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Why research productivity of some scientists is higher? Effects of social, economic and cultural capital on research productivity

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ABSTRACT

In the past decades, the awareness about the concept of research productivity at higher education institutions has improved which led to an increase in the number of studies dealing with the subject. Such studies mostly deal with correlations between research productivity and organizational elements, gender, age, professional experience, and alma mater characteristics. To provide an innovative dimension to the existing studies this study focuses on the interaction between the research productivity of the scientists and their childhood period and childhood setting. In this context, the aim of our study is to examine the effects of cultural, economic, and social capitals on research productivity of both scientists' current status and their parents' during their childhood. The data were collected from 9499 faculty members through a survey questionnaire which included items on cultural, economic, and social capital. The data on research productivity of the participants were taken from the Web of Science. The major findings of the study are as follows: (a) Turkish scientists both have lower levels of parents' level of-during childhood- and their current level of cultural capital, and they mostly come from families with the lower-middle economic level; (b) they have medium level social capital; (c) cultural and social capitals together can account for 69% of research productivity, and the order of the related items are found to be childhood objectified cultural capital, current embodied cultural capital and parents' embodied cultural capital during childhood; (d) among social capital structures, relational social capital is the strongest predictor of research productivity and (e) economic capital is not a significant predictor of research productivity. We believe that our current findings contribute to the studies on higher education research by uncovering the new relationships between structures.

1. Introduction

Turkey is one of the countries with the largest higher education capacity in Europe with 203 universities, 8 million higher education students and nearly 200 thousand teaching staff [1]. The Turkish higher education system has grown rapidly in the past 20 years. Because 131 of total 203 universities were established during this period. However, this quantitative growth has negatively affected the research productivity of scientists and as a result the rank of Turkish universities in world university rankings has become lower. For instance, no Turkish university is ranked among the first 300 rankings. In addition, in some rankings Turkish universities are not in the first 500 universities worldwide. It is certain that it is because of the lower research productivity at the Turkish universities. However, Turkish scientists are reported to have higher levels of awareness on research productivity [2]. There are some reasons for

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this fact. The most significant and major reason for this is the huge growth of the Turkish higher institutions in the past 20 years. For instance, there were 64 thousand scientists in 2000 which became 80 thousand in 2005, 102 thousand in 2010, 148 thousand in 2015 and 185 thousand in recent period [1]. This expansion was made possible through the softened criteria in entering the graduate studies at universities. More specifically, graduate student admission and graduation criteria were weakened, and faculty member recruitment criteria of many universities were removed or reduced because they could not employ faculty members. The publication and minimum foreign language proficiency points required for associate professorship promotions, which are also carried out centrally, have been reduced or eliminated. As a result of these modifications, the academic inbreeding rate in Turkey has become quite problematic [2]. Another result of this expansion is that the resources allocated to higher education institutions were reallocated to personnel expenditures (salary, insurance payments, etc.), construction and infrastructure expenses of newly established universities instead of research and development activities.

Due to this steep increase in the number of faculty members, this study focusses on the interaction between the research productivity of the scientists and their background and childhood setting. The present study consists of innovative dimensions in comparison to the relevant studies in the literature. First, unlike those working in developed countries, the education level, occupation, and economical status of the parents of Turkish scientists are quite different. An examination of the effects of this difference on the research productivity will contribute to the expansion of Pierre Bourdieu's theory of capital. Secondly, the findings of the study can give us more detailed information about the validity of the common belief that being a faculty member is the profession of the elites. Finally, one of the important questions to be answered is whether the reputation and careers of the scientists whose research productivity is higher resulted from their family background or from their own potential. To answer these questions, the *Human Capital Theory* and the findings of the studies dealing with research productivity were used.

The study is organized as follows: Next section, "Background", covers the findings about the Human Capital Theory and studies on research productivity and research questions. Then the section on "Methodology" presents the information about sample and data collection and data analysis procedures. The section on "Findings" is presented in two subsections. In the first one provides the findings about the validity and reliability of the data analysis and descriptive findings. The second subsection presents the findings about the effects of the cultural, economic, and social capital on the research productivity. Then there are sections on discussion and conclusion.

2. Background

2.1. Human Capital Theory

Intangible assets of individuals are expressed as Human Capital Theory (HCT). Its theoretical framework was developed by the scholars from Chicago School of Economics, including T. Schultz and G. Becker, in the 1950s. It is not only a theory but also an approach which is used to propose policies based on the analyses of human interactions. This strategy places education at the forefront and views it as the engine for economic growth [3]. It expects that human capital is any collection of skills or innate or learned characteristics that enhances an individual's capacity for economic productivity [4].

The HCT also argues that education provides productivity in labor which has effects on gains. The lifetime wages of educated labor serve as a measure of the value of educational investments. Education, employment, output, and income all follow a logical progression. Graduate earnings follow when educated labor acquires a transportable human capital utilized by employers [5]. There are various theories and concepts about the HCT. Of them the most known one is the conceptualization of Bourdieu [6] which includes the following three elements: (a) economic capital, (b) social capital and (c) cultural capital. Control over economic resources (money, assets, and property) is referred to as *economic capital*. The term *"social capital"* describes the present and future benefits of having an ongoing web of established connections. Knowledge and intellectual prowess that support a person in reaching a higher social rank in society are referred to as cultural capital.

According to Coleman [7], when there is a change in the current structure in the process of value creation and the adjustments allow favorable relational outcomes, human capital, regardless of the type, is generated. Individually, capital can be acquired, replicated, and increased through cultural investments to grant access to social networks that enable the creation of both immediate and long-term connections that are advantageous economically [8]. On the other side, increasing human capital is crucial for enhancing business success. Interactions among employees foster a strong commitment to the values and objectives of the business in organizations with a higher degree of human capital. Otherwise, the existing organizational assets lose their effectiveness, causing difficulties in moving towards cultural and economic development. There are findings which supports the importance of human capital in improving employee performance. However, little is known so far about the impact of cultural, economic, and social capital on the research productivity of scientists.

