Publication Performance of Individual Scientists in consolidated versus non-consolidated teams with different team status levels

A survey study on publication performance differences among European and American university scientists within the majors Chemistry, Economics and Mechanical engineering.

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Author:

Jenny Wassenaar
Student Psychology
University of Twente, the Netherlands

Supervisors University of Twente:

Prof. Dr. K. Sanders
Behavioral Sciences
University of Twente, the Netherlands

Dr. B. Schyns
Behavioral Sciences
University of Twente, the Netherlands

Abstract

In an effort to examine the publication performance differences between European and American scientists, I conducted an international survey on researchers in the majors Chemistry, Economics and Mechanical Engineering. A questionnaire, which examined variables like team consolidation and team status, was mailed to researchers in the departments Chemistry (300) Economics (340) and Mechanical engineering (230) of universities in the US, UK, the Netherlands, Germany and France. Of these, 129 (15%) usable questionnaires were returned. For my sample, individual researcher's publication performance was found to be (a) dependent on the consolidation of the team the researcher works in, and (b) positively related to the perceived status of their team and university. The background variables gender (c) and major (d) were also found to be significantly related to the publication performance of the individual researchers. Male researchers show higher production performance rates than their female counterparts and researchers in an engineering field of study showed a higher production performance compared to their colleagues in the flied of Economics. The findings are discussed in relation to earlier publication performance research.

Introduction

All universities have the goal to produce new knowledge through research programs. Therefore a university emphasizes on innovative research and freely exploring truth (Wang, 2001). The quality of research within universities is directly related to the research outputs, like the publication performance of the researchers (e.g. articles, books, citations) and conference presentations (von Tunzelmann, Ranga, Martin, & Geuna, 2003). Rankings of universities based on researchers' publication performance attract attention of among others research centres and are important for third party endowments and research grants (Tombazoz, 2005). This reward structure is well captured by Trow and Fulton's (1977) phase "Publish and Flourish."

In the past century, the independent university researcher has increasingly been replaced by research teams due to a push of technology and knowledge quantity as well as a pull of transportation and communication possibilities (Adams, Black, Clemmons & Stephan, 2005). In their study Ruël, Bastiaans and Nauta (2003) describe phenomena that exist within a team and how these affect the productivity and quality of the team's performance. They found that a feeling of trust could have a positive influence on the output of a team, while free riding had a negative influence. In the study of Rey-Rocha, Martín-Sempere, and Garzón-García (2002), the effect of working in a research team on individual performance has been examined. They found that this individual performance is enhanced when the researcher works in a consolidated team and this positively affects publications in international journals. Based on the definition of consolidated team used in their study, a consolidated team in this study is characterized by

- open communication between all team members,
- the involvement of all team members in the progress and the goals of the research
- the autonomous working method of the team with a shared social identity,
- a time span; the team exists over a longer period of time and will continue its activities for at least one more year.

The productivity of researchers is mostly defined by a financial function, which relates the financial inputs with multi-product outputs (Dundar & Lewis, 1995). Tjafel (1982) states that the costs and benefits cannot been understood independently of the social status of the individual or team of individuals. Social status is the higher or lower status of teams of individuals in a particular domain (e.g. society or company), based on their traits and actions, and is mostly gained by the association with a particular team independently from their individual characteristics (Weiss & Fershtman, 1998).

The study of Rey-Rocha et al. (2002) will serve as the foundation of this study. Although research teams themselves are not the analysis unit in this study, research team characteristics and team status are variables that can influence its components' productivity. Therefore the aim of this study is:

1. to specify the publication performance variance between individual university researchers who work in teams with different degrees of team consolidation or no team at all.
2. to examine the individual publication performance variance in relation to the effect of the perceived and real status of their team and their university.

The three research questions of this article are:

- Is there a relation between publication performance and team consolidation?
- Is there a relation between team status and individual publication performance?
- If these relations exist how do these variables influence the publication performance?

