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THE ROLE OF FINANCIAL SPENDING ON SCIENTIFIC RESEARCH ON THE GLOBAL INNOVATION INDEX FOR A SAMPLE OF SELECTED COUNTRIES

A.P BUSHRA ABDULBARI AHMAD
Tikrit University- College of Administration and Economics
e-mail: bushra.ae33@tu.edu.iq

A R T I C L E I N F O.

Keywords: research, scientific, index, innovation.

Abstract:

The current study attempted to identify the impact of financial spending on scientific research on the global innovation index for a sample of selected countries (Iraq, Tunisia and Algeria) from the point of view of specialists and experts in the fields of innovation and scientific research.
The quantitative approach and questionnaire were adopted to collect data in Iraq, Tunisia, and Algeria. The sample size was 150 specialists at research, and SPSS was used to analyze the data.
The results concluded that the use of research roleively affects the global innovation index; its impact on the number of researchers then affect on the global innovation index with an average of (4.55) and a high level of strength. And it's increase on the productivity and profitability of companies with an average of (4.23) and a high level of strength.
The study identify the most challenges facing financial spending on scientific research according to the Global Innovation Index, and give some recommendations to improve and enhance the level of financial spending on scientific research.

Introduction

Innovation has proven crucial to the expansion of economies during the last several years. Economic growth is significantly influenced by the interest of economic actors in it, particularly in industrialized nations where innovation and technology are vital to the economy. Every task that businesses undertake to invent new goods and services falls under the category of research. It is often the initial stage of thescientific process, carried out with the goal of producing new goods. In fact, lacking a research program might cause a company to fail and lose its competitive edge. Its continued existence may be reliant on alternativescientific strategies including alliances, mergers, and acquisitions.

Businesses engage in research because it advances knowledge and technology and provides valuable information that can be used to boost profits. Additionally, this corpus of information is applied to enhance goods and services, putting the company ahead of rivals. The presumption that research would pay off right away should not be made, notwithstanding the high price tag. Instead, research should be carried out with the understanding that the outcomes add to the business's long-term profitability (Baden-Fuller & Haefliger, 2013).

Many people mistakenly associate innovation with the concept of new technology or goods. The reality is that there have also been advancements in other fields. Innovators may be found in any industry. It involves putting innovative ideas into practice in order to give customers, workers, or business models more value. Innovation basically refers to performing things in a unique way in order to advance the company. This may be done in a variety of ways, such upgrading or creating new items. When developing strategies for change and identifying possibilities, innovation also considers potential future hazards. Thus, we may claim that innovation results in a competitive advantage. To stand out from the competition, the company strategy must cleverly include innovation. This isn't, however, imply that the only component of success is innovation. Businesses must also be well aware of the financial strategies they must use in order to implement innovation (OECD/European Union (2018). Since innovation involves three distinct stages—discovery, incubation, and acceleration—it is technically superior to research (O'Reilly & Binns, 2013). In comparison, the initial stage only includes a small portion of research. Businesses also need to recognize that evolving revenue models, expanding into new markets, and creating business applications all need time and resources (SÖZEN & TUFANER, 2013).

In order to accomplish inventivescientific, financial spending on scientific research generates the circumstances for the deployment of better and more advanced technologies. The introduction of new goods or manufacturing techniques is made possible by a growth in patents, which also helps nations innovate and change their exports of high-tech products from low-tech items. Despite research is a major driver of economic growth, little is known about how important it is. However, since business taxes support SCIENTIFIC RESEARCH, which is crucial for fostering innovation, they have turned out to be extremely advantageous for innovation in both types of nations. Our research explains how expenditure on SCIENTIFIC RESEARCH affects the global innovation index for a sample of chosen nations. Additionally, we want to ascertain and comprehend the degree to which corporate SCIENTIFIC RESEARCH investment has an impact on innovation in these nations. Previous research mainly analyzed how governance quality affected innovation in OECD nations (Dritsaki & Dritsaki, 2023).

Using the variable Innovation Index to foster innovation, we expect to fill up the gaps left by earlier research. However, due to the nature of institutions and how they support innovation, this research focuses on corporate taxation. The use of varied tax returns hasn't been included in prior research generally. The analysis's conclusions are incorrect and ambiguous since it blends different economic activities that affect taxes .These results will be crucial for developing a comparative study of the factors influencing innovation promotion across OECD nations.

1.1 Research Questions

The main question of this research is: "**What is the impact of financial spending on scientific research on the global innovation index for a sample of selected countries (Iraq, Tunisia and Algeria) from the point of view of specialists and experts in the fields of innovation and scientific research?"**

This main question is subdivided into the following sub-questions:

1. What is the impact of financial spending on scientific research on the number of researchers? How does the number of researchers affect the global innovation index?
2. What is the impact of research expenses on the productivity and profitability of companies?
3. What are the most important challenges facing financial spending on scientific research according to the Global Innovation Index?
4. What are the most important suggestions and recommendations to improve and enhance the level of financial spending on scientific research and thus the global innovation index?
5. What is the difference between the level of financial spending on scientific research in all selected countries (Iraq, Tunisia and Algeria) and to what extent does the level of financial spending on scientific research affect the global innovation index in each of them?