In this study, we focus on the dimensions of the cultural, social, and economic capital and investigate their impact on research productivity at the higher education institutions (HEI). Given that HEI attach much more importance to human capital in contrast to other organizations, it is important to examine the contributions of the cultural, social, and economic capital. As a result of this study, we aim to fill the gap in studies on higher education and to understand the role of the cultural, economic, and social capital in developing HEIs, and to present evidence-based data to administrators and policy makers about effective ways to improve organizational performance.

2.2. Cultural capital

The concept of cultural capital was developed by Pierre Bourdieu and has been frequently used in the studies on education [9]. In

Bourdieu's theory of cultural reproduction, the concept of cultural capital was developed as a tool to explain how children's achievement at schools depends on the educational level of their parents [10]. It was first conceptualized as the language of capital, meaning the advantages of heirs, but the term was replaced by cultural capital in the 1979 edition [11]. With an investigation of the lifestyles, tastes, cultural competences, and with input from various groups, as well as their attitudes on cultural, ethical, and political subjects, this concept of cultural knowledge, habits, and benefits derived from tastes has spread from the education system to the entire society in *Distinction* [12].

According to the hypothesis, having educated parents benefits their children in more ways than one may think of, including both in-home support and access to high-brow cultural artifacts like arts and music [13]. Reiterating his definition from earlier, Bourdieu [6,14,15] stated that cultural capital is an equal resource to economic resources (economic capital) and social networks (social capital), and that it is knowledge of the prevalent cultural codes written in a society. In addition, he asserted that cultural capital is a resource in itself and may be converted into economic and social capital [16].

In summary, the term "cultural capital" in the most general sense refers to the cultural characteristics that are rewarded in fields such as education. Yet Bourdieu has used the term differently in his various writings. Nearly forty-five years after the term used in the studies, there is still no consensus on its definition [9]. The theory about the concept has also been interpreted in various ways. Some authors have criticized its narrow interpretation for expressing participation in the fine arts and have argued that cultural capital should be seen to include certain forms of skills and knowledge that are rewarded in the education system [17].

Bourdieu [6,18] stated that there are three types of cultural capital: (a) embodied (language, attitudes, preferences, etc.), (b) objectified (cultural goods, books, works of art, etc.) and (c) institutionalized (educational credentials). It may promote social reproduction in all three states. Cultural capital refers to legitimized knowledge and social tendencies transmitted through socialization processes, parental education, social and family networks, and other links to privilege. Cultural capital can be embodied, for example, in the way students dress, walk or talk. In short, cultural capital is objectified or institutionalized. Parents either unwittingly pass on their cultural capital to their offspring by exposing them to objectified and physical forms of it while they are together, or they actively use their cultural capital in the transfer of it to offspring. Children eventually acquire their parents' cultural capital, which becomes ingrained in their conduct and is referred to by Bourdieu as habitus [16]. Habitus is the intellectual propensity that is physically manifested, and it joins forces with social positions to create a social connection structure. It is a set of internalized schemas that enables us to comprehend how all thoughts, perceptions, and behaviors specific to a culture are created [19].

In this study cultural capital is conceptualized in three ways. The first one is *institutionalized cultural capital* dealing with the educational and professional levels of parents of scientists. The second one is *objectified cultural capital* dealing with the number of books and artistic products at their childhood home and at their current homes and offices. The last one is *embodied cultural capital* which refers to their involvement. However, of them *institutionalized cultural capital* is not used in the study.

Although there have been many studies evaluating the effects of cultural capital on academic achievement, the studies evaluating its effects on the research performance of scientists are limited. Scientists particularly are one of the professions that bring the highest degree of cultural capital stocks to the academy, i.e., to their positions. Cultural capital is crucial for scientists in their professional lives and can have a favorable impact on their individual performance, just like it does in many other professions. More precisely, those with greater cultural capital have shown improved performance in many studies [20–23]. For this reason, we hypothesized that cultural capital would influence how productively scientists conduct their research.

2.3. Social capital

The concept of social capital and the importance of human relations gained popularity in the late eighties with the work of Pierre Bourdieu and James Coleman [24]. Central to the concept of social capital is the idea that relational resources within a community can be used by specific actors to achieve desired outcomes [19]. While some researchers focus on interactions that connect different actors as sources of social capital (for example, Burt [25]), other researchers emphasize the nature of shared values that underpin interactions between people (for instance, Coleman [7]). In the most general sense, social capital includes social networks and the norms of reciprocity and reliability arising from them [26]. Social capital is a frequently discussed concept, and there is no consensus on its definition. The distinction between individual social capital and collective social capital, evident in the works of Bourdieu, Coleman, Sampson, Putnam, and Fukuyama, remains to this day. Social capital manifests itself through social cohesion through mechanisms such as mutual trust, social norms, and reciprocity. On the other hand, social capital can also be conceptualized as a formation arising from a social network that provides resources such as social support, knowledge and prestige [24].

In conceptualizing social capital, Bourdieu focuses on the effects of individual-level connections, while Coleman focuses on the functional importance of social capital and its place in social structures as well as its outputs for small groups such as families [27]. This means that social capital is a multidimensional construct that encompasses both structural (networks) and attitudinal (norms) features [28]. Nahapiet and Ghoshal [29] drew attention to the opposite structural and attitudinal aspects of social capital and argued that the concept is a multidimensional entity. These dimensions are structural (connections between actors), relational (trust among actors), and cognitive (shared goals and values among actors).

In this study social capital is divided into three subsets. The first one is *structural social capital* which refers to the interactions of scientists with others and units. The second one is *relational social capital* dealing with the trust, norms, and expectations between participants of the organizations. The last one is cognitive social capital which refers to the level of sharing the common organizational goals and values by the scientists.