Social psychological team effects on individual productivity

In 1619 Descartes formulated his "method" in which he mentioned that products designed by one individual are generally better than those developed in teams (Fancher, 1996). In the later centuries two opposing ideas on team productivity were developed. In 1880, Ringelmann found in his rope pulling study that the force produced by men in a team was lower than the sum of the individual forces produced by each man alone (Ingham, Levinger, Graves & Peckham, 1974). His findings were ignored back then, but his test was validated in the 1970's, following the theory of the reduction in motivation by individuals in teams: so-called "social loafing" (Williams & Karau, 2004). According to Haslam (2004) this phenomenon can rise from a feeling among the team members that their input is not identifiable. In relation to the social identity theory a researcher who participates in a clear team setting with relevant tasks with much social control performs better than an individual who works alone (Holt, 1987). A shared social identity in a team is likely to result in better performance of a team as a whole and is likely to improve psychological well-being (Messik & Mackie, 1989). This shared social identity is one of the characteristics of a consolidated team.

In their study Rey-Rocha et al. (2002) found that researchers in consolidated teams produce more articles than their equals in non-consolidated or no teams. Yang and Tang (2004) discussed the relationship between team consolidation and information system development on team performance using a social network approach. According to their findings team consolidation was positively related to overall performance. These findings form the foundation of the following hypothesis:

Hypothesis 1:

The publication performance of individual researchers in consolidated teams is higher compared to researchers in non-consolidated teams and better then researchers who work alone.

Status effects on productivity

Research in social psychology on team characteristics has focused on the role of social hierarchies in constraining individual behaviour, in which individual status characteristics form the basis. Effects of status on performance have been studied by Berger and his colleagues (Berger, 1977; Berger, Wagner & Zelditch, 1985). Berger et al. (1985) defined characteristics of individuals (such as sex or race) that give rise to differential status expectations as diffuse status characteristics. These expectations, in turn, can generalize and, through a process of behavioral confirmation of expectancies similar to the self-fulfilling prophecy (Rosenthal & Jacobson, 1968), affect power-related behavior and perceptions of power across a variety of social contexts (Keating, Dovidio, Heltman, Brown & Ellyson, 1988). Keating and colleagues have shown that status (which is accompanied by certain expectations) can have a self-fulfilling power.

According to Skaff, Pearlin and Mullan (1996), a high social status is related to a high perceived control of one's own life. This perception is identified by three parameters: self-efficiency, locus of control and mastery. Self-efficiency focuses on the control one has over the performance of a specific task (Bandura, 1977). Locus of control is a personality construct referring to an individual's perception of the locus of events as determined internally by his/her own behaviour vs. fate, luck, or external circumstances (Rotter, 1966). Finally, mastery is the extent to which one regards one's life-chances as being under one's own control (Pearlin & Schooler, 1978). Skaff et al. (1996) also states that a perception of great control enhances productivity, thus linking status and productivity.

This study focuses on team status. Berger and colleagues (1972) stated that when task oriented teams are differentiated with respect to external status characteristics, this status determines the prestige within the team whether or not the external status characteristic is related to the task. This means that in a team of people having the same status, that status can be a stronger influence on prestige then capability. However Keating et al., (1988) state that this status is also build up by task capability; Berger et al. (1985) identified task familiarity as a basis of status in expectation states theory.

There have been many experiments concerning social status in relation to productivity. Thomas, Ravlin and Barry (2000) studied the effect of management teams' status on effectiveness and performance of the team. They augmented that the status of a team will affect the members' performance based on the notion that being a member of a high status team will increase a team member's feeling of self worth and effectiveness. Hence the positive effect that high team status has on the individual will improve individual performance. Overall they found that higher status teams were more effective and productive than lower status ones.

Jemmott and Gonzalez (1989) separated school children in two teams: a helper team and a boss team. The helper team was considered the lower status team and the bosses the higher status team. After a mutual activity, the children were asked to complete puzzles. In accordance with the status characteristic theory predicts, the children of the boss team performed better than the ones of the helper team. This status effect theory was used for formulating the following hypothesis:

Hypothesis 2:
Researchers of higher status universities show higher scientific productions than their colleagues in lower status universities.