1.2 Research Significance

The importance of the research lies in the fact that it shows the impact of financial spending on scientific research on the global innovation index in selected countries, and to what extent the global innovation index can be affected by financial spending on scientific research. In addition benefit from applying successful international experiences, such as the Finnish and Korean experiences in the field of research, scientific, innovation and creativity, and benefiting from them in Iraq, Algeria and Tunisia.

Literature review

1.1. Research (SCIENTIFIC RESEARCH)

Research, usually referred to as research and technology scientific, refers to a group of creative initiatives performed by corporations and governments to create new services and goods. Activities related to research may be contracted out to a study institution (university or government agency) or performed by specialized divisions or centers inside a corporation. Research often refers to long-term scientific and technology efforts that are focused on anticipated commercial performance and intended objectives in the context of commerce (Dritsaki & Dritsaki, 2023).

The primary determinant in a company's existence is the creation and scientific of new goods. Due to fierce competition, the global industrial scene is changing quickly, forcing businesses to regularly update their range of products and layout. worldwide supply chain administration, which is the provision of products Providing services to an international network of businesses have the potential to drive innovation and enact laws that often govern social and environmental concerns (Najjar et al., 2023). A system driven by marketing is one that establishes client wants and creates products with a proven track record of success. Consumer demands and a new product's possible niche market are identified through market research. Research are focused on creating items to address unmet demands ifscientific is based on technology (Anderson & Narus, 1998).

Scientific research enables the development of information base and increases the propensity for more investigation. The digital economy, utilizing information and technology, promotes economic growth and improves innovation and service provision (Al Momani et al., 2021). High SCIENTIFIC RESEARCH spending is the foundation for investigating technology sectors for sustainable innovation, according to several researches (Wu et al., 2020). Developing an invention and putting it into action include uncertainty, particularly about the idea's profitability, as research is the most precarious aspect of funding. The most roleive and long-lasting strategy for innovation is the augmentation and expansion of research expenditures (Markham et al., 2010). Investment is therefore a crucial component that not only feeds the economic engine but also ensures the sustainability of innovation (Sarpong et al., 2023). Overall, research is found to be positively connected with business productivity across all industries, although high-tech organizations exhibit this positive association at a considerably higher level than low-tech ones (Ortega-Argilés et al., 2011).

1.2. Innovation

Innovation is the use of ideas in a real-world setting to create new products or services or to enhance existing ones. Various definitions have been identified in literature reviews on innovation. In 2009, many scientific publications published about sixty definitions, based on their own study, put out the interdisciplinary definition that reads as follows: "Innovation is the multistage process by which organizations convert ideas into new, improved products, services, or processes in order to advance, compete, and differentiate successfully in their market." the development of increasingly innovative products, services, technologies, and business strategies, which inventors subsequently release onto the market, is what constitutes innovation (Baregheh et al., 2009). Several studies have shown The favorable consequences of innovation on significant business performance metrics, including output, workforce, revenue, and exports. These advantages create improved competitive prospects for firms to compete on a national and global scale. Increases in competitiveness resulting from importing technology greatly impact a nation's production and trade specialization patterns, as well as the growth in the average salary of skilled human capital (Chudnovsky et al., 2004).

Innovation is difficult to assess due of its ambiguous nature. Different indications that may be gleaned from business models and yearly financial reports of organizations are used to gauge innovation. Financial spending on scientific research (SCIENTIFIC RESEARCH), the number of SCIENTIFIC RESEARCH employees, and the number of patents are some of these indicators. The indicators can be categorized into proportional indicators, growth indicators, input indicators, and production indicators. Proportional indicators measure the ratio of product cash flow in the previous years. Product sales growth is monitored using growth indicators, patents, and customers. Input indicators assess spending on scientific research and marketing. Production indicators focus on the number of new products and production units (Das, 2020).

Correlations that enable inferences about the business model's ability for innovation may be found when these indicators are coupled with one another. An organization has a stronger potential for innovation if its business model can forecast cash flow, SCIENTIFIC RESEARCH expenditures, patent applications for new goods, and SCIENTIFIC RESEARCH spending on new products. Recently, theory and practice have been more interested in the scientific aspects of innovative business models. An innovative company strategy provides for distinction from rivals and is adapted to client demands. Leaders in innovation are known for their adaptive and flexible ways to managing ideas and initiatives. They give workers a comfortable workplace where they may expand their horizons and find inspiration for fresh ideas (Gocer et al., 2016). Additionally, they encourage staff members' inspiration and gratitude while they work on a specified challenge. All employees are driven in the same direction by healthy innovation. To influence the activity, innovative behavior has to be internalized by all participants. Transparency is a necessary, too, in the end. Employees must be aware of the innovative themes that are now strategically pertinent. Moreover, all staff members must be informed of choices involving innovation. Indicators of innovation are important instruments for decision-making in both the public and commercial sectors. It is essential for establishing competitive strategies in the private sector. Indicators of innovation are crucial to the formulation and execution of public sector policies that support and assess innovation (Dritsaki & Dritsaki, 2023).