Social capital refers to the resources and benefits we obtain as individuals or groups through our connections with others [30]. From an individual perspective, social capital can affect job performance in different ways. However, due to the diversity in the

conceptualization and functionalization of the social capital structure, our understanding of social capital's relationship to individual measures of job performance is lacking. In particular, the social capital of scientists is very important in their professional lives, as in many other professions, and can positively affect the research productivity of scientists. In short, research on individuals with high social capital has revealed that these individuals show higher productivity [31–36]. Therefore, in the study, it was thought that social capital affects the research productivity of scientists.

2.4. Research productivity

Over the last four decades, numerous HEIs have used the New Public Management model to increase their effectiveness using private sector-based performance standards and output controls [37]. With this model, output-based research productivity has been used in the evaluation of scientists at HEIs. This has had profound consequences for both HEI and scientists, and many HEIs have switched to a performance-based research evaluation system [38]. It can be stated that this system is employed by almost all HEIs. For this reason, the concept of research productivity is now defined by the number of articles, citations and H-indexes collected in databases such as Web of Science (WoS) and Scopus [39–41].

With the introduction of the concept of research productivity, research productivity differences among scientists have attracted the attention of many researchers [42–46]. It is possible to classify the studies on this subject in two sub-groups. The first group of studies generally focused on personal factors such as age, gender, and academic title as variables affecting research productivity [47–56]. For example, Finkelstein [57] concluded that scientists' research orientation, PhD degree, early publication habits, communication with colleagues, and time devoted to research had significant effects on the number of their publications. In another study, Henry et al. [58] found that personal, environmental and behavioral factors have significant effects on their research productivity. In many studies, significant relationships were found between research productivity and personal factors such as gender, age, marital status, and having children [59,60]. In another large-scale study, individual characteristics such as motivation, professional networks, and research training received are found to have significant effects on scientists' research productivity [61].

In the second group of studies, organizational factors such as department size, university ranking/prestige, managerial characteristics, and budget come to the fore to explain research productivity [62,63]. For example, it is found that the climate of the department (work/life balance) is highly effective on faculty research productivity [64,65]. Similarly, scientists employed by a large university that reward research and give faculty members enough time to do research are found to be more productive. Allison and Long [66] showed that the more prestigious the university where scientists work, the higher the productivity of the scientist, and the effect of the workplace on productivity is stronger than the effect of productivity on the decision to choose a workplace. In summary, it can be said that high research productivity is associated with individual characteristics, fifteen institutional characteristics and leadership in studies on research productivity of scientists [67].

As can be seen from the findings given above although the factors affecting the research productivity of scientists have been examined for many years, there are no studies focusing on the connection between the research productivity of scientists and their childhood environment they grew up in. In our study, we focused on the effects of scientists' childhood cultural and economic capital and current social capital on their research productivity. In addition, the definition of research productivity used in the study is a combination of the number of articles published in internationally respected journals and the number of citations received by these articles [2].

2.5. Research questions

The aim of this study is to examine the effects of scientists' childhood cultural and economic capital and current social capital on their research productivity. Therefore, the first research question (**RQ_1**) is formulated as follows: What is the current cultural, economic, and social capital of scientists in Turkey and their parents during their childhood? The **RQ_2** is as follows: How do scientists' parents' cultural, economic, and social capital during their childhood affect their research productivity? To answer this research problem, factors such as gender, academic title, academic experience (years from PhD degree to date), the number of students per

Table 1
Distributions regarding the demographic characteristics of the participants.

Variables	n	%
Gender		
Female	4769	50.2
Male	4730	49.8
Academic Title		
Professor	2884	30.4
Assoc. Professor	2830	29.8
Assistant Professor	3785	39.8
Science Area		
Social Sciences	3531	37.2
Science and Math	1894	19.9
Engineering	1490	15.7
Health Science	2584	27.2

scientists, and university size, which are assumed to affect research productivity, were taken into consideration. The last **RQ_3** is as follows: How do scientists' cultural, economic, and social capital affect their research productivity? In order to answer the last research question, the effects of factors assumed to affect their research productivity were taken into just as in RQ_2.

3. Methodology

3.1. Sample

The related sample of the study is 89,848 scientists working at 200 Turkish universities [1]. The data of the study were collected from 9499 scientists who voluntarily took part in the online questionnaire. Of the participants, 4769 (50.2%) were female and 4730 male (49.8%). Their age ranges between 29 and 73 ($M = 45.5$; $SD = 8.6$). The rate of scientists who have the title of assistant professor is 40% ($n = 3785$) (Table 1). The reliability coefficient of the study is 99% with an error margin of 0.02. Therefore, minimum required number of participants out of 89,848 scientists is 3964 [68]. Given that the number of participants is 9499 in the study, it is sufficient to represent Turkish scientists. In addition, the stratification in terms of various characteristics of the participants (such as gender, academic title, fields) is like the stratification for the general academic number.

3.2. Measurements

At the beginning of the study a study protocol titled "Scientific Research and Publication Ethics Committee" was approved. We developed a form containing demographic questions and contacted scientists. First, we explained the purpose of the study to the scientists and informed them about the confidentiality of the data, the voluntariness and anonymity of participation. We then collected informed consent forms. A link about the survey was sent to the scientists who declared that they would be participants, and they were asked to answer the survey questions online. It took about 10 min for the participants to answer the questions.

3.3. Measurement of the cultural capital

In the questionnaire there are nineteen items about **cultural capital** which have five dimensions. The first five items are about the "**Institutionalized Cultural Capital**". The items are of classification type. Their scores were calculated using the "Equality 1" [69]. The professional skill scores of the participants' parents were determined by the ISCO-08 (2008) rating, and for their education level, the UNESCO 2011 version's International Standard Classification of Education (ISCED) was used which included the level rating of 0–8. Given that all study participants had the same degree of education and occupation, those factors were not taken into account while calculating the Institutionalized Cultural Capital component. The institutionalized cultural capital score is evaluated between 0.5 and 9. A high score indicates higher institutionalized cultural capital.

