

# Demystifying Research Productivity in Public and Private Universities: The case of Morocco

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## Abstract

The aim of this study was to investigate determinants affecting research productivity in Moroccan universities. It explored 5 variables, namely, Autonomy in research, incentives to publishing, recognition, working conditions and university-private sector partnership and to what extent each determinant impacts research productivity. The research used was a descriptive method based on explanatory survey and bivariate statistical correlations between the determinants and research performance. The sample of 150 participants among which 95 responded, was randomly chosen among private and public universities. Primary data was collected by use of questionnaires. The research suggests that only three determinants have a significant impact on research productivity, namely, recognition, incentives to publishing and working conditions. Interestingly, recognition and incentives to publishing were not the most important factors in increasing research productivity but rather working conditions and more specifically, top management support and leadership. Finally, the study revealed that despite the marketing effect of private universities advertising better education than public counterparts, findings show that both type of universities show similarity in research outcomes. The study created a base for future research that can help universities better support their research activities and indirectly the economy through transfer of knowledge especially in emerging markets.

**Keywords:** Research and development, effectiveness of research practices, public and private universities, research productivity, university working conditions, emerging economies.

## 1. Introduction

Research has shown that activity for universities is essential for worldwide competitive economies (Fontana et al., 2006). As a result, public and private universities in the world developed devoted to promoting professors' research performance, which influences universities' ranking and student recruitment.

The government of Morocco wants to foster innovation and bring R&D activities in line with international standards. Government officials aim to make R&D a

source of competitiveness and growth for the region. Consequently, they have implemented numerous initiatives in recent years: the creation of the Interdepartmental Committee on Scientific Research and Technological Development (CNRST, 2018), whose role is to align and coordinate research projects with the private sector including universities; the development of Training Units and Research within public universities to train teachers and researchers on how to manage and lead innovation projects (CSEFRS, 2018); and the creation of new research labs in information technology and

economics. These governmental structuring programs aimed to create a regional R&D atmosphere that might provide more opportunities for developing R&D initiatives including increased interfaces between research activity and industries in the horizon of 2025 (CSEFRS, 2018). However, and despite all the initiatives, researchers, medias, and officials have pointed out the failure of these governmental initiatives. For instance, there was a 20% decline in patent applications in the country between 2016 and 2017 (Moroccan Office of Industrial and Commercial Property, 2018). Moroccan scientific production representing barely 0.1% of world production (Unesco, 2020). Research and development (R&D) spending constitutes 0.8% of Morocco's GDP in 2017 compared to an average of 2.3% in OECD countries (Diouri, 2018). Moreover, making an inventory of Research and Development outcomes and effectiveness within public and private universities in Morocco immediately raises a problem: the quasi-absence of data.

The objective of this paper is to shed lights on the determinants that impacts research performance within public and private universities. The main research question was concerned with the determinants of research performance. The research also sought to see if there were any correlations between some of the determinants, and if there were differences between the private and public universities in terms of research productivity.

The study proceeded to a literature review to identify what previous publications stated on the determinants of research performance in universities. Research method depicts how data are collected using a specific questionnaire model that was specifically designed and sent to faculty and researchers in both public and private Moroccan universities. The data was analyzed using SPSS to conduct

descriptive and statistical correlation analysis coupled with factor analysis if necessary. Research findings pointed out the major results and correlations between determinants. The paper concludes by discussion limitations and challenges of the research and proposes further avenues of research.

## 2. Literature review

### 2.1 Determinants of research performance

Competition in scientific research, percentage of publications and international ranking has led universities to actively improving research performance. Potential determinants of research productivity have been identified in literature. However, complex statistical models and amplitude in variance on one side and the cultural environment in which studies have been conducted on the other side led to uncertainty about which factors contribute the most to research performance. Nevertheless, the determinants of research performance lie in the combination of different variables among which institutional and structural factors namely, working environment, university reputation, incentives, recognition, resource allocations, colleague's interactions, resources materials and industry linkage (Perkmann et al., 2013, Daraio and Bonaccorsi, 2016, Abramo, D'Angelo and Murgia, 2017, Vick and Robertson, 2018, Ballesteros-Rodríguez et al., 2020) and individual factors like achievement motivation, age, gender, teaching workload, psychological feeling, job satisfaction and perception of stress and years of experience (Chen, Gupta and Hoshower, 2006, Yang, 2017, Kenny and Fluck, 2018, Nafukho, Wekullo and Muyia, 2019). However, and surprisingly, literature also suggests that some factors usually considered as potential determinants of research

productivity have little or no significant impact. Hu and Gill (2000) observed that factors such as experience, faculty **status and age do not significantly contribute to research performance.**

Abramo, D'Angelo and Murgia (2017) studied the relation between collaboration and research performance and their findings revealed that research performance is positively affected by internal collaboration and top management support. Jameel and Ahmad (2020) in their studies to evaluate the factors impacting research productivity demonstrated that research funding, job satisfaction and collaboration have significant impact on research outcomes. Khalil and Khalil (2019) observed that barriers related to research performance lie to funding, teaching workload, experience at higher education and research facilities. Paul et al (2017) have suggested that the determinants of research performance are mainly research environment, faculty perseverance and engagement, incentives, and job satisfaction.