1.3. Global Innovation Index (GII)

Various metrics aim to measure innovation, such as the World Economic Forum's Global Competitiveness Report, the global innovation index (GII) by INSEAD, the Bloomberg Innovation Index by Bloomberg L.P., and the jointly created international innovation index. The international innovation index assesses the level of innovation in a country. It is included in an extensive study that looks at the financial benefits of innovation and how the government might promote it through public policy. This index monitors both the inputs and outputs of innovation, was released in 2009 (Kacprzyk & Doryń, 2013). The World Competitiveness Report has been ranking nations based on the Global Competitiveness Index since 2004, using the latest theoretical and empirical data. The dataset consists of about 110 variables, with around two thirds coming from executive opinion research and one third coming from publically available sources like the UN. The twelve pillars that make up the variable structure each reflect one of the key factors that influence competitiveness. Seven equally weighted indicators are used in Bloomberg's innovation index to assess dozens of factors, including as SCIENTIFIC RESEARCH expenditure, manufacturing capacity, and the concentration of publicly traded high-tech companies (Pala, 2019).

The Global Innovation Index (GII) was established in 2007 by INSEAD and has significantly influenced how innovation is measured and has become a key component in economic policy development. More countries are now regularly reviewing their yearly GII rankings and creating strategies to raise their level of performance. The most recent trends in global invention are tracked by the Global invention Index (GII). It highlights the benefits and drawbacks of innovation while rating the importance of innovation ecosystems in different economies each year. The index, designed to provide the most comprehensive picture possible of innovation, has over 80 factors, including evaluations of the political situation in each economy, educational system, infrastructure, and knowledge production. The many measures provided by the GII may be used to track progress and compare changes to the economies of other nations (Dritsaki & Dritsaki, 2023). According to Dutta et al. (2011), INSEAD initiated the Global Innovation Index project in 2007 with the relatively uncomplicated aim of developing novel methodologies and metrics that more accurately reflect the magnitude of innovation in society. These metrics would surpass traditional indicators of innovation such as the quantity of PhD students, published research articles, newly established research centers, patents, or scientific research expenditures. GII is frequently reliant on two crucial subindices. Five input pillars comprise the Innovation Input Subindex, which serves as a representation of the elements of the national economy that facilitate creative endeavors.

Two pillars that are thought to be the outcomes of inventive activity inside the economy make up the Innovation Output Subindex. Even though there are only two pillars in the Output Sub-Index, it is given the same weight when determining the final GII score. The sum of the two sub-indices is hence the GII score in its whole. Three further subpillars make up the individual input and output GII pillars ((Sofrankova et al., 2018):

- 1st pillar: Institutions (subpillars – Political environment, Regulatory environment, Business environment),
- 2nd pillar: Human capital and research (subpillars – Education, Tertiary education, Research &scientific),
- 3rd pillar: Infrastructure (subpillars – ICTs, General infrastructure, Ecological sustainability),
- 4th pillar: Market sophistication (subpillars – Credit, Investment, Trade, competition & market scale),

- 5th pillar: Business sophistication (subpillars – Knowledge workers, Innovation linkages, Knowledge absorption),
- 6th pillar: Knowledge and technology (subpillars – Knowledge creation, Knowledge impact, Knowledge diffusion),
- 7th pillar: Creative outputs (subpillars – Intangible assets, Creative goods and services, Online creativity) (Dutta et al. 2017).

The World Bank, the United Nations Educational, Scientific, and Cultural Organization, the World Intellectual Property Organization, the International Energy Agency, the International Telecommunications Union, and a few other carefully chosen private organizations provide all of the official data that is currently available (Dutta et al. 2017).

