Academic (economic) woman: Gender, incentives and performance at Danish research institutions

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Abstract

The gender diversity theory presumes that an equal mix of men and women has an impact on organizational performance, but this presumption has gained limited empirical support. This article finds that gender diversity and performance are weakly associated, but that the gender composition has more complex effects in conjunction with workplace financial incentives. Because men and women tend to respond differently to financial incentives at research institutions, we analyze how gender, incentives and the perception of these incentives affect organizational performance. Using data from 2000-2005, the analysis includes 162 Danish research institutions (17 government research institutions and subunits of 10 universities). The main conclusion is that gender diversity seems to have a very modest, but positive impact on the performance, measured as the output of scientific publications, and that women and men react differently to financial incentives.

Introduction

Studies of workplace diversity have become increasingly important in management research (Christian, Porter & Moffitt, 2006: 459; Ocon, 2006: 3-6; Pelled, Eisenhardt & Xin, 1999: 1), and to a lesser extend, also in studies of the public sector (Meier, Mastracci & Wilson, 2006). The information/decision-making strand in the diversity literature (White & Rice, 2005; Bell, 2006; Murrell & James, 2001) argues that diversity of personal characteristics such as ethnicity and gender improves performance when it fosters diversity in information, abilities or perspectives (Webber & Donahue, 2001: 144), while the social categorization perspective holds that diversity reduces performance because it increases the level of conflict. For gender as a diversity characteristic, neither the information/decision-making nor the social categorization perspective has gained strong empirical support; most studies find very weak positive associations between performance and gender diversity (Lee & Farh, 2004; Dwyer, Richard & Chadwick, 2003; Kochan et al., 2003; Webber & Donahue, 2001).

The organizational gender composition may, however, have more complex effects on performance. Experimental research indicates that there are gender differences in the response to incentive systems (Villeval, Gupta & Poulsen, 2005), and the combined impact of organizational gender diversity and financial incentives may be important for organizational performance. Specifically, the perception of the incentives (Frey, 1997) needs to be taken into account, because financial incentives perceived as supportive increase performance, whereas performance decreases when financial incentives are perceived as controlling (Andersen & Pallesen, 2008). The conjoint influence of organizational gender composition and (perceived) financial incentives has, to our knowledge, not been tested before.

The present article aims to begin to fill this gap by an investigation of the impact of the gender composition and financial incentives at Danish research institutions. We test whether the

degree of gender diversity (Thomas, 1995) affects aggregate performance, operationalized as the number of scientific publications, and whether the gender composition affects the association between financial incentives and organizational performance. Using data from 2000-2005, the analysis includes 162 Danish research institutions (17 government research institutions and subunits of 10 universities).

First, we present the theory behind the two hypotheses on the impact of gender diversity and gender differences in competitiveness. Then we present our register data, survey and methods followed by our empirical analysis consisting of a series of regression analyses. The article ends with a discussion of the results and a conclusion.

The gender diversity hypothesis

The information/decision-making perspective and the social categorization perspective are the two most common theoretical approaches in the diversity literature (Christian, Porter & Moffitt, 2006: 461). The social categorization perspective claims that workgroup diversity reduces performance because diversity may foster poor group relations. The argument is that group members use similarities and differences as a basis for categorizing into in-groups and out-groups and that diversity makes this categorization more problematic (*ibid.*). In contrast, the information/decision-making approach (White & Rice, 2005; Bell, 2006; Murrell & James, 2001) presumes that diversity is positively related to performance, because heterogeneity increases cognitive resources and problem-solving abilities (Webber & Donahue, 2001: 144). The argument is that greater variability in skills, abilities and perspectives extend the knowledge base from which the group members can make decisions and stimulate employees to consider other options facilitating more thoughtful processing of problems and novel ideas (Christian, Porter & Moffitt, 2006: 461).