((mothers' professional skill + mothers' educational level) / 2) + ((fathers' professional skill + fathers' educational level) / 2)Equality 1

Two items in the questionnaire deal with the **"Objectified Cultural Capital (Childhood period)"**. The related items are given as follows: Q1: "How many books (excluding textbooks) were at your home when you were a child?" and Q 2: "How many artworks (paintings, sculptures, etc.) were at your home when you were a child?" The answer options for I1 are as follows: "10 books or less", "11–25 books", "26–100 books", 101–200 books", "201–500 books" and "more than 500 books." The answer options for Q2 are as follows: "None", "1–2 artworks", "3–5 artworks", "6–10 artworks" and "more than 10 artworks". Concerning the participants' objectified cultural capital (childhood) scores, the lowest book/artwork group was scored from 0 to 5. Then, objectified cultural capital scores were obtained by summing the scores of the two items for each participant. The objectified cultural capital score is evaluated on a scale of 2–10. A high score indicates higher objectified cultural capital.

Three items in the questionnaire are about the **"Objectified Cultural Capital (Current)"**. The related items are given as follows: Q1: "How many books are at your home and office?", Q2: "How many classical literatures, poetry books, novels, etc. are at your home and office?" and Q3: "How many artworks (paintings, sculptures, etc.) are at your home?" The answer options for Q1 and Q2 are as follows: "10 books or less", "11–25 books", "26–100 books", 101–200 books", "201–500 books" and "more than 500 books." The answer options for Q3 are as follows: "None", "1–2 artworks", "3–5 artworks", "6–10 artworks" and "more than 10 artworks". Concerning the participants' objectified cultural capital (current) scores, the lowest book/artwork group was scored from 0 to 5. Then, objectified cultural capital scores were obtained by summing the scores of the two items for each participant. The objectified cultural capital score is evaluated on a scale of 3–15. A high score indicates higher objectified cultural capital.

The four items of the questionnaire measure the **Embodied Cultural Capital (Childhood)** dimension of cultural capital. These items measuring this dimension are as follows: Q1: "How often did your family members read books in your childhood?", Q2: "What was your level of participation in extracurricular activities in your childhood?", Q3: "How often did you discuss political or social issues with your parents in your childhood?" and Q4: "How often did you discuss books, movies or television shows with your parents as a child?". A seven-point Likert scale was used to evaluate the answers given to these items of this dimension (1 = "Never or Almost Never" to 7 = "Pretty much"). The total score of embodied cultural capital is divided by the number of items, and this average score is evaluated. A high score indicates a higher level of embodied cultural capital.

The six questions of the questionnaire measure the **Embodied Cultural Capital (Current)** dimension of cultural capital. These items measuring this dimension are as follows: Q1: "How often do you travel?", Q2: "How often do you use/speak a foreign language?",

Q3: "How often do you visit places such as museums, ruins and exhibitions?", Q4: "How often do you go to theatres, dance shows, concerts?", Q5: "How often do you communicate with your friends living in other countries?" and Q6: "How often do you read books?". A seven-point Likert scale (1 = "Never or Almost Never" to 7 = "Pretty much") was used to evaluate the answers to these items of this dimension. The total score of embodied cultural capital is divided by the number of items, and this average score is evaluated. A high score indicates a higher level of embodied cultural capital.

3.4. Measurement of economic capital

The **Economic Capital Structure** consists of one dimension and was measured with 3 items in different types. The items measuring the economic capital structure are as follows: Q1: "How would you describe your family economically in your childhood?", Q2: "How many siblings do you have?" and Q3: "Where did you live in during your childhood (0–7 years)?" The first item was answered choosing one of the options as follows: low, below medium, medium, above medium, high, and very high. The potential answers to the second item are as follows: none, I have 1 sibling, I have 2 siblings, I have 3 siblings and I have more than 4 siblings. The potential answers to the third items are as follows: village, town, district and province. In the economic capital responses of the participants, the lowest economic level was scored with 1 and the highest level with 6. Sibling numbers were scored from 1 to 5, from highest to lowest. The childhood settlement was scored between 1 and 5 from the village to the city center. Afterwards, economic capital scores were obtained by summing the scores from the three items for each participant. The economic capital score is evaluated between 3 and 16. A high score indicates higher economic capital.

3.5. Measurement of social capital

In the questionnaire there are fifteen items about social capital under three dimensions. The first dimension is "**Cognitive Social Capital**" about which there are six items. The second one is "**Relational Social Capital**" which has five items. The last one is "**Structural Social Capital**" which was measured with four items. The answers to these fifteen items were given using a 7-point Likert type scale (1 = "never or almost none" and 7 = "very often"). The total score in each dimension is divided by the number of items, and this average score is evaluated. A high score indicates higher relevant social capital.

3.6. Measurement of research productivity and normalization

In this study, the number of articles and citations, which are universally accepted scientific output measures for research productivity, were used as the main indicator. We used the Web of Science (WoS) database for scientists' article and citation in article' information (Queries were run between 07–10 January 2023). Web of Science (formerly Web of Knowledge) is a website that provides subscription-based access to multiple databases that provide comprehensive citation data for many different academic disciplines. Web of Science Core Collection's (*i*) Science Citation Index Expanded (SCI-Ex.), (*ii*) Social Sciences Citation Index (SSCI) and (*iii*) Arts & Humanities Citation Index (A&HCI or AHCI) databases were used for queries. We have chosen this database because it is used both as a reference for academic appointments and promotions in Turkey and by university ranking bodies, and is therefore considered a representative of quality peer-reviewed publications [70].

We searched WoS for every academic who participated in the study and whose names were obtained through dynamic software. In the WoS search, we used a few combinations for author names such as first name, last name, first letter of first name, surname, first letter of last name. For female researchers, we included the surname differences due to their marital status into the data set with an algorithm we developed in the study. Then, we recorded the number of articles and citations in an Excel file in response to each scientist.