1.4. The impact of financial spending on scientific research on the global innovation index

Endogenous models provide a more thorough explanation of the connection between financial spending on scientific research and economic growth (Romer, 1986). According to Romer (1986), research are prerequisites for the existence of technological advancement. According to the endogenous model, human capital and knowledge aquisition are used in research to produce technological advancement. The assumption of growing or constant returns to scale of knowledge due to spillover roles or so-called "learning by doing" is another crucial component of endogenous growth models. We can achieve exponential economic growth even with constant SCIENTIFIC RESEARCH spending by assuming growing returns to scale. On the other hand, if we assume constant returns to scale, then a rise in SCIENTIFIC RESEARCH spending should guarantee an increase in innovation that is proportionately higher. Thus, this ought to result in a proportionate rise in productivity and, as a result, permit long-term economicscientific that is steady (Huňady & Orviská, 2014). Additionally, prior research (Canh et al., 2019; Bekhet & Latif, 2018) Research on mitigating the effects of taxes on innovation promotion has demonstrated the significance of tax incentives. Nevertheless, these studies have neglected to consider other forms of taxes that are essential for fostering innovation, including those generated by the business sector and enterprises' profit tax. Furthermore, past research contains flaws. Regarding tax contribution analysis in supporting innovation, they are restricted to a small region that only includes OECD nations and excludes non-OECD countries. This procedure might only show how much money was lost to taxes in OECD nations, but comparing the two areas would yield more accurate data (Balsalobre-Lorente et al., 2021).

The literature is replete with publications that examine the empirical facets of the connection between SCIENTIFIC RESEARCH, innovation, and revenue. An excerpted review of the empirical literature on the roles of SCIENTIFIC RESEARCH spending and innovation activities is presented in this section. By assessing the number of patents per million people in the various areas of Europe, Bilbao-Osorio and Rodrguez-Pose (2004) investigated the roles of public and private sector investment in research, higher education, and innovation. The outcomes of their investigation They used cross-section OLS regression to determine that investments in scientific research and investments related to innovation in higher education were more favorable in the periphery regions, based on an analysis of 103 regions for which data were available between 1990 and 1995. Additionally, the socioeconomic makeup of the area affects how SCIENTIFIC RESEARCH spending affects innovation. Ulku (2004) looked at the connection between GDP per capita, SCIENTIFIC RESEARCH spending, and innovation for 20 OECD and 10 non-OECD economies between 1981 and 1997. The article employed Arellano-Bond GMM estimators, several panel approaches with fixed roles, and patent data for its analysis. It was discovered that innovation and GDP per capita between OECD nations and third-world countries had a strong and positive link. Additionally, it showed that financial spending on scientific research supports inventions in OECD nations.

Hassan and Tucci (2010) The empirical investigation of the significance of innovation in economic science from 1980 to 2003 utilizing panel data on a sample of 58 countries. They made advantage of patent data to approximate innovation. Their research revealed that economies in nations with high-quality patents develop more rapidly. Additionally, their findings supported the notion that economies expand faster in nations with higher levels of patenting. Goser et al. (2016) studied the roles of SCIENTIFIC RESEARCH and innovation expenditure on revenues for eleven EU nations from 1990 to 2011 using analysis of Next Generation panel data. These findings show that when innovation and SCIENTIFIC RESEARCH spending both increase by 1%, income increases by 0.19% on average and by 4.05% when innovation increases by 1%. The results also demonstrated a bidirectional causal relationship between SCIENTIFIC RESEARCH spending, innovation, and income.

Kacprzyk and Doryn (2017) investigated the relationship between innovation and economic growth in EU countries for the period 1993-2011. The authors examined whether spending on SCIENTIFIC RESEARCH and patenting has a distinct impact on new (EU-13) and old (EU-15) members. The bias-corrected least squares dummy variable (LSDV) estimator and bootstrap methodology were utilized by the authors. They also looked into the impact of various investment kinds and financing sources on research. The authors concluded that expenditure on SCIENTIFIC RESEARCH had no discernible impact on economic growth. Patents, however, turned out to be a significant predictor of GDP per capita growth in new EU members. Aynur (2019) used the random coefficient model (RCM) to investigate the roles of five technical factors on the economicscientific of 25 developing nations from 1996 to 2016. The author employed panel data heterogeneity and cross-sectional dependency for the analysis of the work. According to the model assessment's findings, SCIENTIFIC RESEARCH spending has a considerable negative impact on economicscientific in China, Egypt, Iran, Moldova, Panama, Serbia, and Uzbekistan. The number of SCIENTIFIC RESEARCH researchers has a major detrimental influence on economic growth in Iran, Mexico, Tunisia, and Uzbekistan. On the other hand, the number of SCIENTIFIC RESEARCH researchers in China, Russia, Turkey, and Ukraine has a very beneficial influence on economic growth.

Kolodziejczyk (2020) attempted to rate the innovation performance of all 28 European Union member states using three primary innovation indices, The Bloomberg Innovation Index, the Global Competitiveness Report, and the Bloomberg Innovation Index are all included. Utilizing fundamental data visualization and variable analysis techniques, the innovation performance of EU member states was compared and contrasted. The study demonstrated that the European Union is innovative, as supported by the global rankings of EU member states for all three innovation indicators.