Method

Sample and procedure

The academic ranking of world universities formed the sampling frame of this study. A high status was appointed to nineteen universities which listed in the top fifty the world class ranking lists of the academic ranking of world universities 2004 (Shanghai Jiao Tong University Institute of Higher Education, 2004) and their top hundred ranking in the Times Higher Education Supplement (The Times Higher Education Supplement, 2004).

Seven lower status universities were selected on their top 51-100 in the first mentioned list. Also, nine Dutch (lower status) universities were included in this study because this research took place in the Netherlands. Thirty-five universities were selected in total. They originate from the USA (10) and Europe (25); UK (8), The Netherlands (9), Germany (4) and France (4).

Publishing and citation activities vary considerably from one discipline to another, according to a classical scientrometrics' insight (Carayol & Matt, 2006). To get a broad view, be able to see disturbance in the data of a discipline and to be able to compare disciplines, three majors were selected on the basis of their availability in the high status universities; Economics, Chemistry and Mechanical Engineering. Per university and within these three departments ten researchers were randomly chosen and asked to participate in the study. This resulted in a test sample of 870 researchers divided over Economics, Chemistry and Mechanical Engineering in respectively, 300, 340 and 230 researchers. The researchers were asked to fill in a digital survey about different aspects of their research activity during a five-year period (2000-2004).

A database is compound of all researchers who were selected for this study. All information used in the database was available on the Internet, for example e-mail address, contact address, name, university, field of study and country per researcher. This database was used in a later stage to complement missing data in the questionnaire.

First, the researchers were sent an e-mail with the request to fill in the 28-point electronic questionnaire. The questions were divided over four thematic blocks: Personal and professional information, Research Team, Individual Research Activity, and Collaborations. Research team focused on the team situation and team status of the researchers. Individual Research Activity compiled questions on the individuals' publication performance and status perception. Collaborations focused on the (international) interaction with other team(s). Researchers who did not respond were sent a reminder after three weeks. The electronic questionnaire was closed two months after the first request.

The total response rate for this study was 129 (14.8%) divided over the countries USA 24 (2.8%) and Europe 87(10%); UK, the Netherlands, Germany, and France respectively (34 (3.9%), 33 (3.8%), 9 (1%) and 11 (1.3%) respondents) with 18 (2%) missing values. The total response rate in relation to the majors; Economics, Chemistry and Mechanical engineering are respectively 38 (4.5%), 48 (5.5%) and 28 (3.2%), with 15 (1.7%) missing values. Missing values are respondents of whom the country or major was not inserted in the survey and not traceable in the database created. 12% of the respondents were female.

Performance measurement techniques

In most studies that deal with the performance and productivity of research teams, a bibliometric approach is used. Bibliometrics deal with the study of paper-based literatures or databases (White & McCain, 1989). Other research techniques for collecting information about productivity performances are peer reviews, surveying, or a combination of techniques (Rey-Rocha et.al, 2002). Peer review is the process used for controlling the work performed by ones peers to reach specific standards and criteria (Van Raan, 2001). A survey is a measurement method to collect data from people using a questionnaire (Dooley, 2001).

Rey-Rocha et al. (2002) did both a scientist's survey and a bibliometric study on the productivity performance of individual researchers in team structures. They found that the average number of articles produced per author was less, in the bibliometric study compared to the scientist's survey. However, both measurement methods showed the same trends in the publication performance in relation to the researchers' team consolidation.

The peer review method is not used in this study because the information required is researcher specific. Neither will the bibliometric method be used in this study, because in this study researchers' status will be categorized by real and perceived status, which cannot be found in existing databases. Thus, this study will use the scientist's survey of which only the trends in the data will be used for the conclusion and discussion and not the absolute data. Since Martin and Skea (1992) are suggesting that productivity of individual researchers is mainly shaped by the teams with which they are most closely involved, this study will be conducted on micro level.