The number of articles and citations of the scientists showed great interdisciplinary differences. The source of the difference is the publication production processes in the discipline, the international nature of the discipline, academic appointment, and promotion criteria [2,71]. For this reason, we have normalized the number of articles and citations of each scientist for their own discipline (social sciences, natural and mathematical sciences, engineering, and health sciences) in order to eliminate both the normal distribution of the number of articles and citations used in research productivity and the differences arising from the discipline in the study. For this reason, we considered scientists whose raw article and citation numbers are 3 and 1.5 times the interval between the median value of the relevant discipline and the median value of the relevant discipline. After these scientists were given 100 and 99 points, respectively, we applied logarithmic transformation to the remaining scientists and scored them linearly in the ratio of raw articles or citations in the range of 0–98 points. In the next process, we collected the "normalized article" and "normalized citation" scores calculated over 100 points and recorded them as the "**research productivity score**" of the relevant scientists. The differences of normalized research productivity scores between disciplines were examined by AVOVA analysis, and the results showed that the normalized research productivity averages did not differ according to disciplines ($p > 0.05$).

3.7. Date analysis

In the present study, we employed explanatory factor analysis (EFA), partial least squares (PLS), hierarchical regression analysis, correlation analysis, and confirmatory factor analysis (CFA). A two-stage strategy was chosen since the structures of embodied cultural capital (childhood and current), economic capital, and social capital are secondary frameworks. We originally used EFA with varimax rotation to assess first-order latent structures. The validity of the measurement models was then examined using convergent validation

and discriminant validation. Cronbach's alpha and composite reliability (CR) were employed to assess the measurement's dependability. Using Pearson correlations, we examined the connections between social, cultural, and economic capital. We evaluated the relationship between research productivity and cultural, economic, and social capital using hierarchical regression analysis. In the model, the dependent variable was research productivity, and the independent variables were cultural, economic, and social capital. The hierarchical regression model allows the researcher to determine the order of entry of the independent variables into the regression equation. Thus, each independent variable is evaluated at its own entry point for the additional explanatory power it contributes to the equation [72]. In the analysis, we added the independent variables to the model in order of time: (a) childhood cultural and economic capital, (b) current cultural capital, and (c) social capital. Based on previous findings, we aimed to control the effects of several potential variables that may be related to research productivity. As control variables, we chose gender, academic title, academic age (years from doctorate degree to present), number of students per academic, and university size. In the study, the Variance Inflation Factor (VIF) was employed to detect the multicollinearity between all explanatory variables. In the analysis, we found all VIF values between 1.00 and 2.20. Therefore, there is no multicollinearity between the explanatory variables. The significance level for the data analyses conducted for this investigation was set at $p < 0.05$. The data were coded and analyzed using SPSS 23.0, Statistical Package for Social Sciences.

4. Results

4.1. Instrument validity and reliability

Prior to the analysis in the study, we used exploratory factor analysis to verify that the measurements were one-dimensional. Institutionalized and objectified cultural capital structures were excluded from the EFA because, as was mentioned in the measures section, they only had one formative score. First, it was recognized that the findings of the KMO and Bartlet test analyses of the acquired data might be used to conduct an exploratory factor analysis. The factor loading of all items was later found to be over |0.50| and only one factor was loaded when EFA was conducted with varimax fundamental axis rotation (Table 2).

Based on EFA, the constructs were found to produce between 0.52 and 0.66 AVE. Therefore, it can be said that all constructs have convergent validity. The Cronbach α reliability coefficients of the measurement models were found to be between 0.77 and 0.83. CR coefficients range from 0.87 to 0.94, with good to very good reliability. Therefore, the questions in each construct are highly correlated, indicating that they measure the same latent construct (Table 3).

Table 2
Exploratory factor analysis results.

Embodied Cultural Capital (Childhood)	FL	Com.
1. How often did your family members read books in your childhood?	.907	.823
2. What was your level of participation in extracurricular activities in your childhood?	.855	.731
3. How often did you discuss political or social issues with your parents in your childhood?	.789	.623
4. How often did you discuss books, movies or television shows with your parents as a child?	.588	.415
Embodied Cultural Capital (Current)	**FL**	**Com.**
1. How often do you travel?	.785	.661
2. How often do you use/speak a foreign language?	.735	.616
3. How often do you visit places such as museums, ruins and exhibitions?	.720	.545
4. How often do you go to theatres, dance shows, concerts?	.712	.518
5. How often do you communicate with your friends living in other countries?	.658	.507
6. How often do you read books?	.525	.376
Cognitive Social Capital	**FL**	**Com.**
17. I can trust the promises made by my colleagues at the university.	.877	.779
16. I know that my colleagues at the university will not take advantage of troubles or problems.	.788	.626
19. I trust to share specific ideas, feelings, and goals with my colleagues.	.780	.664
13. I feel that the majority of my colleagues at the university are enthusiastic about completing tasks.	.765	.618
18. Most of the people who work with me are ready to help if needed.	.763	.656
15. I feel that the majority of my colleagues at the university care about the interests of the academy.	.614	.398
Relational Social Capital	**FL**	**Com.**
9. I think that I have a strong academic network.	.855	.757
8. I have many friends working at different universities.	.808	.666
7. Individuals frequently visit me to have scholarly information.	.721	.543
11. I am active member of a study group, an administrative committee, or an organization.	.683	.511
12. I feel that the research team shares a common point of view during the joint academic works.	.664	.587
Structural Social Capital	**FL**	**Com.**
1. I have strong bonds with my family.	.866	.770
3. I speak to my family members about every topic.	.847	.744
2. I have a habit of visit my family members, siblings or other relatives on a weekly basis.	.770	.610
4. My home environment is friendly and healthy.	.753	.615

Note: FL = factor load; Com. = communality.

Table 3
Reliability, convergent validity and unidimensionality.