Omri (2020) studied how technological innovation might promote economic growth and improve social and ecological conditions in a sample of 75 nations with varying income levels. The author utilized the VECM technique to examine causality in the study of this research. This study showed that technical innovation adds to the three pillars of sustainability in industrialized nations. In low-income nations, they have minimal influence on ecological or economic aspects, but in middle-income nations, they do have a noticeable impact. Minovic and Jednak (2021) examined the causal relationship between economic growth, innovation spending, and foreign direct investment from 2000 to 2017 in six selected EU members (Bulgaria, Croatia, Hungary, Romania, Slovakia, and Slovenia) and three EU candidates (North

Macedonia, Serbia, and Turkey). They utilized three indicators: the summary innovation index, the capacity innovation index, and the global innovation index, to analyze innovation. Slovenia is the top performer in innovation according to all three categories. Bulgaria, Romania, and North Macedonia are considered "modest innovator" countries according to the summary innovation index, whereas Slovenia, Slovakia, Hungary, Serbia, Turkey, and Croatia are defined as "moderate innovator" countries. Serbia ranks lowest in innovation capacity according to the capacity innovation index, despite a large improvement in this parameter since 2012. Serbia and North Macedonia rank lowest in this ranking, as per the global innovation index. Causality tests revealed a reciprocal association between economic growth and foreign direct investment, economic growth and innovation expenditure, and foreign direct investment and innovation spending (Dritsaki & Dritsaki, 2023).

From 2008 to 2018, Ugurluay and Kirikkaleli (2022) examined the impact of innovation on the availability of advanced technologies in 10 wealthy countries. Pedroni's co-integration method was employed to analyze the long-term associations among variables in panel data analysis, while FMOLS and DOLS procedures were used to estimate the variables. The study showed a strong connection between innovation, education, public funding, life expectancy, and the availability of advanced technologies. In high-income countries, innovation enhances the accessibility of advanced technology. However, sustained technological availability is impacted by factors such as education, public financing, and life expectancy. The availability of advanced technology is the result of innovation, education, public funding, and longevity.

Maha et al. (2022) examined how technological progress influenced economic development in developing countries such as Argentina, Algeria, Brazil, Bulgaria, Chile, China, Egypt, India, Indonesia, Iran, Mexico, Morocco, Peru, Philippines, Poland, Romania, Sri Lanka, Thailand, Tunisia, and Turkey between 1990 and 2018. They utilized the error correction model (ECM) technique to do this. The audits revealed that increased levels of technological innovation indicators, including education spending, patent issuance rates, scientific research spending, scientific research researcher numbers, high-tech exports, and scientific and research output, are associated with short- and long-term economic growth. There is a short-term causal relationship between technical innovation and GDP, as well as a long-term, reciprocal link between technological innovation and GDP. It is crucial to have robust laws that incentivize foreign investors to invest in scientific research in these nations, hence promoting further research. Dritsaki & Dritsaki (2023) found that technical innovation significantly influences a country's economic sustainability.

2. Methodology

The study will use the quantitative descriptive technique to attain its targets and objectives. The study will use a quantitative survey to thoroughly investigate the perceptions of financial spending on scientific research among specialists and experts in the fields of innovation and scientific research in selected countries (Iraq, Tunisia, and Algeria). The survey results will be analyzed and confirmed to guide the researcher in achieving the desired outcomes (Creswell, 2008). The researcher will use a survey designed to evaluate specialists' and experts' view of how financial expenditure affects scientific research on the Global Innovation Index. This survey will gather original data for the study and evaluate the research topics. An online questionnaire will be issued to a sample of 150 professionals and experts to get their insights on the influence of financial expenditure on scientific research.

In order to estimate the internal consistency reliability of the questionnaire items prior to distributing them to the research sample, the researcher will, for instance, use the alpha Cronbach test.

Other statistical analytical approaches will also be used in the context of questionnaire design and data analysis purposes. Finally, several analytical procedures will be employed for the analysis of the acquired data and testing hypotheses, The statistical package for social science SPSS software will be used to put these analytical strategies into practice.

Reliability test

Table (1) "Cronbach Alpha" reliability coefficients for the fields of study and the tool as a whole

	Number of items	Cronbach's alpha.
The number of researchers and role the global innovation	3	0.71
productivity and profitability of companies	11	0.85
challenges facing financial spending on scientific research	6	0.89
suggestions and recommendations to improve and enhance the level of financial spending on scientific research	8	0.92
The tool as a whole	28	0.78

Table (1) shows that the reliability coefficients ranged from (0.71 - 0.92). The Cronbach's alpha value for the "suggestions and recommendations to improve and enhance the level of financial spending on scientific research" was 0.92, for the challenges domain was 0.89, for the productivity and profitability of companies domain was 0.85, and for The number of researchers and role the global innovation was 0.71.

The overall reliability coefficient for the questionnaire was 0.78, These are high and acceptable coefficients for the study tool (questionnaire), as a Cronbach's alpha coefficient above 0.70 is considered acceptable.