Measures

Publication performance

There are various ways to measure the publication performance of individuals (Lohman, Fortuin & Wouters, 2004; Henri, in Press). The faculty of health sciences of the University of Sydney

uses well-defined indicators for research performance. Their Research Performance Indicators (RPI) weighting scale served as the leading measurement method for this study (University Sydney Faculty of Health Sciences, 2002). RPI points were awarded to the following publications; book: 5 points, edited book: 1 point, book chapter: 2 points, book new edition/ revision: 0.5 points, article published in a peer reviewed journal: 2 points, published international/national conference proceeding: 0.5 points and a published international/national conference abstract: 0.25 of a point.

The respondents in this study were asked to indicate the number of articles, books and other publication's (e.g. dissertations) they produced in the reference period 2000-2004. These articles were awarded 2 points, the books 5 points and the other publications 1 point. This last score is based on the sum of rest RPI indicator scores divided by its number (1+2+.5+.5+.25=4.75/5=0.95 rounded to 1). Publication performance is the dependent variable in this study.

Team Consolidation

Following the study of Rey-Rocha et al. (2002), researchers were asked to classify themselves as being part of one of the next categories; 1C (one consolidated team), 1NC (one non-consolidated team), MC (multiple consolidated teams), MNC (multiple not consolidated teams), M(N)C (depending on the project both consolidated and non consolidated teams) or NT (researchers that are no members of no teams). In order to get a mutual understanding the consolidated team characteristics set in this study are clarified in the questionnaire.

Successively the respondents were asked to choose the research team that is most important for them. The rest of the team questions referred to this chosen team only. The respondents were divided over three consolidation categories: C (consolidated teams (1C) + (MC)), NC (non consolidated teams (1NC) + (MNC)) and NT (no team). Researchers out of the M(N)C team were divided over the C and NC team depending on their description of their chosen research team and their answers on team perception questions.

Status

Barreto & Ellemers (2003) considered the independent and interactive effects of internal categorizations (how people see themselves) and external categorizations (how they are categorized by others) on social behaviour. In assumption that their findings are not only applicable on social behaviour but also on productivity this study will divide the variable status in two sub teams: Status Real, based on academic rankings of the researchers' university and Status Perception, based on questions about the status of the researchers' university.

Status Real:

Social status describes the relative social esteem of a university (Miyamoto & Dornbush, 1955). Status evaluation is a subjective process that results in fairly stable evaluative outcomes (Berger et al., 1972). As applied to universities, perceptions of status are mostly seen as the financial status of a university that is often correlated with the more objective measures of faculty productivity (Burke, 1988). However, status is not limited to any specific activity. Consistent with McGee (1971), status has its foundation in academic reputation. University status has been considered a factor in many aspects of a researchers' career and plays a big role in the labour market possibilities of academics (Burke, 1988). Studies in many disciplines have shown that a few high status universities dominate the top journals and awards are also concentrated in the

hands of a small number of universities (Zuckerman, 1970). In this study is the Status Real is the assumed high status that a researcher receives from being part of a high-status university, and low status for researchers from a lower ranked university. The ranking, as described in sample and procedure, was divided from the academic ranking of world universities 2004 and the times higher educational supplement 2004 (Shanghai Jiao Tong University Institute of Higher Education, 2004; The Times Higher Education Supplement, 2004). The variable Status Real is introduced as a dummy variable that equals one if the respondent has a high status and zero in case of a low status.

Status Perception:
A principal factor analysis was applied to capture the underlying dimensions of Status Perception, (7 items) divided over two sub groups Team Status Perception (4 items) and University Status Perception (3 items). The choice of the number of factors is based on three criteria. First, the Kaiser criterion was used, which advices dropping all factors with eigenvalues below 1.0, since factors are then no longer more important than a single variable (Kaiser, 1960). Second, the Cattell's scree test (Cattell, 1966) was applied. Cattell's scree test involves plotting the eigenvalues against the factor number and takes the point at which the curve starts to straighten out as giving the number of factors to be extracted. Cattell's Scree Test, which is said to be more accurate than the Kaiser criterion (Zwick & Velicer, 1986), showed that for the dimension Status Perception a maximum of 2 factors is suitable. Finally, and this is considered the most important criterion, the factors were tested for reliability using the Cronbach Alpha. Factor analysis revealed that for the dimension Status Perception one factor has the best reliability.