The impact of University-Private Sector partnership on research productivity has been highlighted in literature. Landry, Traore and Godin(1996) observed that collaboration between universities and industries fosters research productivity. Manjarrés-Henríquez, Gutiérrez-Gracia and Vega-Jurado (2008) observed, in their research conducted in Spanish universities, that university-industry collaboration has a significant impact on research productivity and R&D. In Brazil, Garcia et al. (2020) suggested that researchers that collaborate with industry over the long-term showed superior research performance. Similarly, Sá and Litwin(2011) argued that university-industry collaboration in Canada positively impacts research outcomes with the use of federal policy instruments meant to facilitate such a collaboration. However,

prior research suggests that faculty and scientists who have experience in working with the private sector may see their publication rates decreasing because of private firms' requirement on protecting their patents and intellectual property rights (Bozeman and Corley, 2004, Lin and Bozeman, 2006).

## 2.2 Definition of research performance

Precisely defining research performance has been challenging due to perception gaps in the academic world. According to Creswell (1986), research performance is made of different constituents including the number of publications in refereed journals, book chapters, working with post-graduate students on dissertations and class-projects, obtaining research-grant, obtaining license or patents, developing experimental designs, and producing works of an artistic or creative nature. Print and Hattie (1997) include in research performance, articles in referred journals and refereed conferences, supervised doctorate degrees and being an editor board of established journals. Wootton (2013) proposed to measure research performance by assessing research grant, peer-reviewed articles, and supervision of PhD students. Finally, assessing research productivity in terms of impacts on micro-level i.e.: local industries, innovation, engineering for instance or macro-level i.e: healthcare, transportation, technology, artificial intelligence for example turned to be is extremely difficult because of the nature, the complexity and the heterogeneity of research outcomes and the availability of reliable metrics (Banzi et al. 2011).

University ranking is a reference in the world of education and research publications is one of the ranking constituents (Vernon, Balas, and Momani, 2018). Therefore, faculty are under pressure to publish, the so called publish or perish, as the number of publications heavily contributes to a better ranking and

university reputation, and for them to obtain the highly sought out tenure status (Aprile, Ellem and Lole, 2020). For the purpose of this paper, research productivity has been defined as number of articles or book chapters published in referred journals.

### **3. Research design**

#### **3.1 Research method**

Descriptive statistics using quantitative analysis provide insight into how researchers and professors in public and private universities within Morocco perform in their R&D projects and how they perceive their research activities. One hundred fifty (150) participants were randomly selected from different public and private universities regardless of their scientific background. Ninety-five (95) valid questionnaires were taken into consideration for this study. The number of years in academic experience vary from 2 to 28 years. There were 59 males and 36 females. The average age of participants was 42.

Results are expected to show the extent to which each determinant or dimension affects the quality of R&D activities. They might also show a correlation between some determinants. The purpose was to find the root causes that undermine R&D in public and private universities and to shed light on the main dimensions that affect faculty perception and experiences.

In order to design a reliable and valid questionnaire, discussions and meetings with more than 150 academic faculty were conducted to obtain their input in order to determine the important determinants that influence perception and research output. Based on these discussions, the ideal environment for a researcher is usually defined as having access to autonomous research, being independent in managing budgets and grants, working under good conditions, and getting support from

hierarchy. Annex 1 summarizes the determinants as they were defined based on common agreement between faculty and researchers.

Although these dimensions come from informal discussions with faculty and researchers, this study sought to validate the dimensions through a larger sample of faculty study to cover as many Moroccan regions as possible to reduce ambiguity. Every dimension described in annex 1 was assessed through several questions (see annex 2 - the questionnaire).

The method used to obtain data were self-administered questionnaires. As with any other statistical tools, questionnaires have advantages as well as biases. Known as a time efficient and standardized tool, one of its advantages is that participants know there is a limited time required to answer. The method helps to collect data at a relatively quick pace while respecting privacy. It encourages honest responses as long as anonymity is assured. Standardization reduces incorrect and inappropriate responses. The questionnaire is less likely to feed the research with complex and nuanced information.

An important disadvantage lies on the uncertainty of who answered the questionnaires. It is difficult to keep track of questionnaires once they have been sent to participants. It is impossible to evaluate the attitudes and feelings people have when they read the questions and some questions might have been misinterpreted. Although some of these issues can be minimized through individual interviews, they cannot be totally eliminated.