None of the two diversity approaches has gained strong empirical support. The evidence on the effects of gender diversity is mixed, and most studies find very weak positive associations between performance and the degree of equal mix of men and women (Lee & Farh, 2004; Dwyer, Richard & Chadwick, 2003; Kochan et al., 2003; Webber & Donahue, 2001). One interpretation of this finding is that the negative effects of diversity presumed by the social categorization approach outweigh the positive effects presumed by the information/decision-making approach. Another possibility is that the impact of diversity is contingent on the organizational task, and that diversity only optimizes performance when both female- and male-related skills are important.

In line with the idea that different tasks demands different skills, the diversity literature increasingly includes task-related factors in the analysis of the association between diversity and performance (for a meta-analysis, see Bower, Pharmer & Salas (2000)). Psychological research indicates that the variability in skills is linked to the fact that women are (on average) more empathic (Baron-Cohen 2003:29-60; Eisenberg & Lennon 1983), whereas men are (on average) more systematic (Benbow & Stanley, 1980 & 1983; Leahey & Guo, 2001; Baron-Cohen et al. 2003). Empathizing skills seem to be important in the case of team work and direct user contact. For example, Meier, Masstracci and Wilson (2006) show that Texan schools with more female street level bureaucrats have higher overall organizational performance measured as student test scores, prevention of dropouts, ACT scores and college percentages, compared with Texan schools with fewer females (Meier, Mastracci & Wilson, 2006). Their explanation is that "women employ more emotional labor" (*ibid.*: 900). Emotional labor is based on empathy, as emotional labor is defined as "the projection of feelings and emotions needed to gain the cooperation of clients or co-workers, the ability to see another's side of the issue and to integrate that perspective into what the organization does" (*ibid.*: 899). This implies that emotional labor (and thus empathizing skills) is

primarily relevant in organizations with high levels of cooperation. In contrast, tasks such as math, physics, and engineering require high systemizing abilities (Baron-Cohen, 2003: 72).

Some tasks demand both types of skills: Research, it may be argued, often involves both cooperation and logical reasoning, and both systemizing and empathizing skills are relevant to researchers. This indicates that organizational diversity is relevant for scientific knowledge production (Gibbons et al. 1994: 6). Following the ideas that the impact of diversity is contingent on the organizational task, and that diversity optimizes performance only when both female- and male-related skills are important, the gender diversity hypothesis is: Research institutions with high levels of organizational gender diversity (close to an equal mix of male and females) publish more scientific publications than research institutions with lower levels of gender diversity.

This is a conservative test of the diversity hypothesis, because diverse research institutions often employ high proportions of females, and several studies have shown that individual female scientists publish less than individual male scientists (Cole and Zuchkermann, 1984; Kyvik, 1990; Prpiû, 2002). Although this so-called 'productivity puzzle' (Cole and Zuchkermann, 1984) has been studied intensively, we still do not know why men publish more than women (Stack, 2004: 912). Prpiû, however, argues that the introduction of a competitive scientific system increased the gender differences in young Croatian scientists' productivity (2002: 47), and this suggests that gender differences in competitiveness might be important.

The competitiveness hypothesis

In addition to their different empathizing and systematizing skills, men and women differ with regard to their competitiveness (Villeval, Gupta & Poulsen 2005; Gneezy, Niederle & Rustichini, 2003; Niederle & Vesterlund, 2005; Ahlgren & Johnson, 1979). Specifically, it has been argued that there is a gender difference in the propensity to prefer to be rewarded based on relative performance

such as a tournament, rather than being rewarded on the basis of one's own performance only, such as in piece rate systems (Villeval, Gupta & Poulsen, 2005: 1). Based on an economic experiment where the participants, before performing a task, were asked to choose to perform under a competitive payment scheme (tournament) or a non-competitive payment scheme (piece rate), Villeval, Gupta and Poulsen (*ibid.*: 28) found that women are less likely than men to choose the competitive payment scheme. Gneezy, Niederle and Rustichini (2003: 1049) also found a significant gender gap in performance in mixed sex tournaments (men perform better), while there was no difference between men and women when performing under a piece rate reward system. As tournament competitions for scientific positions are important in most developed countries, gender differences in competitiveness might explain the abovementioned 'productivity puzzle'. Tournament competitions may induce the male scientists to perform their best whereas female scientists perform better under piece rate incentives. This implies that the impact of both individual gender and organizational gender composition should be seen in relation to the financial reward systems at the research institutions.