The researchers' perception of his/her status was asked in seven items. Two examples for items read "My team has a good reputation within my research field" and "My university has a good national reputation", (6 point scale, 0= no comment, 1= totally disagree,.., 5=totally agree, of which a 0 score was defined as missing value). The factor analysis showed that it is better to combine the two sub groups Team Status Perception and University Status Perception into one factor. Hence, Status Perception has seven items (Cronbach's alpha .85). A high score on these items refers to a high Status Perception of the participant's team and university. The respondents are categorized according to their answers in five groups: very low status perception, low status perception, normal status perception, high status perception and very high status perception.

Background and control variables

Gender: There are still big differences between the status of women and men within the university setting (Castle & Schutz, 2002). Wenneras & Wold (1997) found that a female researcher had to be two and a half times more productive than the average man to receive the same competence scores. Zuckerman, Cole, Bruer and Eisberg (1994) showed that the process of cumulative advantages might be a reason of the persistent position of woman in "the outer circle of science" because it amplifies an initial situation where woman published less than men. Hence, in this study gender is introduced as a dummy variable that equals one if the respondent is a woman.

Major: According to a classical scientrometrics' insight vary publishing activity and citation activities considerably from one discipline to the other (Carayol & Matt, 2003). Hence, the three majors in this study, economics, chemistry and mechanical engineering are considered to be

background variables. Two dummy variables will created: M1 equals 1 for economics, 0 for chemistry and –1 for mechanical engineering, M2 equals 0 for economics, 1 for chemistry and –1 for mechanical engineering.

Country: In the study of Rahman et al. (2005) different country trends of article production were determined. The results showed that there were significant different trends over time in the different counties. Therefore the countries from which the researchers operate are also included as the last background variable. Hence, in this study country is introduced as a dummy variable that equals one if the respondent is from the USA and zero in case the researcher is a resident of Europe (UK, the Netherlands, Germany or France).

Data analysis

The variables defined are first tested on their normal distribution, using the Skewness test. The dependent variable (publication performance) was found to be not normally distributed; hence, it was transformed using the log transformation for better fit (Gingerich, 1995). After this transformation all the variables were assumed to be normally distributed. Then the correlation matrix for all variables is calculated. An ANOVA and a post hoc ANOVA, the multi-comparison Bonferroni test was conducted, which is used to measure the significant differences between the variables with more than two groups (e.g. Country and Study). Finally a multiple regression analysis was conducted to determine a linear model between the multiple independent variables and the depended variable (publication performance).

Results

Descriptives and correlations of the variables used in this study are shown in Table 1. Except for 'Status Real' all independent variables are significantly related with publication performance (.37, .55, $p < .01$). The background variables Gender, M1(dummy1 majors) and M2(dummy2 majors) were significantly correlated (-.36, .33, $p<.01$; .28, $p<.05$) to the depended variable Publication Performance. The mean productivity over the group is 10^{x} ($10^{1.52}$ = 33, SD = .43). No severe multicollinearity ($R^2i>.9$) was found (Devore, 1999).

Table 1

Correlation for all variables (N=129)

	Correlations	M	SD	1	2	3	4	5	6	7	8
1	Publication Performance	1.52	.43								
2	Team Consolidation	2.39	.71	.55**							
3	Status Real	.52	.50	-.02	-.11						
4	Status Perception	4.34	.73	.37**	.03	.23*					
5	Gender	.12	.32	-.36**	-.24*	-.01	.10				
6	M1 (dummy1 majors)	.09	.76	.33**	-.22*	.01	-.08	.03			
7	M2 (dummy2 majors)	.18	.80	.28*	.13	-.09	.10	-.04	.38**		
8	Country	.22	.41	.02	-.15	.50**	.19	-.04	.04	.01	