Dimensions	Items	AVE	A	CR	KMO	D.
1-Embodied Cultural Capital (Childhood)	4	.63	.79	.87	.83	1
2-Embodied Cultural Capital (Current)	6	.55	.78	.90	.80	1
3-Cognitive Social Capital	6	.52	.83	.94	.87	1
4-Relational Social Capital	5	.59	.80	.90	.90	1
5-Structural Social Capital	4	.66	.77	.88	.88	1

Note: AVE = average variance extracted; α = Cronbach's α; CR = composite reliability; KMO = measurement of suitability of the Kaiser–Meyer–Olkin sample; D. = dimensionality.

4.2. Common method bias

Harman's single factor test was used to control for common method bias [73]. All dependent and independent variables were examined using the explanatory factor analysis. It was found that the factors together account for 55.25% of the total variance. However, the first factor accounts for only 10.14% of the variance. These findings indicate that there is no problem in the data set indicating common method bias [74].

4.3. Descriptive findings

The cultural, economic, and social capitals of scientists are described (see Table 4). Institutionalized cultural capital scores of scientists' families ($M = 3.70$) and their both childhood and current Objectified Cultural Capital scores (childhood $M = 2.09$; current $M = 2.95$) are quite low. Their Embodied Cultural Capital score (childhood $M = 3.71$; current $M = 4.63$) is found to be moderate. Their childhood economic capital scores ($M = 8.82$) are also found to be moderate. Their Cognitive Social Capital score ($M = 4.46$) is also found to be moderate, while their Relational Social Capital score ($M = 5.15$) and their Structural Social Capital score ($M = 5.66$) are found to be mid-high. Before testing the theoretical models created in the study, the correlation coefficient of the relations between cultural capital, economic capital and social capital scores was examined. The results showed that there is a positive significant correlation between cultural capital, economic capital and social capital.

4.4. Multi variable analysis

We conducted a four-stage hierarchical regression analysis to determine the effects of cultural, economic, and social capital on research productivity. In the study, we aimed to control the effect of several potential variables that may be related to research productivity (the dependent variable). **Model 1** included gender, academic title, academic experience (year since doctoral degree), number of students per academic, and university size. **Model 2** covered the scientists' childhood Cultural Capital (Institutionalized, Objectified and Embodied) and Economic Capital variables. **Model 3** included their current Objectified and Embodied variables. **Model 4**, on the other hand, consisted of their Social Capital (Cognitive, Relational and Structural) variables. The result of the hierarchical regression analysis is presented in Table 5.

In the first model, five control variables significantly accounted for only 0.03% of the variance in research productivity ($\Delta F_{(5, 8958)} = 57.81$, $p < 0.01$). The results showed that there is a positive relationship between research productivity and gender, academic title, and academic experience. In addition, a negative significant relationship was found between the number of students per academic and research productivity. However, there is no significant relationship between research productivity and university size.

The inclusion of the scientists' childhood Cultural Capital and Economic Capital variables in the second model significantly accounted for 32% of the variance in research productivity ($F_{(9, 8954)} = 471.95$, $p < 0.01$). This resulted in a statistically significant improvement in the variance explained (R^2 change = 0.29) in contrast to Model 1 ($\Delta F_{(4, 8954)} = 958.72$, $p < 0.01$). The results showed a positive and significant relationship between scientists' childhood Cultural Capital and research productivity. However, there is no significant relationship between economic capital and research productivity. These results show that the second group of variables

Table 4
Descriptive statistics of the study variables.

Dimensions	*M*	*SS*	Min.	Max.	1	2	3	4	5	6	7	8	9
1-Institutionalized CC.	3.70	2.31	0.5	9	–								
2-Objectified CC. (Childhood)	3.11	2.09	2	10	.58**	–							
3-Objectified CC. (Current)	10.35	2.95	3	15	.10*	.35**	–						
4-Embodied CC. (Childhood)	3.71	1.48	1	7	.49**	.61**	.25**	–					
5-Embodied CC. (Current)	4.63	1.06	1	7	.22**	.27**	.44**	.38**	–				
6- Economic Capital	8.82	2.51	3	16	.58**	.45**	.09**	.39**	.26**	–			
7-Cognitive SC.	4.46	1.21	1	7	.03*	.07*	.04	.16**	.17**	.02	–		
8-Relational SC.	5.15	1.20	1	7	.06*	.13**	.23**	.26**	.46**	.04*	.39*	–	
9-Structural SC.	5.66	1.21	1	7	.14**	.21**	.12*.	.36**	.25**	.16**	.24*	.29**	–

***Note*:** CC. = Cultural Capital; SC. = Social Capital *$p < 0.05$; **$p < 0.01$.

Table 5
Hierarchical regression analysis of research productivity.

Predictors	Model 1			Model 2			Model 3			Model 4		
	B	SE	β	B	SE	β	*B*	*SE*	β	B	SE	β
(Constant)	3.33	1.51		−22.74	1.44		−39.38	1.46		−36.86	1.63	
Gender (*ref.*: Female)	5.52	.39	.14*	.52	.34	.01	−.48	.33	−.01	−.53	.33	−.01
Academic Title (*ref.*: Professor)	2.65	.54	.06*	.36	.45	.00	−.20	.43	−.00	.03	.44	.00
Academic Age (Years after PhD/MD)	.10	.02	.04*	.19	.02	.08*	.12	.02	.05*	−.06	.03	−.01
University Student Size (*ref.*: large)	−2.61	.68	−.04*	.71	.57	.01	1.17	.54	.01**	−.01	.02	−.00
Number of Students per Faculty Member	−.07	.05	−.01	−.22	.04	−.04*	−.14	.04	−.02*	−.14	.04	−.02*
Institutionalized Cultural Capital				.48	.10	.06*	.64	.09	.08*	.62	.09	.07*
Objectified Cultural Capital (Childhood)				2.69	.11	.30*	2.29	.11	.25*	2.28	.11	.25*
Embodied Cultural Capital (Childhood)				.88	.03	.27*	.63	.03	.20*	.66	.03	.21*
Economic Capital				.01	.08	.00	−.22	.08	−.03	−.23	.08	−.03
Objectified Cultural Capital (Current)							.64	.06	.10*	.64	.06	.11*
Embodied Cultural Capital (Current)							.69	.02	.23*	.73	.03	.24*
Cognitive Social Capital										.41	.04	.06*
Relational Social Capital										.70	.03	.12*
Structural Social Capital										.33	.08	.02*
R		.17			.56			.62			.69	
R^2		.03			.32			.39			.48	
R^2 change		.03			.29			.07			.09	
F change		57.81			958.72			509.77			581.13	
Sig.		<.010			<.001			<.001			<.001	

*$p < 0.01$.

