faster, have significantly fewer vulnerabilities and reduce the cost of physical server infrastructure. Elixir is ideal for full-stack web development, which combines with powerful web frameworks such as Phoenix LiveView for outstanding productivity and performance.

Source: (Bajpai, 2021; Alibaba Group, 2022; Amazon Research and Development Expenses 2010–2022; Annual research and development expenditure of Alphabet from 2010 to 2021; Microsoft's expenditure on research and development from 2010 to 2021; Apple Research and Development Expenses 2010–2022; Samsung Electronics Invests in R&D in 2021; Facebook Reports Third Quarter, 2021).

For 2022, after inter-segment elimination, non-Internet industries contributed 53% of Cloud revenue, up more than five percentage points compared to the last year. Recent evidence suggests that cloud adoption has even accelerated during the COVID-19 pandemic (McKinsey, 2020). For instance, a recent survey of 250 mid-sized companies around the world found that 82% of the respondents increased cloud usage as a result of the COVID-19 pandemic and 91% are planning a more strategic use of cloud in the near future (Snow, 2020). Financial innovations in cloud services is proceeding apace, as growing volumes of venture capital and private equity funding have flown into new applications of cloud technology and development operations (DevOps) over the past three years (Feyen et al., 2021). We find that financial innovations have a significant impact on the development of international corporations, in particular, on their financial development (Figure 6).

Amazon annual financial innovations expenses for 2020 were USD 42.74 million, an 18.95% increase from 2019 and which is almost 3.5 times more than in 2015. Apple annual financial innovations expenses for 2020 were USD 18.752 million, a 15.63% increase from 2019 which is only USD 10.7 million more than in 2015. Compared to the other analyzed companies, only Amazon significantly increased its spending on financial innovation.

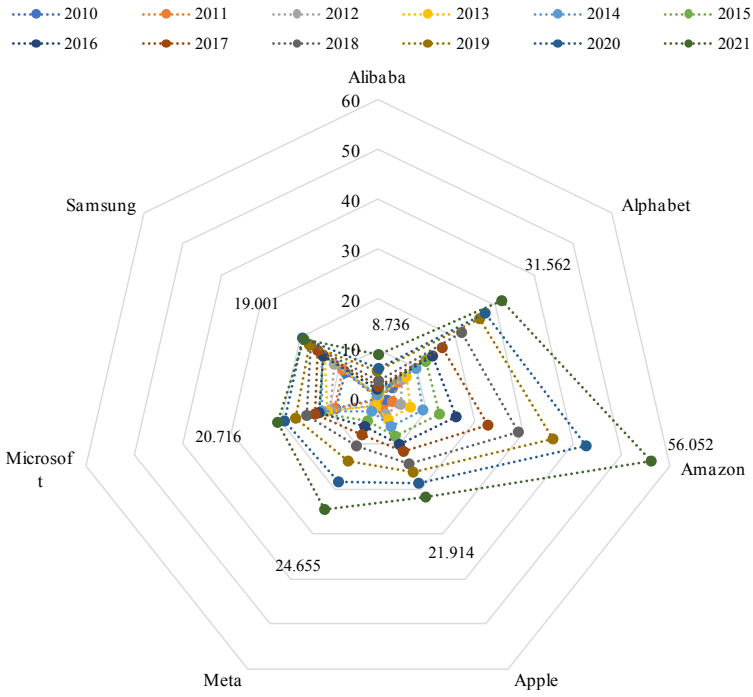


Figure 6. Expenditures incurred for financial innovation by international corporations (millions of USD)

Source: See Table 2.

When financial innovation is practiced over the long term, it enhances emerging markets and supports their financial development. A positive relationship between financial innovation and financial development suggests that the more corporations spend on R&D activities, and hence the promotion of financial innovation, the greater the financial development.

The company Microsoft has increased spending on R&D, with rising revenues, maintaining the overall allocation at 13% over the years. In addition, Amazon research and development expenses for the twelve months ending June 30, 2022 were USD 62.607 million, a 26.77% increase year-over-year. Moreover, this brought tremendous success to the company.

International corporations use financial innovations to bring products to market, reduce operational costs, and boost mobile banking. Every company seeks to retain its leading position in the dynamic, increasingly competitive world of finance, and strives to be a data-driven and customer-centric organization while operating efficiently.

Discussions

Our results lend support to research questions and are consistent with studies by Mollaahmetoğlu and Akçalı (2019), Centobelli et al. (2019), and Akcali and Sismanoglu (2015), which also discovered a positive relationship between R&D spending and economic growth, and consequently, financial development in the countries. They claim that through introducing new financial products, enhancing resource utilization in company, streamlining financial transactions, and lowering the risk of losses, financial innovation promotes economic growth. Zhu et al. (2020) confirmed that financial innovation is fueled by R&D spending, technological transfer, and networking.