* $p<.05$, ** $p<.01$

The Levene's test in the ANOVA showed that the variances of the status perception variable is not homogeneously distributed (.030, $p<.05$). However, failure to meet the assumption of homogeneity is not fatal to ANOVA. In this case the significance level of the F-test was very significant $F(3, 77) = 4.02$, $p<.01$. Hence, one can assume that status perception does influence publication performance (de Vocht, 2002). Table 2 presents these findings. The results showed a

significant difference between the Consolidated Teams, Non Consolidated Teams and No Research Team members F(2, 78) = 16.48, $p<.01$, this is inline with the first hypothesis. In order to check if the Consolidated Team members are the better producing researchers a post Hoc Bonferroni test is conducted.

Table 2

Analysis of Variance for Publication Performance

Source	*df*	*F*	η	*p*
	Between subjects			
Team Consolidation	2	16.48**	2.19	.00
Status Real	1	.04	.01	.85
Status Perception	3	4.02**	.67	.01
Gender	1	10.95**	1.85	.01
Major	2	13.56**	1.71	.00
Country	1	.03	.01	.87
Within group Error		(11.78)		
	Within subjects			
Team Consolidation	76		.13	
Status Real	73		.19	
Status Perception	74		.17	
Gender	74		.17	
Major	65		.13	
Country	73		.19	
Within group Error		(71.23)		

Note. Values enclosed in parentheses represent mean square errors.
* $p<.05$, ** $p<.01$

Since the ANOVA test showed significant differences between the groups of Team Consolidation and Major, I used the Bonferroni test to check whether or not the three groups are significantly different in relation to the dependent variable Production Performance. The Bonferroni test showed that there is no significant difference between respondents with No Team (NT) and the ones in a Non Consolidated Team (NCT) (.303, $p>.05$). There is however a significant difference between members of a Consolidated Team (CT) and (No Team & Non Consolidated Team) (.637, $p<.01$; ..334, $p<.05$). Hence a new dummy variable is created "Consolidation" that equals one if the respondent is from a Consolidated Team and zero in case of a Non Consolidated team or No team. These results give prove for the first hypothesis, stating that members of consolidated teams are more productive than their colleagues in non consolidated teams of researchers who work alone.

For the variable Major the Bonferroni test showed that there is no significant difference between Chemistry and Mechanical Engineering (.212, $p>.05$) There is however a significant difference between Economics and Chemistry & Mechanical Engineering (.516, $p<.01$;.304, $p<.05$). Hence a new dummy variable is created: "Major". This dummy variable that equals one if the respondent is from an engineering major (Chemistry and Mechanical engineering) and zero in case of Economics. Appendix A shows the results of the Bonferroni test for the variables Team Consolidation and Major.

To determine the relation between all independent variables and the Production Performance a linear regression will be conducted. Multiple regression calculates the linear model between the dependent variable Production Performance (Y) and the multiple independent variables (X_i). The general model with *k* independent variables is stated in equation (1).

(1) $Y = A + B_1*X_1 + B_2*X_2 + \ldots + B_k*X_k$

The intercept A is the value of Y in case all independent variables equal 0. Every independent variable has a partial regression coefficient B_i, which shows the influence of X_i on Y. In this study *k*=6. By way of running the multiple regression analysis several times and deleting insignificant variables each time, only the significant independent variables are left. These variables influence the dependent variable.

Table 3 presents the results of the multiple regression analysis on publication performance. R gives the correlation of the dependent variable with all independent variables (.803). R^2 is the determinate- coefficient, which gives the percentage of the explaining variance, the bigger the R^2 the better "fit" of the model (.646). With means that 65% of the variance in Production Performance can be explained by the five independent variables. With smaller samples, like in this study, R^2 is usually estimated too large. Therefore the R^2 adjusted gives a better idea of model fit; the R^2 is corrected by the number of cases (.621). With the F test one can test whether or not the model is significant (H0: multiple $\rho=0$). The model is significant according to the F test (25.96, $p < .01$). Finally the model is tested on outliers with the Casewise diagnostics option, with 2 SD. Two outliers were removed from the data set.