#### **3.2 Ethical issues**

The research topic raises several ethical issues for the participants. The sensitive topic of research performance demanded that conditions were present to allow respondents to be well-informed about the purpose of the research and to rest assured that their personal information would not



be used or disclosed in any document or publication. The ethical issues that were addressed are anonymity, informed consent and confidentiality.

### **Anonymity**

No respondent or company was ever disclosed. A pseudonym was used to refer to a specific finding. Respondents were ensured that field notes and transcripts did not contain personal identifiers. Raw and processed data was locked, and password protected.

### **Informed consent**

To get informed consent from participants, trustful and reliable communication was established with respondents. First, background information on the main researcher was provided. Furthermore, the aim and brief outline of the research was provided. The researcher's role in helping universities improve their research activities was also discussed. If necessary, they obtained an authorization from their employers to fill out the questionnaire. They were told the purpose of the questionnaire, how much time it should take to fill out and whether they wanted to

receive the findings by email. They were told about the general research schedule and planning.

### **Confidentiality**

Participants were told sensitive data would not be shared. Any other type of data would be shared with those who are part of the research team. Results were reported in a way that protects participants' identity and prevents tracking back their sources. To reassure respondents, they were informed of all procedures used to keep data safe and under control. Moreover, data collected was not used for any other purpose.

## **4. Research findings**

### **4.1 Frequencies of determinants**

First, findings for each dimension are presented and commented. Further investigations about connections between different dimensions are eventually identified and analyzed. Finally, investigations are conducted to compare public and private universities over different determinants and how they perform in research outcomes.

**Table 1**

### **Determinant: Autonomy in conducting research**

Question: Would you say that	Strongly Disagree	Disagree	Agree	Strongly Agree	Neutral
1- Your research department has a word to say in setting up budget for research	87,4%		10,5%		1,1%
2- Your research department manages its expenditures freely	83,2%		14,7%		2,1%
3- You have chance to make propositions in your research orientations	71,6%		28,4%		
5- You have freedom to conduct truly independent research	54,8%		16,8%		28,4%
21- You have the autonomy to set up a new research project	78,9%		9,5%		11,6%

Questions 1,2,3 and 21 in Table 1 clearly

show that researchers do not have independence in the way they conduct research regarding budget set-up, managing expenditures or creating new research

projects. Questions 5 shows that more than half of the respondents cannot conduct independent research. The average answers to the questions 1, 2, 3, 5 and 21 are divided into 83% strongly disagree from

public universities and 78% strongly disagree from private universities. There is a consistency between public and private universities.

**Table 2**

**Determinant: Incentives to publishing**

Questions	Strongly Disagree	Disagree & Disagree	Agree & Strongly Agree	Neutral
8- Remunerations and payment conditions are competitive regarding to the market	53,7%		12,6%	34,7%
9- Incentives aligned with research outcomes?	68,4%		18,9%	12,6%
	No		Yes	
11- Is there any incentive if one of your articles is published? (y/n question)	56,8%		43,2%	

From Table 2, majority of the respondents indicated that there are no incentives to publish (question 11), and that salaries do

not reflect the market conditions (question 8). It shows that 68,4% of respondents consider that incentives when they exist, do not correspond to the efforts made by faculty.

**Table 3**

**Determinant: Recognition**

Questions: Would you say that	Strongly Disagree	Disagree & Disagree	Agree & Strongly Agree	Neutral
6- Hierarchy gets you involved in designing research policies and procedures?	47,4%		48,4%	4,2%
7- You contribute to Faculty recruitments when it comes to research	56,8%		23,2%	20%
25- Your research is valued?	50,5%		42,1%	7,4%
27- Hierarchy provides recognition to your research activities?	56%		44%	

Table 3 reveals that a majority of 50,5% of the respondents feel that their research activities are not properly valued (question 25) even though more than a half of participants (56%) said that their research

activities receive recognition (question 27). However, almost half of respondents (47,4%) said that they are involved in setting research policies and procedures (question 6) and more than 56,8% contribute to faculty recruitment regarding research activities.

**Table 4****Determinant: Working conditions**

Working conditions (16, 17, 18, 19) Availability of material and resources (20,22,23,26,28,29) Perception of management & Leadership	StronglyDisagree&Dis agree	Agree&StronglyA gree	Neutral
16- Would you say that your university provides necessary material and means for your research	49,5%	44,2	6,3%
17- Would you say that your university invested in improving research material?	47,4%	38,9%	13,7%
18- Would you say that your university will invest in the next 12 months in new material related to your research activities (software, computers, database access, technical and scientific materials)?	48,4%	30,6%	21%
19- Would you say that hierarchy fosters the use of new technology in research?	70,5%	11,6%	17,9%
20- Would you say that work environment inspires people to increase quality of research?	56,8%	20%	23,2%
22- Would you say management provides enough time to conduct your research?	72,6%	11,6%	15,8%
23- Do you think that hierarchy supports the enhancement of research?	48,4%	39%	12,6%
26- Do you think that internal procedures and processes facilitate your research projects?	64,2%	14,7%	21,1%
28- Do you think that your manager is fully committed to your research project?	43,2%	34,7%	22,1%
29- Do you think that research activities are managed under effective leadership?	40%	35,8%	24,2%