Statistical analysis:

To answer the study questions, the following statistical procedures were used through the SPSS statistical package:

- Frequencies and percentages for demographic variables of the study sample.
- Means and standard deviations for the responses of the study sample in all domains of the study tool.
- Analysis of variance (ANOVA) and t-test to detect differences based on study variables.

Scale correction:

The final questionnaire consisted of (28) items. The researcher used a 5-point Likert scale, where "strongly agree" was assigned 5 points, "agree" was assigned 4 points, "neutral" was assigned 3 points, "disagree" was assigned 2 points, and "strongly disagree" was assigned 1 point.

To determine the level of results based on the sample responses, the following criteria were used:

Impact level[1]:
- Low if the mean value is less than 2.33
- Moderate if the mean value is greater than or equal to 2.33 and less than 3.67
- High for a mean value of 3.67 or higher.

Descriptive statistics

The total study sample consisted of (150) parson, The table (2) shows the demographic variables of the study sample.

Table 2. Descriptive table

	Frequency	%
Gender		
Female	30	20.0
Male	120	80.0
Age		
Under 35	39	26.0
35-50	67	44.6
Over 50	44	29.4
country		
Iraq	27	18.0
Tunisia	71	47.3
Algeria	52	34.7
Experience		
Less than 1-5	5	3.3
6-10	61	40.7
More than 10 years	84	56.0

Interpretation

The details of demographics profile are shown in table no 2, in which the gender category shows 80.0% are males and 20.0%% are females.

While age category characteristics shows that 44.6% respondents were from 30-50 years, 29.4% respondents were over 50 years, and 26.0% respondents were under 35 years.

The country category shows 47.3% respondents were Tunisia, 34.7% were Algeria, and 18.0% were Iraq.

Moreover, The Experience in research category shows that 56.0% of participants had more than 10 years, 40.7% of participants had experience from 6-10 years, and 3.3% had experience only less than 1 to 5 years.

[1] The response range(1-5) was divided into 3 categories of equal length, i.e. with a length of 1.33, based on the following equation:
Length of period = (maximum answer score - minimum answer score) / number of levels.

Research Questions:

1) What is the impact of financial spending on scientific research on the number of researchers? How does the number of researchers affect the global innovation index?

To answer this question, the arithmetic means and standard deviations of the items were calculated with the field as a whole, and Table (3) shows this.

Table (3): Arithmetic means and standard deviations for the domain items and the "The number of researchers and role the global innovation" as a whole (n=150)

Num	Paragraphs[2]	Mean	SD	Impact level	Rank
1	Increasing the number of researchers leads to an increase in the scientific innovation index	4.60	0.81	High	1
2	The number of researchers in R& D has a significant negative impact on economic growth.	4.56	0.92	High	2
3	The number of employees in R& D is an inappropriate indicator for empirical analysis	4.51	1.01	High	3
	domain as whole	4.55	0.45	High	

It is noticed from the results in Table 3 that the arithmetic means of the paragraphs related to the number of researchers and its role on the global innovation ranged from (4.51- 4.60) and all paragraphs received a high score.

The paragraph with the highest score, ranking first, states that " increasing the number of researchers leads to an increase in the scientific innovation index" with mean equal (4.60). Then, The paragraph No.2 (after rephrasing its answers) states that increasing the number of researchers has a positive impact on economic growth. The last paragraph on impact level (after rephrasing its answers) indicates that increasing the number of employees is an appropriate indicator in the field of research with mean equal (4.51). Overall, the axis as a whole, which measures the impact of financial spending on scientific research on the number of researchers and the scientific innovation index, had an average score of (4.55) and a high level of strength.

2) **What is the impact of research expenses on the productivity and profitability of companies?**

To answer this question, the arithmetic means and standard deviations of the items were calculated with the field as a whole, and Table (4) shows this.

Table (4): Arithmetic means and standard deviations for the domain items and the "productivity and profitability of companies" as a whole (n=150)

Num	Paragraphs	Mean	SD	Impact level	Rank
1	Innovation is one of the most important modern indicators and the most important	4.64	0.98	High	3

[2] Negative paragraphs (2,3) have been rephrased to become positive.

	means of growth and economic scientific in countries of the world.				
2	Innovation is a comprehensive process that contributes to the process of economic growth andscientific.	4.41	1.11	High	6
3	Thescientific of technological innovation has a direct impact on the sustainability of the economic scientific of any country	4.50	1.06	High	5
4	Research are necessary conditions for technological progress to exist	4.60	1.01	High	4
5	Financial spending on scientific research and investing in innovation supports competition and progress.	3.66	1.34	Moderate	9
6	R& D spending can ensure long-term economic growth under the assumptions of semi-endogenous models	3.63	1.38	Moderate	11
7	Companies play an essential role in basic research and a dominant role in more applied research.	4.21	1.21	High	7
8	Financial spending on scientific research has a positive impact on productivity growth in these companies.	4.69	0.90	High	1
9	An optimal level of investment in research andscientific can produce a significant rate of economic growth	3.89	1.33	High	8
10	There is a positive relationship between research,scientific, and innovation expenditures and income. That is, if research,scientific, and innovation expenditures increase, income increases.	3.64	1.35	Moderate	10
11	Increasing spending on research and scientific leads to an increase in the scientific innovation index.	4.67	0.93	High	2
	domain as whole	4.23	0.96	High	