The final regression model is stated in equation (2).

(2) $Y = .211*X_1 + .237*X_2 - .363*X3 + .309*X_4$

Y = Production Performance
X_1 = Consolidation
X_2 = Status Perceived
X_3 = Gender
X_4 = Major

This model shows that being part of a consolidated team has a positive effect on Publication Performance compared to researchers who work alone (.211). Status perception also has a positive effect on publication performance (.237). In this sample, the background variable Gender is negatively related to Publication Performance (-.363) which means that women have a significantly less Production Performance then men. Finally the Major in which the respondents are active, had its effect on Production Performance; engineering respondents produced significantly more than their economics colleagues (.309). The Beta-coefficient gives an indication of the relative influence of every independent variable. Status Perception has the highest absolute Beta Value |.444| followed by Major, Gender and Consolidation, respectively (|.350|, |.291| & |.252|). These results support Hypothesis 1, which states that team consolidation affects research performance positively. These results also give partial support for Hypothesis 2, demonstrating that high status perception positively affects publication performance; however, the real status is not found to be significantly related to the publication performance.

Table 3

Summary of Backwards Hierarchical Regression Analysis for Publication Performance

	Model 1			Model 2			Model 3		
Variable	B	SE B	*β*	B	SE B	*β*	B	SE B	*β*
(Constant)	.251	.193		.259	.190		.257	.188	
Consolidation	.205	.076	.245**	.209	.075	.250**	.211	.074	.252**
Status Real	.004	.080	.045	.003	.069	.027			
Status Perception	.237	.045	.443**	.234	.045	.438**	.237	.043	.444**
Gender	-.368	.106	-.296**	-.365	.105	-.293**	-.363	.104	-.291**
Major	.309	.077	.351**	.309	.076	.351**	.309	.076	.350**
Country	-.004	.093	-.037						
R^2		.647			.646			.646	
F		16.818**			20.462**			25.956**	

p<.05, ** *p*<.01

Discussion

The results provided some evidence for a relation between publication performance and team consolidation. Also a relation between team-status and individual publication performance was found, although the real status, the status ones receives from being part of a high-ranked university, did not have a significant influence on the publication performance of their researchers. The status one perceives to have is been found to be significantly related to the production performance. Hence, the relations were found to exist and their partial influence on production performance was found using a multiple regression analysis.

The results of status perception on performance can be explained by the fact that this research made use of production estimates given by the respondents and not of a biliometric research. For further studies on this subject it would be interesting to compare the findings of the scientist's survey with the findings of a bibliometric study as these can show differences in productivity rates (Rey-Rocha et al. 2002). It is possible that respondents who produce many articles are more likely to define themselves as "high status" or visa versa (a causal relation). However, there is no literary evidence for this allege. The high-ranking status of universities, defined as Status Real in this study, does not seem to affect the researcher's performance. An explanation for this lack of a significant relationship can be found in Keith's (2001) study on university status, which showed that this is quite stable over time, even if universities try to change their characteristics.

This study made use of a questionnaire survey. Cross-national mail surveys aiming at industrial populations generate very low response rates. If the non-respondents are not politely requested again to complete the survey by mail or telephone contact, response rates typically vary between 6% and 16% (Harvey, 1987; Yu & Cooper, 1983). Reminders usually increase response rates, but also examples of just 8.8% are known even though a reminder was sent (Kopp, 1994). Low response rates can form serious threats for research (Harzing, 2000), since this can lead to samples that are too small to draw any conclusions from. Since this survey research aims at researchers (professors, doctors, pre-doctoral) of universities with not much time to fill in questionnaires, a response rate of about 10 % was expected beforehand. The final response rate was 15.2%. In order to find a more definite answer to the research questions, a more extended survey would be appropriate.