As shown in Table 4, 49,5% of respondents reveal that universities do not provide the necessary material and means to conduct research (question 16) while 48,4% indicate that participants did not receive any material to support their research for the last 12 months (question 18). Participants attested at 47,4% that their university did

invest in new resource materials (Question 17). Questions 19, 20 and 23 further indicate that hierarchy moderately supports research and only 48,4% said that top management encourages research (Question 23). 72,6% of respondents said that they do not have enough time to conduct research (question 22) while 64,2% believed internal procedures do not facilitate their research projects (question 26). Finally, 43,2% of participants felt that

their managers are not fully committed and engaged in their research activities (question 28) while 40% think that there is

a need for a better leadership for research programs (question 29).

**Table 5**

**Determinant: Partnership University/Private Sector**

Questions	No	Yes
12 Your university or research center have a partnership with private organizations	68,4%	31,6%
13- Research department get funds or any other help from private organizations	63,2%	36,8%
14- Have you ever worked in partnership with private organizations for research purpose	61,1%	38,9%
15- Have any private organizations ever got in touch with you or your research department	64,2%	35,8%

Table 5 indicates that more than 60% of the respondents feel there is not enough research collaboration done with the private sector. Partnerships, funding, collaboration, or interest from the private sector is lacking.

**Table 6**

**Comparison Public/Private universities regarding Competitive salaries**

Question: Would you say that salaries are competitive regarding market conditions

	Strongly Disagree	Disagree	Agree	Strongly Agree	Neutral
Public universities (28 respondents)	19%		2%		5%
Private universities (67 respondents)	35%		13%		26%
<b>Total</b>	<b>54%</b>		<b>15%</b>		<b>31%</b>

Table 6 reveals that 54% respondents believed that their salaries were not competitive with the market. Respondents from the public university had a slightly stronger opinion towards non-competitive salaries.



**Table 7****Number of published articles**

Question: How many articles have you published during the last 12 months?

Percentage

0 article	49,5%
1 article	35,8%
2 article	13,7%
3 article	1.1%
4 or more articles	0%

(14,8%) published 2 or more articles during the last 12 months while no faculty published 4 articles or more.

Table 7 shed light on the number of articles published. Almost half of respondents have published no article and very few faculty

**Table 8***Number of publications by university type*

Question: How many articles have you published during the last 12 months?

Public

Private

Total

0 article	10	37	47
1 article	11	23	34
2 article	6	7	13
3 article	1	0	1
4 or more articles	0	0	0
Total of published articles	18	30	

private or public universities, only 44,7% of faculty in private universities published whereas 64,3% of faculty from public universities have published at least one article in the last 12 months.

Table 8 reveals that faculty in private universities have published more articles in the last 12 months. However, reported to the number of participants coming from

**Table 9***Incentives to publishing – Comparing public and private universities*

Question: Would you say that incentives are aligned with research outcomes?

Public

Private

Total

Str. disagree	12	21	33
Disagree	7	25	32
Neutral	3	9	12
Agree	4	12	16
Str. Agree	2	0	2
Total	28	67	95

percentage of respondents, results are similar as 19 out of 28 are either strongly disagree or disagree (67,8%) in public universities while 46 out of 67 (68,6%) are either strongly disagree or disagree in private universities.

Table 9 shows that faculty in private universities have lower opinions on incentives for publishing than those in public universities. However, in terms of

#### 4.2 Correlations between dimensions

Bivariate correlation statistical analysis measures the linear relationship between different dimensions and the dependent variable “articles published”. In order to simplify the analysis between dimensions and the dependent variable, factor analysis was conducted to reduce many individual items (questions) into few numbers of factors only for some dimension (see annex 3). Table 10 reports significant connections between published articles and recognition with a coefficient of 0.624 (Sig below

0.01). Strong correlation appears between publications and working conditions for both the perception participants have regarding management and leadership and the availability of resource materials to conduct research with a respective moderate coefficient of 0.523 and strong coefficient of 0.856 (Sig below 0.01). Findings reveal a significant correlation between incentives for research and published articles. The table 10 shows no correlation between autonomy and the fact that universities collaborate with the private sector with published articles.