It is noticed from the results in Table 4, that the arithmetic means of the paragraphs related to productivity and profitability of companies ranged from (3.63- 4.69) and all paragraphs received a high score, except the paragraphs No (5, 6,10).

The paragraph with the highest score, ranking first, states that " Financial spending on scientific research has a positive impact on productivity growth in these companies." with mean equal (4.69) and high score. The last paragraph is: "R& D spending can ensure long-term economic growth under the assumptions of semi-endogenous models" with mean equal (3.63) and Moderate Score.

Overall, the axis as a whole, which measures the productivity and profitability of companies, hade mean equal (4.23) and a high level of strength.

3) What are the most important challenges facing spending on research according to the Global Innovation Index?

To answer this question, the arithmetic means and standard deviations of the items were calculated with the field as a whole, and Table (5) shows this.

Table (5): Arithmetic means and standard deviations for the domain items and the "challenges facing financial spending on scientific research" as a whole (n=150)

Num	Paragraphs	Mean	SD	Impact level	Rank
1	Financial spending on scientific research varies according to the country's progress and economicscientific	4.00	1.23	High	2
2	The increase in R& D expenditures must ensure a proportional increase in innovation	3.77	0.96	High	4
3	The corporate tax system promotes and encourages innovation in companies through tax exemptions on research and scientific.	3.31	1.21	Low	6
4	Corruption negatively affects innovation, but it affects it positively beyond the threshold level	3.98	0.92	High	3
5	The social gains from private investments in R& D are much higher than the direct individual gains of the investor	3.60	0.98	Moderate	5
6	The roleiveness of spending on research andscientific is gradually decreasing, due to the increasing diversity of products	4.35	1.13	High	1
	domain as whole	3.83	1.10	High	

It is noticed from the results in Table 5, the challenges facing spending on research at the means of the paragraphs related to h andscientific ranged from (3.31- 4.35) and all paragraphs received a high score, except the paragraphs No (5, 3).

The paragraph with the highest score, ranking first, states that " The roleiveness of financial spending on scientific research is gradually decreasing, due to the increasing diversity of products " with mean equal (4.35) and high score. The last paragraph is: " The corporate tax system promotes and encourages innovation in companies through tax exemptions on research." with mean equal (3.31) and low Score.

Overall, the axis as a whole, which measures the challenges facing spending on research hade mean equal (4.23) and a high level of strength.

4) What are the most important suggestions and recommendations to improve and enhance the level of financial spending on scientific research and thus the global innovation index?

To answer this question, the arithmetic means and standard deviations of the items were calculated with the field as a whole, and Table (6) shows this.

Table (6): Arithmetic means and standard deviations for the domain items and the "suggestions and recommendations to improve and enhance the level of financial spending on scientific research" as a whole (n=150)

Num	Paragraphs	Mean	SD	Impact level	Rank
1	Technological progress in research is achieved through the use of knowledge accumulation and human capital	4.65	1.03	High	5
2	Spending on SCIENTIFIC RESEARCH and investing in innovation ensures a sustainable educational level for the workforce, creates new products, and improves peoples living conditions.	4.50	1.10	High	8
3	In order to increase productivity and achieve economic growth, individuals and companies must be innovative.	4.66	1.01	High	4
4	Tax policy is the best support for innovation processes.	4.55	1.09	High	7
5	Audit quality directly affects the association between company value and tax aggressiveness. Therefore, this factor becomes the primary tool to motivate companies to plan new tax strategies to increase shareholder value.	4.60	1.05	High	6
6	It is necessary to increase financial spending on scientific research in developing countries in order to catch up with developed countries.	4.72	0.90	High	1
7	It is necessary to increase financial and moral support for researchers to innovate new goods and services because consumer tastes are constantly changing, which contributes to thescientific of countries.	4.70	0.93	High	2
8	It is necessary to develop and innovate new goods because the innovation process will be reflected in the form of the industry in the market and affect the possibility of the survival or withdrawal of many industrial institutions.	4.71	0.96	High	3
	domain as whole	4.63	0.99	High	

It is noticed from the results in Table 6, that the arithmetic means of the paragraphs related to suggestions and recommendations to improve and enhance the level of financial spending on scientific research ranged from (4.55- 4.72) and all paragraphs received a high score.