The consolidation of the team a researcher belongs was related to publication performance, which

gives more support for the findings of Rey-Rocha and colleagues (2002) indicating that team consolidation is an important factor for research performance. However this study did not control for the number of researchers working on a publication, this could have negatively affected the researchers in the "No Team" group. The measures and characteristics used in this study may have been too limited or not clearly formulated for all respondents, as more countries and studies were involved. Further studies on team consolidation in relation to productivity performance could provide more evidence, but first a solid and clear definition of team consolidation is needed. This study may be used as a jump-start in setting this definition.

The support for gender differences can be explained by Xie and Shauman's (1998) study on sex differences in publication performance. One of their findings was that this could be explained by personal characteristics. Finally, support for the differences between the majors can be found in the study of Eisemon (1974) who examined the relationship between institutional affiliation and scholarly activities and outlooks. It showed significant differences between different engineering studies with respect to their publication performance, professional involvement, attributes toward professional life and job satisfaction.

In summary; this research showed that working in a consolidated team positively affects individual publication performances. Furthermore, if a researcher perceives his/her research team as "high status" than one can assume a higher performance then for a researcher who perceives his/her team as "normal". However, this could be a causal relation. Gender differences were detected within this study; male researchers show a higher research production rate than their female counterparts. Finally, Engineering researchers showed a higher production rate than their colleagues in Economics.

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Appendix A
Multiple comparisons Bonferroni Test

Table A

Bonferroni differences between Team Consolidation in relation to Publication Performance (N=129)

(i)	M	SD	(j)	M difference (i-j)	SE	*p*	95% Confidence Interval	
							Lower Bound	Upper Bound
NT	1.10	.36	NCT	-.303	.127	.060	-.615	.009
			CT	-.637**	.119	.000	-.930	-.343
NCT	1.40	.36	NT	.303	.127	.060	-.009	.615
			CT	-.334**	.091	.001	-.558	-.110
CT	1.73	.37	NT	.637**	.119	.000	.343	.930
			NCT	.334**	.091	.001	.110	.558

* *p*<.05, ** *p*<.01

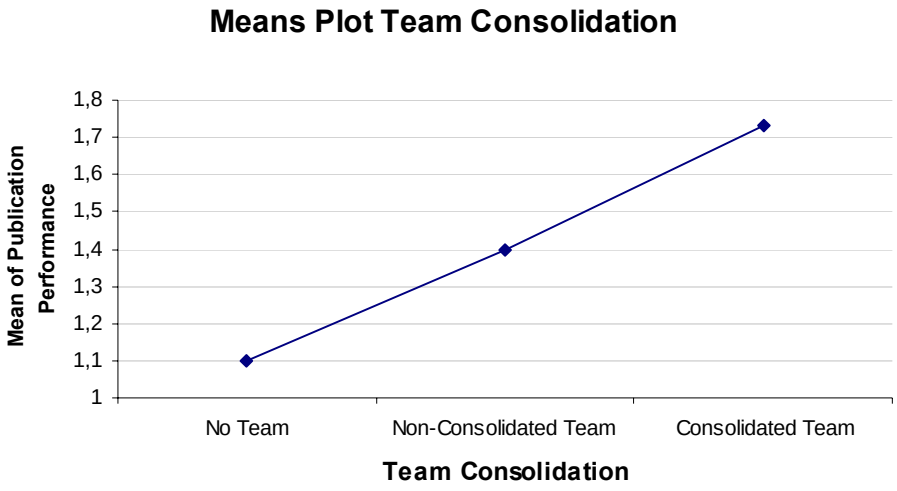

Table B

Bonferroni differences between Majors in relation to Publication Performance (N=129)

(i)	M	SD	(j)	M difference (i-j)	SE	*p*	95% Confidence Interval	
							Lower Bound	Upper Bound
Mechanical	1.55	.39	Chemistry	-.212	.11	.178	-.484	.595
			Economics	.304*	.11	.032	.019	.588
Chemistry	1.77	.35	Mechanical	.212	.11	.178	-.059	.484
			Economics	.516**	.10	.000	.276	.760
Economics	1.25	.34	Mechanical	-.304*	.11	.032	-.588	-.019
			Chemistry	-.516**	.10	.000	-.760	-.273

* $p<.05$, ** $p<.01$