**Table 10**

#### Correlation Determinants/Numbers of Articles published

		Autonomy	Incentives to publishing	Recognition	Working conditions - Material	Working conditions - Management & Leadership	Partnership University/Private sector
Articles Published	Pearson correlation	<b>-0.125</b>	<b>0.601</b>	<b>.624**</b>	<b>.523**</b>	<b>.856**</b>	<b>0.129</b>
	Sig. (2-tailed)	0.229	0.000	0.000	0.000	0.000	0.214
	N	95	95	95	95	95	95

\*\*. Correlation is significant at 0.01 level (2-tailed)

## 5. Discussion

This section analyzes the contribution of each the five dimensions, namely autonomy in conducting research, incentives to publish, recognition from hierarchy, working conditions and partnership with private sector, to research productivity.

### 5.1 Autonomy in conducting research.

Results reveal that autonomy in research has no significant impact on research performance. It is usually the norm for researchers to manage their budget although finance departments need to authorize major expenses as a control against the original research proposals. However, data show that an average of 83,2% of respondents have no freedom to manage their budget. This situation could be driven by institutional

commitments, budgets coming from the private sector for specific research topics, lacking research doctoral students to support the research thus making it infeasible, or control of upper management wanting to direct research topics for their personal agenda.

### 5.2 Incentives to publishing.

Although half of the respondents have published no articles during the last 12 months (table 7), it seems that incentives have significant impact on publishing ( $r=0.601$ ). That could be related to the fact that 56,2% of participants said there is no incentive to publishing and so they did not publish (table 2). The argument may be that they have low output due to low or absence of incentives and that when incentives are provided, faculty tend to be active in publishing. Important to note that 53,7% of the respondents feel they are remunerated below the market (table 2).

This could be an indicator on the sample of the survey. However, if universities offer uncompetitive salaries, they might obtain professors that are below average with regards to research output.

### 5.3 Recognition

An average of 50% of researchers (table 4) do not feel valued while 56% saw their hierarchy providing no recognition. The significant correlation between recognition and publication (table 10) confirms that without valuing faculty contributions, it may not reinforce motivation, positive engagement and research outcomes that result in better research performance.

This could be a starting point for change management as it does not require significant financial investment. Having research awards, internal presentations, or publicizing research could easily improve this issue.

### 5.4 Working conditions

Table 10 reveals that perception of support from hierarchy and leadership style is the most influential determinant of research performance with a coefficient of 0.856 (sig. below 0.01). Faculty would be more likely to publish if there is an efficient leadership even though it was unclear from the answers what leadership style would be preferable. It seems that top management support, defined as devotion to research activities, giving more time to do research, encouraging the use of new technology and inspiring faculty to increase quality of research, may result in facilitating research activities and improving research productivity. Results show that top management support and attention are critical to research productivity and faculty empowerment. However, the availability of resource materials dedicated to research seems to have a moderate significant impact on research performance with a coefficient of 0.523 (sig. below 0.01). The combination of support of top management, efficient leadership style and the

availability of resource materials for research seem to have the most significant contribution to research performance. This study provides a clear indication that working conditions, either managerial practices or resources, have significant effects on faculty performance when it comes to publication. Universities should put more emphasis in ensuring that working conditions are favorable and in fostering inspiration and motivation in order to leveraging research performance. In that sense, it confirms what literature has said about the link between working conditions and employees' performance.

### 5.5 Partnership University/Private sector

An average of 63% of respondents said that there is very low or no interaction and collaboration in research with the private sector and industries. For those who published, the correlation is not significant (table 10). Since feeling undervalued and with unattractive or absence of incentives seemed to be a clear issue with researchers, weak university-industry collaboration in research is not surprising. The lack of interaction with the private sector is an issue in research. At a time when many governments, including the Moroccan government, are searching for options to finance research, many look to the private sector for support and interaction with private companies. As literature stated, corporate engagement in joined research activities is essential if universities are to stay competitive and seek to increase their reputation and international ranking.

## 6. Comparing performance of private versus public universities

Faculty from private universities have better perception regarding their wages. However and unexpectedly, faculty from public universities have a higher rate of publication than those from privates (table 8). That is, there were a higher percentage of respondents from private universities

who did not publish at all. In Morocco however, private universities market themselves as having more competent professors to attract students. This research does not support this marketing statement and it confirms that salaries are not significantly correlated with research outcomes.

There were also similar results for incentives to publishing where an average of 68% of both faculty from private and public universities said that incentives are not aligned with research outcomes. Again, it was expected faculty in private universities to have favorable opinions on incentives to publishing than those from public universities. It is common practice for some private universities to offer financial rewards for published articles because public universities have budget constraints and are not for profit, but this determinant seems to be moderately correlated with publications (table 10).

There can be several reasons why there are similar results between private and public universities. First, the managers in private universities who oversee these programs might not have solid background in research or more competencies than their counterparts in public universities. Performant managers are probably in other management positions that are more money attractive. Secondly, there might be strong pressure on generating short-term profits in private universities, which will prevent managers from having the necessary budgets for research.