The paragraph with the highest score, ranking first, states that " It is necessary to increase financial spending on scientific research in developing countries in order to catch up with developed countries." with mean equal (4.72) and high score. The last paragraph is: " Spending on SCIENTIFIC RESEARCH and investing in innovation ensures a sustainable educational level for the workforce, creates new products, and improves" with mean equal (4.55) and a high score.

Overall, the axis as a whole, which measures the suggestions and recommendations to improve and enhance the level of financial spending on scientific research, hade mean equal (4.63) and a high level of strength.

5) What is the difference between the level of financial spending on scientific research in all selected countries (Iraq, Tunisia and Algeria) and to what extent does the level of financial spending on scientific research affect the global innovation index in each of them?

To examine the differences in the level of financial spending on scientific research affect the global innovation index based on countries (Iraq, Tunisia, Algeria), we will use the One-Way ANOVA technique. This technique is suitable for nominal variables with three categories.

Table (7) Shows the mean and standard deviations of the level of financial spending on scientific research affect the global innovation index according to countries

Variable	categories	Mean	SD
countries	Iraq	-1.133	1.218
	Algeria	0.141	.8788
	Tunisia	1.361	1.361

Table (7) shows noticeable differences in the responses of the study sample based on countries variable. One Way ANOVA test was applied to determine statistically significant differences at a certain level of significance. The table (8) shows this.

Table (8): Results of the One Way ANOVA analysis for the differences between the mean responses of the sample individuals based on countries variable.

	Sum Square	DF	Mean Square	F	Sig
countries	26.571	2	13.286	15.594	*0.001

*Correlation is significant at the 0.05 level (2-tailed)

Table (8) shows statistically significant differences in the level of financial spending on scientific research affect the global innovation index based on countries variable. The value of F was 15.594 with a statistical significance of 0.001. The difference was in favor of (Tunisia) with an average of 0.141 and a standard deviation of 0.8788.

General conclusions and recommendations

The current study aimed to explore the impact of research spending on the global innovation index, as it is considered an important variable indicating thescientific and innovation of a society; By monitoring the impact of financial spending on scientific research on the number of researchers and how does the number of researchers affect the global innovation index. It also, examines its impact on the productivity and profitability of companies. In addition to the above, this research identified the main challenges and the most important suggestions and recommendations to improve and enhance the level of financial spending on scientific research and thus the global innovation index, through a sample of 150 individuals working in the field of research from Iraq, Tunisia, and Algeria.

Through this study, it was found that financial spending on scientific research to increasing global innovation; this is consistent with the studies of Romer (1986),Markham et al.,(2010); because research are prerequisites for the existence of technological advancement and global innovation.

The sample respondents agreed to a high degree that increasing the number of workers in the field of research is an indicator of an increase in the number of research and thus raising the innovation index; this can be interpreted as research seeking knowledge through systematic steps, which helps in finding market competitiveness among companies that rely on it, this is consistent with the studies of Wu et al (2020), Huňady & Orviská (2014).

Also, the study found that financial spending on scientific research contributes to increasing the company's profits and makes it a leader in the field of innovation, because SCIENTIFIC RESEARCH seeks to create a competitive opportunity for the company by focusing on expected business performance and intended goals,

which leads to increasing the company's profitability and economic growth, and this is consistent with studies Baden-Fuller & Haefliger (2013), Najjar et al. (2023), Hassan and Tucci (2010), Goser et al. (2016), Kacprzyk and Doryn (2017).

The new in the current study is that it pointed out the most prominent challenges and recommendation to improve and enhance the level of financial spending on scientific research and thus the global innovation index from the point of view of a sample of specialists in the field of research.

Among the most prominent challenges facing financial spending on scientific research according to the Global Innovation Index, are: the roleiveness of financial spending on scientific research is gradually decreasing due to the increasing diversity of products, financial spending on scientific research varies according to the country's progress and economicscientific so this will constitute a challenge for non-developed countries. Also, Corruption negatively affects innovation.

The specialists at Research suggested several of recommendations to improve and enhance the level of financial spending on scientific research, such as: It is necessary to develop and innovate new goods because the innovation process will be reflected in the form of the industry in the market and affect the possibility of the survival or withdrawal of many industrial institutions, this is consistent with study SÖZEN & TUFANER (2013).

Based on the previous results of the study and the recommendations of specialists, the current research recommends a set of proposals, including:

- It is necessary to increase financial spending on scientific research in developing countries in order to catch up with developed countries.
- It is necessary to increase financial and moral support for researchers to innovate new goods and services.

- Motivating companies to use research as an important strategy to achieve profits and make them competitive.
- It is necessary to develop and innovate new goods and expand into new markets.
- Conducting another theoretical study aimed at identifying other factors that affect global innovation other than research.
- Expanding field studies in other Arab countries to know the extent to which these countries use the research strategy.

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