Danish research institutions have always had tournament incentives. Danish researchers vie for positions: PhD students compete to become assistant professors (three year fixed-term employment contracts), and assistant professors compete to obtain a tenured position as associate professor. Full professorships are also filled on the basis of tournament competitions. Before 2000, the salary of Danish researchers was alone determined by position and seniority, but piece rate incentives were introduced in 2001 at Danish research institutions with the so-called "New Wage" (see below). Some of the locally negotiated "New Wage" schemes reward publications (e.g. having published an article in a specific journal) with a fixed piece rate regardless of the output of other researchers. Based on the experimental evidence, we would expect that female researchers are more responsive than males to this piece rate incentive based on absolute performance; male researchers

would be expected to continue to do their best in the tournament competition, regardless of the introduction of the "New Wage" schemes.

Ideally, a test of this proposition requires information about each individual researcher. Our data is, however, collected at the institutional level, and thus we are only able to analyze the impact of a *proportion* of females in conjunction with the piece rate incentive schemes. This investigation may, nevertheless, provide us with an indication of the conjoint impact of gender and piece rate incentives for organizational performance. Thus, the competitiveness hypothesis is: The piece rate financial incentives in the Danish New Wage schemes affect the number of published scientific publications more at research institutions with a high proportion of female researchers compared to research institutions with a low proportion of female researchers.

The theoretical model

As discussed above, the gender diversity hypothesis predicts that gender diversity will affect the number of publications positively. The competitiveness hypothesis presumes that the relationship between piece rate incentives and the number of publications is conditional on the proportion of employed women, i.e. the higher the proportion of females, the stronger the association. This is illustrated in figure 1.

[figure 1 here]

Figure 1 also includes the perception of the piece rate incentives, because an earlier investigation of the introduction of financial incentive schemes at Danish research institutions (Andersen & Pallesen, 2008) showed that the effect of incentives depends strongly on whether the incentives were seen as supportive or as controlling. This investigation supported Frey's argument that

external rewards “crowd out” intrinsic motivation and reduce the work effort if rewards are perceived as a device to control behaviour while rewards tend to “crowd in” intrinsic motivation if the affected individuals consider the reward to be supportive of their own choices and values (Frey 1997). In this case, the incentives serve as an acknowledgement of their work effort and morale and increases self-esteem and emphasize self-determination (Frey, 1997; Frey & Jegen, 2001). Thus, financial incentives are expected to affect behaviour in two ways: besides the relative price effect – the normal economic response to incentives – there is a crowding effect that works through its impact on intrinsic motivation (Frey & Jegen, 2001: 590-591). Whether the crowding effect works in the same direction as the relative price effect (and increases the agents’ motivation to perform) depends on the perception of the incentive as either controlling or supportive (Frey & Jegen, 2001: 594-595). The perception of the incentive is included in the model to make sure that the effect of the gender variables is not spurious. The next section will operationalize the variables, followed by the results and a discussion.

Data and methods

The investigation includes all Danish research institutions with valid data in both 2000 and 2005, excluding institutions that did not exist during the entire period under investigation. Furthermore, very small institutions (less than 12 employees) are excluded to ensure the reliability of the data. Also the clinical departments at Health Science Faculties are excluded, because they are partly hospital and partly university institutions. This leaves us with 162 Danish research institutions (17 government research institutions and subunits of 10 universities).