## Conclusion

This study produced results regarding determinants affecting research output in private and public universities in Morocco. The number of publications is strongly related to working conditions and more particularly to top management support and leadership. The number of publications is also significantly correlated to Incentives to publishing. Even though faculty in public

and private universities have low autonomy in the way they conduct their research, it has no significant impact on research outcomes. Recognition is the second most significant determinant of research productivity both in public and private universities while salaries seem to be disconnected. Surprisingly, faculty from private universities share the same perception than those from public, namely, salaries do not influence publications, even though their wages are better perceived than faculty in public universities. University-Industry collaboration factor seems to have no influence on research outcomes both for public and private universities.

From data collected in this study, it appears that research in public and private universities is suffering from lack of incentives and recognition. One of the consequences of poor management in universities is that they will eventually no longer attract best students. Since a main component for national and international rankings is research output, universities need to increase publication output if they want to improve reputation and student enrollment.

The study shows that research needs effective management and leadership. But moreover, researchers need to be inspired and motivated both by effective incentives and recognition.

The work conducted in this research could be a stepping-stone for another valuable research. First, it could be applied in other emerging countries to do a comparative study. This would help to see if there are some particularities of Morocco that are producing these results. Other successful regions could provide knowledge to be transferred back to Morocco.

Secondly, the study could focus on certain disciplines such as Business, Engineering, Health or Social Sciences that may differ considerably on how they support research and have collaboration with the industry.

For instance, for Business Colleges, it is probably more likely that they have more collaboration with the industry than social sciences. Health sciences may have more financial research support and higher wages than other disciplines.

Thirdly, focusing on more detail about important determinants may provide more in-depth on how it can be improved. This should be more explored as to the type of recognition. The same can be said about working conditions and leadership style.

Lastly, the research could be expanded to include the topic of research impact on the industry. The context of the study was done to explore the conditions to improve research, which would then hopefully increase the transfer of knowledge to the industry, and hence improve national and international competitiveness.

## References

1. Abramo, G., D'Angelo, A. C., & Murgia, G. (2017). The relationship among research productivity, research collaboration, and their determinants. *Journal of Informetrics*, 11(4), 1016-1030.
2. Aprile, K. T., Ellem, P., & Lole, L. (2020). Publish, perish, or pursue? Early career academics' perspectives on demands for research productivity in regional universities. *Higher Education Research & Development*, 1-15.
3. Argyris, C., Putnam, R. W., & Smith, M. C. (1985). *Action Science: Concepts, methods, and skills for research and intervention*. San Francisco: Jossey Bass.
4. Ballesteros-Rodríguez, J. L., De Saá-Pérez, P., García-Carbonell, N., Martín-Alcázar, F., & Sánchez-Gardey, G. (2020). Exploring the determinants of scientific productivity: a proposed typology of researchers. *Journal of Intellectual Capital*.
5. Banzi, R., Moja, L., Pistotti, V., Facchini, A., & Liberati, A. (2011). Conceptual frameworks and empirical approaches used to assess the impact of health research: an overview of reviews. *Health research policy and systems*, 9(1), 1-10.
6. Bozeman, B., & Corley, E. (2004). Scientists' collaboration strategies: implications for scientific and technical human capital. *Research policy*, 33(4), 599-616.
7. Chen, Y., Gupta, A., & Hoshower, L. (2006). Factors that motivate business faculty to conduct research: An expectancy theory analysis. *Journal of Education for Business*, 81(4), 179-189.
8. Cherkaoui M., (2009), "Comment valoriser la recherche au Maroc", Workshop de la compétitivité, Presse HEM
9. CNRST, (2018), Stratégie de 2018-2022, Retrieved from <https://www.cnrst.ma/index.php/fr/-cnrst/a-propos/strategie-2018-2022>
10. Creswell, J. W. (1986). Concluding thoughts: Observing, promoting, evaluating, and reviewing research performance. *New Directions for Institutional Research*, 1986(50), 87-102
11. Daraio, C., & Bonaccorsi, A. (2017). Beyond university rankings? Generating new indicators on universities by linking data in open platforms. *Journal of the*