(childhood Cultural Capital and Economic Capital) is a greater predictor than the control variables (Model 1).

The third model significantly accounted for 39% of the variance in research productivity by including scientists' current Cultural Capital variables in the model ($F_{(11, 8952)} = 522.71$, $p < 0.01$). Model 3 led to a statistically significant improvement in the variance explained (R^2 change = 0.07) compared to the previous model ($\Delta F_{(2, 8952)}$ change = 509.77, $p < 0.01$). The results showed a positive and significant relationship between the current Cultural Capital of scientists and their research productivity.

The last model explained 9% of the variance with the addition of the Social Capital variable (R2 change = 0.09), resulting in an improvement in the model ($\Delta F_{(3, 8953)}$ change = 581.13, $p < 0.01$). This result shows that the addition of three social capital variables (Cognitive, Relational and Structural) has a significant effect on research productivity. Overall, the final model explained 69% of the variance in research productivity and revealed eight variables that contributed significantly to research productivity. A strong predictor of research productivity is found to be childhood objectified cultural capital. The current Embodied Cultural Capital and the childhood Embodied Cultural Capital followed this. Additionally, among social capital structures, Relational Social Capital is found to be the strongest predictor of research productivity. However, there is no significant prediction power of Economic Capital in all models.

5. Discussion

The evaluation of research productivity has become a prominent focus for countries worldwide due to several factors, including international benchmarking systems, rankings, performance-based funding schemes, and the pressures of academic capitalism. Higher education scholars such as Altbach [75], Hicks [38], and Slaughter and Rhoades [76] have shed light on these pertinent issues. In this study, we focused on the effects of scientists' families and childhood periods on research productivity, which are partially neglected in studies on higher education. More importantly, the study examines the childhood and current cultural, economic and social capital levels of scientists and their impacts on individual research productivity (articles and citations) (all other factors being equal) in four main disciplines (social sciences, natural sciences, engineering and health sciences). Therefore, the study differs from previous studies and provides important evidence about the research productivity in Turkey.

Most of the parents of scientists in Turkey are primary and secondary school graduates (institutionalized cultural capital). It was found that there were almost no books (objectified cultural capital) at their homes. As the shared cultural background (embodied cultural capital) of the scientists and their parents is very limited, the fact that they had low numbers of books at home is an expected outcome. Similar to cultural capital, the majority of scientists come from lower-middle and middle families. Universities not only act as centers for acquiring and producing science but also provide venues to learn how to access knowledge, to explore the types and forms of it as well as culture and art. For this reason, it is very important for scientists to have a high cultural capital in terms of the qualified human training cycle. Linking these points with the findings of the study, the cultural capital that the scientists bring to the research

context with them has a significant relationship with research productivity in the long term. As in many other fields, the conditions and criteria of legitimate belonging and hierarchy are important in the academic field as well [77]. However, the Turkish higher education system does not reflect this situation. The conceptual discussions on being a scholar revolve around perceiving the profession as elite in Turkey, which is not realistic for the current context. A recent study by the [2] found that even research assistants, most of whom are in their 20s, have very low cultural capital.

During the period of the early Republic (1920–1940) academic staff mostly studied abroad due to the lack of qualified staff with high cultural capital needed by the academy. These people served for a long time with their high social and cultural capital at the universities. The grandchildren of elite grandfathers, who have high cultural capital, went to study abroad with the influence of their habitus, and when they returned, they found a place at the universities according to their preferences and inclinations [78]. Bourdieu [79] defines this situation as the space of powers and states that different categories of professors are reproduced to the extent that they maintain their higher position among the scientists in the group of lecturers in higher education institutions. Today, being an academic in Turkey is similar to the cultural elite of the society, and being an academic does not require having a high cultural capital or a lifestyle according to the habitus of this group. We can attribute this to a few things. The first is disregarding meritocracy due to the increase in the number of universities and the emerging need for scientists. The second is that research assistants are hired for indeterminate positions based on only the results of central multiple-choice exams. Further, they start faculty positions as quickly as possible to meet the need for faculty members resulting from the quantitative growth without a pertinent and appropriate level (in terms of quality, experience and number of publications and citations) of publication record after completing their doctorate studies. The third is that universities accept doctoral students beyond their capacities in order to meet the need for faculty members. For example, a cohort of more than 30 doctoral students was admitted in just one year in a field where the number of faculty members was only six. This practice impacts research productivity, the universities, and the students in multiple aspects such as decreasing the quality of both incoming and graduating students, decreasing the quality of instruction and research activities and finally leaving little time for high-quality research.

The results of the four-stage hierarchical regression analysis carried out to reveal the effects of cultural, economic, and social capital on research productivity can be summarized as follows:

- The study model accounts for 69% of the research productivity variance.
- Both childhood and current cultural capital structures significantly affect the research productivity of scientists. The effect size of the types of cultural capital is found to be as follows: childhood objectified cultural capital ($\beta = 0.25$), current embodied cultural capital ($\beta = 0.24$), childhood embodied cultural capital ($\beta = 0.21$), current objectified cultural capital ($\beta = 0.21$) and institutionalized cultural capital ($\beta = 0.27$).
- Social capital structures significantly affect the research productivity of scientists. The effect size of the types of social capital is found to be as follows: relational social capital ($\beta = 0.12$), cognitive social capital ($\beta = 0.06$) and structural social capital ($\beta = 0.02$).
- There is no relationship between the effect of childhood economic capital on the research productivity of scientists.