These claims are in line with Frame and White's observations that technological advancements have fundamentally altered the commercial business landscape over the past 30 years and led to the development of financial innovations (Frame et al., 2018). Financial innovation is positively impacted by economic growth. According to Damanpour et al. (2009), financial innovation does, in fact, improve a firm's performance. Financial innovations encourage broader financial development that cascades into economic growth through its beneficial impact on saving, investment, and output with the combination of the risk and transaction cost reduction benefits.

Our results are consistent with the supply-leading theory, which postulates that financial innovation may contribute to the growth of the nation's economy. This theory contends that financial innovation promotes economic growth by accelerating the production of wealth, increasing the efficacy of financial companies, improving financial goods and financial intermediation. Financial innovation can be seen in new financial products, enhanced payment systems, lower investment risks, and a quicker pace of capital formation. Thus, financial innovation is regarded as a source of financial growth in international corporations.

Conclusions

In the short and long terms, there is a positive and significant association between financial innovation and economic growth. This is so because financial innovation increases the flow of funds through the financial system, which, in turn, spurs economic expansion.

The main purpose of the study was to investigate the impact of financial innovation on development of international corporations (case studies). A macro-level analysis was conducted. Three countries (the United States of America, South Korea, and China) were analyzed, and a correlation and regression analysis was performed. It should be noted that the signs of the coefficients of the constructed regression ratio were distributed differently in each of the three countries: in China, we have a positive coefficient in the expression for Research and Development Expenditure only at Foreign Direct Investment inflows, in Korea – at both Foreign Direct Investment inflows and outflows, and in the United States – only at Foreign Direct Investment outflows. Next, international corporations located in these countries were analyzed. This analysis showed us what costs were incurred for financial innovation and what effects were obtained from financial innovation.

Our results show that financial innovations have a positive and significant impact on development of international corporations. Although economic growth and FDI have a positive impact on their development, trade openness has an insignificant effect on this development. Enterprises such as the Alibaba Group effectively use their strengths by assuming the role of the Supplier in their cooperation with Hong Kong and expand the biometric digital boarding process. By becoming major listings on both Hong Kong and New York stock exchanges, they aim to further expand and diversify their investor base. Amazon has identified best practices for global products to streamline middle- and back-office processes, speeding up product development. The recognized best practices include standardization of APIs, focus on design and user experience, and the use of data and behavioral economics while following the principles of transparency, clarity, and responsibility. By promoting financial innovation, economic growth can be increased in the long term. One strategy to aid the financial sector in absorbing and spreading new ideas may be to invest in infrastructure and technology to support financial innovation. Regulators should support and articulate institutional and financial policy in order to promote financial innovation.

This study is significant from the standpoint of emerging companies, too. It is suggested that depending more on financial innovation improvement could help firms, both established and new, to remain competitive in the market.

References

Aibai, A., Huang, X., Luo, Y., & Peng, Y. (2019). Foreign direct investment, institutional quality, and financial development along the Belt and Road: An empirical investigation. *Emerging Markets Finance and Trade*, *55*(14), 3275–3294. **doi:10.1080/1540496X.2018.1559139**

Akcali, B.Y., & Sismanoglu, E. (2015). Innovation and the effect of research and development (R&D) expenditure on growth in some developing and developed countries. *Procedia – Social and Behavioral Sciences*, *195*, 768–775. **doi:10.1016/j.sbspro.2015.06.474**

Alibaba Group. (2022). *Business and Strategic Updates*.

Alsmadi, A.A., & Oudat, M.S. (2019). The effect of foreign direct investment on financial development: Empirical evidence from Bahrain. *Ekonomski Pregled*, *70*(1), 22–40. **doi.org/10.32910/ep.70.1.2**

Amazon Research and Development Expenses 2010–2022. Retrieved from https://www.macrotrends.net/stocks/charts/AMZN/amazon/research-development-expenses

Annual research and development expenditure of Alphabet from 2010 to 2021. Retrieved from https://www.statista.com/statistics/507858/alphabet-google-rd-costs

Apple Research and Development Expenses 2010–2022. Retrieved from https://www.macrotrends.net/stocks/charts/AAPL/apple/research-development-expenses

Bajpai, P. (2021). *Which Companies Spend the Most in Research and Development (R&D)?* Retrieved from https://www.nasdaq.com/articles/which-companies-spend-the-most-in-research-and-development-rd-2021-06-21

Błach, J. (2012). Koszty zastosowania innowacji finansowych w działalności przedsiębiorstwa – identyfikacja problemu. *Annales Universitatis Mariae Curie-Skłodowska, sectio H – Oeconomia*, *46*(4), 23–32.