- Association for Information Science and Technology*, 68(2), 508-529.
12. Diouri, 2018. Production scientifique : le Maroc ne représente que 0,1% de la production mondiale. *Finances News*, (2018). Retrieved from <https://fnh.ma/article/-/production-scientifique-le-maroc-ne-represente-que-0-1-de-la-production-mondiale-entretien>
  13. Hu, Q., & Gill, T. G. (2000). IS faculty research productivity: Influential factors and implications. *Information Resources Management Journal (IRMJ)*, 13(2), 15-25.
  14. Jameel, A. S., & Ahmad, A. R. (2020). Factors impacting research productivity of academic staff at the Iraqi higher education system. *International Business Education Journal*, 13(1), 108-126.
  15. Kanter, R. M. (1983). *The change masters*. New York: Simon & Schuster.
  16. Kenny, J., & Fluck, A. E. (2018). Research workloads in Australian universities. *Australian Universities' Review*, 60(2), 25-37.
  17. Khalil, O. E., & Khalil, N. (2019). Business research productivity and barriers. *International Journal of Productivity and Quality Management*, 26(1), 34-57
  18. Fontana, R., et al., (2006) "Factors affecting university-industry R&D projects: The importance of searching, screening and signaling", *Research Policy*, March
  19. Fritz, C. O. (2008). Social inequality and uses of online resources: Perspectives highlighted from an investigation of a large online data set. Report for SAM Learning, London.
  - Porter, M. E. (1995). 'The Competitive Advantage of the Inner City', *Harvard Business Review*, May-June, 55-71.
  20. Garcia, R., Araújo, V., Mascarini, S., Santos, E. G., & Costa, A. R. (2020). How long-term university-industry collaboration shapes the academic productivity of research groups. *Innovation*, 22(1), 56-70.
  21. Landry, R., Traore, N., & Godin, B. (1996). An econometric analysis of the effect of collaboration on academic research productivity. *Higher education*, 32(3), 283-301.
  22. Lin, M. W., & Bozeman, B. (2006). Researchers' industry experience and productivity in university-industry research centers: A "scientific and technical human capital" explanation. *The Journal of Technology Transfer*, 31(2), 269-290.
  23. Miller, D. & Le Breton-Miller, I. *Managing for the Long Run: Lessons in Competitive Advantage from Great Family Businesses*. Boston, MA: Harvard Business School Press, 2005.
  24. Metawie, M. and Gilman M. (2005); "Problems with the implementation of performance measurement systems in the public sector where performance is linked to pay: A literature review drawn from the UK". 3rd conference on Performance Measurements and

- Management Control (Nice September 22-23, 2005)
25. Manjarrés-Henríquez, L., Gutiérrez-Gracia, A., & Vega-Jurado, J. (2008). Coexistence of university-industry relations and academic research: Barrier to or incentive for scientific productivity. *Scientometrics*, 76(3), 561-576.
26. CSEFRS, (2018), L'enseignement supérieur au Maroc, *Conseil Supérieur de l'Education, de la formation et de la Recherche Scientifique*, Retrieved from <https://www.csefrs.ma>
27. Moroccan Office of Industrial and Commercial Property, (2018), Rapport annuel 2018, Retrieved from <http://www.ompic.org.ma/fr/content/publications-ompic>
28. Nafukho, F. M., Wekullo, C. S., & Muyia, M. H. (2019). Examining research productivity of faculty in selected leading public universities in Kenya. *International Journal of Educational Development*, 66, 44-51.
29. Naggi and Tuff (2012), "Managing your innovation portfolio", Harvard Business review, May 2012, 67-74
30. Paul, S., Vijayaragavan, K., Singh, P., Burman, R. R., & Chahal, V. P. (2017). Determinants of research productivity of agricultural scientists: implications for the national agricultural research and education system of India. *Current Science*, 252-257.
31. Perkmann et al. (2013), "Academic engagement and commercialization: a review of the literature on university-industry relations", *Research Policy*, 42
32. Reason, P. (2005). Pragmatist Philosophy and Action Research: Readings and conversation with Richard Rorty. *Action Research*, 1(1), 103-123.
33. Sá, C. M., & Litwin, J. (2011). University-industry research collaborations in Canada: the role of federal policy instruments. *Science and Public Policy*, 38(6), 425-435
34. Thomke S., Reinserten D. (2012), "Six myths of product development", Harvard Business review, May 2012, 85-94
35. Unesco, (2020), How much your country invest in R&D?, *UNESCO Institute of statistics*, Retrieved from <http://uis.unesco.org/apps/visualisations/research-and-development-spending/#!lang=fr>
36. Vernon, M. M., Balas, E. A., & Momani, S. (2018). Are university rankings useful to improve research? A systematic review. *PloS one*, 13(3), e0193762.
37. Vick, T. E., & Robertson, M. (2018). A systematic literature review of UK university-industry collaboration for knowledge transfer: A future research agenda. *Science and Public Policy*, 45(4), 579-590.
38. Wootton, R. (2013). A simple, generalizable method for measuring individual research productivity and its use in the long-term analysis of departmental performance, including between-country

- comparisons. *Health research policy and systems*, 11(1), 1-14
39. World Bank (2010), GDP per capita,  
<http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>
40. Yang, J. C. C. (2017). A study of factors affecting university professors' research output: Perspectives of taiwanese professors. *Journal of College Teaching & Learning (TLC)*, 14(1), 11-20

## Annex 1

Description of Determinants affecting research productivity.