The changes in organizational gender diversity between 2000 and 2005 enable us to analyse the association between gender diversity and the number of publications at the organizational level. As mentioned, no significant financial piece rate incentives to publish existed in year 2000 (because

the salary was alone determined by position and seniority), but around 2001-2002 such piece rate incentive schemes were introduced at some of the institutions. This enables us to analyze the conjoint influence of gender composition and financial piece rate incentives. As these incentives were not introduced at random, we investigated whether this resulted in selection bias. This does not seem to be the case (which will be discussed in more detail after the presentation of the results).

Publications include different types of output: Articles in peer-reviewed journals, books, contributions to anthologies, dissertations, scientific reports, editorials, working papers and other conference contributions, patents and scientific reviews. Prominent among these are articles in peer-reviewed journals, books and contributions to anthologies. We primarily focus on the relative change[1] in the number of scientific journal articles from 2000 to 2005, because this is the most comparable and standardized type of publication. The *level* of published articles is strongly affected by the disciplinary propensity to publish in journals, but the choice to focus on the *growth* in articles should, at least partially, account for this problem. Besides, we control statistically for scientific field to take different publication patterns into account. To ensure that the results are robust, we also analyze the total number of scientific publications and differentiate between the (more prestigious) international publications and the (less prestigious) publications written in one of the Nordic languages. The results are very similar. The publication data come from the registers of the universities and research institutions.

The relative change in the number of journal articles is considered in conjunction with *the relative change in the number of researchers above PhD level* during the same period.[2] We use the entropy-based index (Jehn, Northcraft & Neale, 1999: 749) to form an aggregate measure of gender

[1] The calculation of the relative change is: $\frac{Publications_{2005} - Publications_{2000}}{Publications_{2000}}$

[2] Controlling for (a) total number of researchers and (b) researchers holding a PhD gives almost identical results. The Danish Centre for Studies in Research and Research Policy kindly provided the data, which are also used to estimate the diversity and the proportions of female researchers.

diversity[3] at the research institutions: Diversity = $\sum -P_i(\ln(P_i))$, where P_i represents the proportion of each diversity characteristic (men and women). This measure logically goes from 0 (only one sex represented) to 0.6932 (50 % of each sex). The average organizational percentage of women at the end of 2004 was 27 per cent (N=162), and this has (on average) increased with 3 percent points since 2000. Figures 2-5 show the gender diversity and female proportion.

[figure 2-5 here]

The *degree of piece rate incentive* is measured in a quantitative content analysis of the New Wage schemes. The majority of New Wage schemes are from 2001-2002 when most research institutions negotiated their first local New Wage schemes. Each agreement is classified according to the strength of the incentive to increase the number of publications on a scale from 'no piece rate publication incentive in the agreement' to 'very strong piece rate publication incentive'. In the former group we include research institutions with no New Wage scheme at all or an agreement that does not contain any piece rate incentives. Schemes without incentives linked to research output often explicitly state that they aim to approximate the old seniority-based system. At the other end of the continuum, an institution with an agreement that stipulates automatic pay for each publication is classified as having a very strong piece rate incentive to publish. Specifically, the New Wage schemes were scrutinized for clauses on bonuses for publications in general and subgroups of publications (notably international articles), bonuses for dissertations and full professor qualifications and the size of all these pay supplements linked to research. Table 1 fleshes out the classification of the New Wage schemes.

[3] Using the simple proximity to 50 % male and 50 % females gives similar results.

[table 1 here]

Measured in this way, the typical Danish research institution has a New Wage scheme with modest publication incentives. Only 9 institutions (5.6 per cent) have New Wage schemes with strong or very strong piece rate incentives to publish (table 2). The distribution is thus skewed to the right, and the results should be cautiously interpreted for the higher end of the scale. Still, the classification of the New Wage schemes is considered an interval scale measure because the categories are defined so that the distance between categories in terms of strength of financial piece rate incentive is approximately equal.