Chipeta, C., & Muthinja, M.M. (2018). Financial innovations and bank performance in Kenya: Evidence from branchless banking models. *South African Journal of Economic and Management Sciences*, *21*(1), a1681. **doi:10.4102/sajems.v21i1.1681**

Centobelli, P., Cerchione, R., & Esposito, E. (2019). Exploration and exploitation in the development of more entrepreneurial universities: A twisting learning path model of ambidexterity. *Technological Forecasting and Social Change*, *141*(C), 172–194. **doi:10.1016/j.techfore.2018.10.014**

Damanpour, F., Walker, R.M., & Avellaneda, C.N. (2009). Combinative effects of innovation types and organizational performance: A longitudinal study of service organizations. *Journal of Management Studies*, *46*(4), 650–675. **doi:10.1111/j.1467-6486.2008.00814**

Diemko, J. (2021). *Poland – a complete overview of payments and ecommerce trends and figures. Voice of the industry*. Retrieved from https://thepaypers.com/expert-opinion/poland-a-complete-overview-of-payments-and-ecommerce-trends-and-figures--1249229

Domeher, D., Konadu-Yiadom, E., & Aawaar, G. (2022). Financial innovations and economic growth: Does financial inclusion play a mediating role? *Cogent Business & Management*, *9*(1), 1–21. **doi:10.1080/23311975.2022.2049670**

R&D expenditure – Statistics Explained. (2022). Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=R%26D_expenditure

Facebook Reports Third Quarter 2021 Results. Retrieved from https://s21.q4cdn.com/399680738/files/doc_news/Facebook-Reports-Third-Quarter-2021-Results-2021.pdf

Feyen, E., Frost, J., Gambacorta, L., Natarajan, H., & Saal, M. (2021). *Fintech and the Digital Transformation of Financial Services: Implications for Market Structure and Public Policy*. Washington, D.C.: World Bank Group.

Frame, W.S., Wall, L., & White, L.J. (2018). Technological change and financial innovation in banking: Some implications for Fintech. In A. Berger, P. Molyneux & J.O.S. Wilson (Eds.), *Oxford Handbook of Banking*, 3rd ed. (pp. 1–33). **doi:10.29338/wp2018-11**

Frame, W.S., & White, L.J. (Eds.). (2014). *Technological Change, Financial Innovation, and Diffusion in Banking*. Oxford: Oxford University Press.

Kara, A., & Molyneux, P. (2017). Household access to mortgages in the UK. *Journal of Financial Services Research*, *52*(3), 253–275. **doi:10.1007/s10693-016-0246-1**

Laeven, L., Levine, R., & Michalopoulos, S. (2015). Financial innovation and endogenous growth. *Journal of Financial Intermediation*, *24*, 1–24. **doi:10.1016/j.jfi.2014.04.001**

Lerner, J. (2006). The new new financial thing: The origins of financial innovations. *Journal of Financial Economics*, *79*(2), 223–255. **doi:10.1016/j.jfineco.2005.01.004**

Lopez, L.E., & Roberts, E.B. (2002). First-mover advantages in regimes of weak appropriability: The case of financial services innovations. *Journal of Business Research*, *55*(12), 997–1005. **doi:10.1016/S0148-2963(01)00200-4**

Mollaahmetoğlu, E., & Akçalı, B.Y. (2019). The missing-link between financial development and economic growth: Financial innovation. *Procedia – Computer Science*, *158*, 696–704. **doi:10.1016/j.procs.2019.09.105**

McKinsey. (2020). *The 2020 McKinsey Global Payments Report*. Retrieved from https://www.mckinsey.com/~/media/mckinsey/industries/financial%20services/our%20insights/accelerating%20winds%20of%20change%20in%20global%20payments/2020-mckinsey-global-payments-report-vf.pdf

Microsoft's expenditure on research and development from 2010 to 2021. Retrieved from https://www.statista.com/statistics/267806/expenditure-on-research-and-development-by-the-microsoft-corporation/

Nieminen, M. (2020). Multidimensional financial development, exporter behavior and export diversification. *Economic Modelling*, *93*, 1–12. **doi:10.1016/j.econmod.2020.07.021**

Nyasha, S., & Odhiambo, N.M. (2017). Banks, stock market development and economic growth in Kenya: An empirical investigation. *Journal of African Business*, *18*(1), 1–23. **doi:10.1080/15228916.2016.1216232**

Poland payments market. Growth, trends, Covid-19 impact, and forecast 2022–2027. (2022). Report. Retrieved from https://www.mordorintelligence.com/industry-reports/poland

Samsung Electronics Invests in R&D in 2021. *Business Korea*. Retrieved from http://www.businesskorea.co.kr/news/articleView.html?idxno=87992

Stachera-Włodarczyk, S. (2015). Rola innowacji finansowych w działalności banków komercyjnych. *Zeszyty Naukowe Politechniki Częstochowskiej*, *19*, 64–65.

Tufano, P. (2003). Financial innovation. *Handbook of the Economics of Finance*, *1*, 307–335. **doi:10.1016/S1574-0102(03)01010-0**

World Bank. (2022a). *Global Economic Prospects*. Washington, D.C.

World Bank. (2022b). *World Development Indicators*. Retrieved from https://databank.worldbank.org/source/world-development-indicators

World Development Report. (2022). *Finance for an Equitable Recovery*. Washington, D.C.: The World Bank.

Zhu, X., Asimakopoulos, S., & Kim, J. (2020). Financial development and innovation-led growth: Is too much finance better? *Journal of International Money and Finance*, *100*, 1–24. **doi:10.1016/j.jimonfin.2019.102083**