Determinant	Description
Autonomy in conducting research	<p>Autonomy to manage budgets or grants.</p> <p>Autonomy to cooperate with external entities.</p> <p>Autonomy to conduct fully independent research and to choose research orientations.</p> <p>Autonomy to set up a new research project</p>
Incentives to publishing	<p>Competitiveness in wages compared to the market.</p> <p>Incentives when an article is published.</p> <p>Incentives aligned with those of the market</p>

Recognition	<p>Faculty involved in designing research policies and procedures and in recruiting qualified faculty to improve research quality and outcomes.</p> <p>Research is valued.</p> <p>hierarchy provides recognition to research publications</p>
Working conditions	<p>University provides resource materials for your research.</p> <p>Research enhanced by using information technology.</p> <p>Hierarchy fosters the use of new technology in research.</p> <p>Working climate inspires people to increase quality of research.</p> <p>Hierarchy fully committed to your research project.</p> <p>Research performance and leadership style.</p> <p>Sufficient time to conduct research.</p> <p>Internal procedures facilitate research outcomes.</p>
Public-private partnership	<p>University has a partnership with industries.</p> <p>University gets funds from private organizations</p> <p>Faculty partnership with private organizations for research purpose</p> <p>Private organizations are in contact with Faculty</p>

## Annex 2

The Questionnaire

Would you say that: (Likert scale from 1 strongly disagree to 5 strongly agree)

1- Your research department has a word to say in setting up budget for research?

2- Your research department manages its expenditures freely?

3- You have chance to make propositions in your research orientations?

4. Select your age? 25-35, 36-45, 46-55, 56-65

*Would you say that: (Likert scale from 1 strongly disagree to 5 strongly agree)*

5- You have freedom to conduct truly independent research?

6- Hierarchy gets you involved in designing research policies and procedures?

7- You contribute to Faculty recruitments when it comes to research?

8- Remunerations and payment conditions are competitive regarding the market?

9- Incentives aligned with research outcomes?

11- Is there any incentive if one of your articles is published? *(Yes or No question)*

12- Does your university or research center have a partnership with private organizations in your research activity? *(Yes or No question)*

13- Does your research department receive funds or any other help from private organizations? *(Yes or No question)*

14- Have you ever worked in partnership with private organizations (local or multinational companies)? *(Yes or No question)*

15- Have any private organizations ever got in touch with you or your research department to set up a partnership? *(Yes or No question)*

16- Would you say that your university provides necessary tools and material for your research? *(Likert scale from 1 strongly disagree to 5 strongly agree)*

17- Would you say that your university invested in improving research

material? *(Likert scale from 1 strongly disagree to 5 strongly agree)*

18- Would you say that your university will invest in the next 12 months in new material related to your research activities (software, computers, database access, technical and scientific materials)? *(Likert scale from 1 strongly disagree to 5 strongly agree)*

19- Would you say that hierarchy fosters the use of new technology in research? *(Likert scale from 1 strongly disagree to 5 strongly agree)*

20- Would you say that work environment inspires people to increase quality of research? *(Likert scale from 1 strongly disagree to 5 strongly agree)*

21- Would you say that you have the autonomy to set up a new research project? *(Likert scale from 1 strongly disagree to 5 strongly agree)*

22- Would you say that you have enough time to conduct your research? *(Likert scale from 1 strongly disagree to 5 strongly agree)*

23- Do you think that hierarchy supports the enhancement of research? *(Yes or No question)*

24. Select your academic years of experience? 0-5, 6-10, 11-15, 16-20, >20

25- Would you say that your research is valued? *(Likert scale from 1 strongly disagree to 5 strongly agree)*

26- Do you think that internal procedures and processes facilitate your research projects?

27- Would you say that hierarchy provides recognition to your research activities?

28- Do you think that your manager is fully committed to your research project?

29- Do you think that research activities are managed under effective leadership?

10. Select the university you work for?  
Public, Private

30. What is your seniority with your current employer? 0-5, 6-10, 11-15, 16-20, >20

31. Gender: M, F

32. Do you have international experience in academia? YES, NO

### Annex 3

Factor analysis for specific determinants

Determinant	Factor Analysis		
Autonomy in conducting research			
		Rotation Sums of Squared Loading	
	Factor	% of Variance	Cumulative %
	Q 1	51.368	51.368
	Q 2	33.439	84.807
Recognition			
		Rotation Sums of Squared Loading	
	Factor	% of Variance	Cumulative %
	Q 25	37.396	37.396
	Q 27	27.282	64.678

Working conditions

Working conditions – Material

	Rotation Sums of Squared Loading	
Factor	% of Variance	Cumulative %
Q17	68.987	68.987

Working conditions –  
Management/Leadership

	Rotation Sums of Squared Loading	
Factor	% of Variance	Cumulative %
Q 20	34.555	34.555
Q 22	23.116	57.671
Q 26	15.221	72.892