The most important finding obtained in the study is that the parents of the scientists and the environment they grew up in (childhood cultural capital) are associated with higher research productivity. This outcome supports the cultural capital theory in that the attitudes and behaviors arising from learning outside the school environment are also effective in the working environment [80]. In the context of the current study, we can claim that the cultural capital that students gain from their families in their childhood has an impact on their productivity. In Turkish context, the research productivity of scientists is found to be low in relation to this background. Bourdieu argued that middle-class parents, who are supposed to be more familiar with the legitimate culture, pass on their cultural capital to their children through active socialization (for example, taking the child to a museum) and passive role modeling (for example, reading a book at home). Children also transform their cultural capital into educational outcomes in the school environment. For Bourdieu, schools are middle-class institutions that reward cultural capital and familiarity with the legitimate culture of the ruling classes [81]. The fact that research productivity is more affected by childhood cultural capital than current cultural capital indicates that the cultural choices of scientists may affect their productivity less than the cultural background they bring from their families. In addition, many studies have found a positive relationship between cultural capital and educational success [21,82–86]. From this point of view, our results suggest that the low cultural capital acquired by scientists in Turkey from their families is directly related to their research productivity in their current positions and thus the rankings of Turkish universities in various rankings lists. Since the ranking of higher education institutions can be considered as a kind of indicator of the cultural capital of the scientists working at these institutions, it is extremely important [87], as it becomes the main indicator of the successful competitiveness of the relevant countries in many areas in the global arena in terms of research and knowledge production or research productivity. Bourdieu [88] states that the dominant capital of the scientists, or their dominant capital among all types of capital, is their cultural capital. For example, many studies have reported that individuals' cultural capital has a predictive effect on their future in science [89–94]. In another study conducted by the author of this study, it was found that the self-cultural capital of scientists could account for 13% of their individual job performance. Based on the previous studies, it can be stated that the cultural choices of scientists may affect their research productivity more than the cultural heritage they have acquired from their families.

The impact of social capital on research productivity is found to be limited. The results showed that relational social capital, one of the social capital structures, resulted in higher individual job performance. This finding is consistent with the conceptualizations of Coleman and Lin. Social capital theory [7], assumes that social structure and social relations can create value and facilitate the actions of individuals in a social structure. For this reason, having a common perception about information workers such as scientists will increase sharing information obtained/to be obtained. This allows especially relational social capital to be linked to the network

structure and social resources of the person who can effectively predict career success [33]. Aronowitz [95] associates this situation with the social circles that scientists have established in this process, rather than their academic achievement. In this sense, academic capital as stated by Bourdieu [79] can be expressed as taking part in a relationship established with an environment that strengthens their own position in the hierarchy determined by the power circles at the top in the reproduction of academic staff. In other words, the fact that cultural capital is not distributed equally, as well as being legitimized by laws or cultural acceptances, it can be stated that it is reproduced every time with the inclusion of individuals in the system [96]. The finding that "cognitive social capital has a greater effect on performance than relational social capital" obtained in the study by Kim and Shim [97] contradicts with the present findings. The main reason for this may be due to the fact that Kim and Shim [97] study was conducted in the tourism sector, where the difference between the cultural capital of the employees is small.

This study showed that cultural capital, including that in childhood is the most important indicator of the research productivity. It can be said that this situation supports the idea expressed by Gasset that the university is an institution where not everyone can take part although it is open to everyone. Albeit open to debate, we can put forward that the cultural capital of the scientists, which requires having many different skills together, actually supports the generally accepted understanding that receiving a good pre-school education is a must [95]. Similarly, some studies [21,98–102] examine these effects in the context of East Asia [103,104], and it is reported that employees with higher cultural and social capital show higher job performance. Overall, we conclude that cultural capital has significant implications on the job performance and parallelly on research productivity. Scientists with stronger cultural capital from their childhood and background can be linked with higher research activity and higher prestige.

5.1. Managerial implications

The results of the study reveal three basic managerial implications. First, the rapid increase in the number of universities came with important implications to research, quality and development. Therefore, rapid quantitative growth should be handled very carefully, and meritocracy should not be compromised. However, countries such as Turkey that try to increase the number of students attending universities need alternative solutions to maintain the quality and ranking of universities.

Second, the development of cultural and social capital in higher education institutions should be supported. Cultural capital is the main determinant of academic research productivity. Therefore, higher education institution administrators can increase the social and cultural capital of the scientists by supporting communication and interaction among academic staff, and thus increase the research productivity of scientists through practices such as travel supports to foreign countries, foreign language courses, and cultural events.

5.2. Limitations and future research

The use of a non-random sampling method to identify participants was one of the methodological limitations of this study. Additionally, the cross-sectional nature of the research design did not allow for having a deeper understanding of the relationship between cultural, economic and social capital and research productivity. For this reason, it may be useful to conduct a longitudinal study using experimental designs in future studies.

Although the study shows the significant effects of cultural capital and social capital on the research productivity of the scientists, these effects are not causal. Future studies can use experimental designs to explore whether these effects of cultural capital and social capital on the research productivity is causal. Despite some limitations, the current findings contribute to studies on higher education by defining new relationships between these structures.

6. Conclusion

The results of the study provide significant findings about the ways to improve the research productivity of scientists. The study also provides an insight on research productivity through the quantitative estimates about the impact of scientists, especially their cultural capital. The findings suggest that both cultural capital and social capital may help to improve the research productivity of scientists and even cultural capital on the research productivity of scientists are much significantly higher. However, results showed that both scientists and their parents' low cultural capital during their childhood stands forwards as a disabling factor to predict research productivity. As mentioned in the related sections, academy does not include only scientific production, it also requires sophistication in culture, arts, etc. That is why, raising or recruiting academic staff to train university students who are expected to increase their capital(s), their cultural and social capital may be taken into consideration along with their research productivity.

Author contribution statement

All authors listed have significantly contributed to the investigation, development and writing of this article.

Data availability statement

The authors are unable or have chosen not to specify which data has been used.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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