We conducted a survey with the local shop stewards at the investigated research institutions to measure whether researchers perceive publication bonuses as a mechanism for controlling their behaviour or as a supportive device (89 per cent responded). Since the rank-and-file researchers elect the shop steward, we considered the shop stewards representative of the researchers. At most research institutions, the shop steward function seems to rotate between the ordinary rank-and-file researchers. Due to their superior knowledge of the New Wage schemes and other factors, shop stewards may differ from rank-and-file researchers, but we have no indications of tensions between the two groups. For the Danish data, we therefore presume that the shop stewards' survey responses are valid guides to the staff's general perception of the pay schemes, but that is not necessarily so in other system. We have tested whether the *gender of the shop stewards* affects any of the investigated variables, but this is not the case.

To get comparable answers about the *perception of financial incentives to publish* in a survey conducted after the implementation of the New Wage schemes, we measured the respondents' stands on a number of statements about publication bonuses *per se*. Specifically, we asked for the shop stewards' opinions (totally agrees, partially agrees, neither agrees nor disagrees,

partially disagrees, totally disagrees) on the items displayed in table 1. This table shows a principal component analysis of the items, and the high loadings for the only component with an Eigen value higher than 1 indicate that all items measure the same latent variable. We interpret this component as the perception of the incentive. The high loading of the last item (bonuses as a control where answers are turned) indicates that supportive and controlling perceptions constitute the extremes of the same dimension.

[table 2 here]

An additive index has been calculated from the three items (high is supportive perception), and Cronbach's Alpha for this index is 0.70. The items are coded so that high scores on the index mean that the incentives are perceived as supportive. This index serves as an indicator of the possible conditioning variable in the following analysis of the impact of financial incentives for the increase in publications.

Results

The results are presented as follows: First, we analyse the associations between different operationalizations of the organizational gender and the output of publications. We thus test the gender diversity hypothesis, which claims that any difference from equal representation is detrimental. Second, we include the financial piece rate incentives and test Frey's theory in combination with the different gender perspectives. We thus test whether the gender diversity hypothesis holds in a multivariate analysis, and whether the expected differences in competitiveness can be identified. Third, we investigate whether gender matters for the perception of piece rate

incentives and the degree of piece rate incentives. Fourth, we discuss whether the results are due to selection effects or other spurious effects.

The gender diversity hypothesis presumes organizational diversity with regard to gender to improve performance (increase the number of publications). This implies (1) that research institutions with an equal mix of men and women should perform better than other research institutions and (2) that research institutions which over time get closer to the fifty/fifty gender composition improve their performance more than other research institutions, that is, increase their relative number of publications more.

Cross-sectional analyses

In the cross-sectional analysis, the gender diversity hypothesis predicts a positive association between the organizational level of gender diversity and the number of publications per researcher. Analyzing the bivariate association between the level of publications and the level gender diversity is not sensible due to the differences between the scientific fields. The cross-sectional analyses thus control for this variable.

As shown in table 3, the gender diversity regression coefficient in ordinary least square (OLS) regressions of different measures of the number of publications is statistically insignificant (regardless of the measure of publications used). Substantially, the maximal difference in diversity (from no gender diversity to 50 % men and 50 % women) is estimated to give a difference of between 0.31 and 0.84 publications, depending on the publication measure. This is between 14 and 31 per cent of the average production per researcher. This is not much considering that it is the difference between totally diverse organisations and organizations with only one sex. Although the gender diversity regression coefficient is consistently positive for all the operationalizations of the

dependent variable (publications per researcher), the results do not support the gender diversity hypothesis.

[table 3 here]

Longitudinal analysis

In the analysis over time, the gender diversity hypothesis expects growth in diversity to lead to growth in the number of publications (controlled for other relevant variables). Table 4 shows the regression analyses of the growth in journal articles (the results are almost similar for different measures of publications used, and we therefore only present the results for changes in the total number of scientific journal articles). Models 4-1, 4-3, 4-4 and 4-6 in table 4 test the gender diversity hypothesis (with different sets of control variables), and none of the models shows significant effects of gender diversity. Substantially, the differences are very small, especially when the perception of the incentive is included. For example, according to model 4-6 the maximal effect of a diversity increase is 0.12 article per researcher (from diversity=0 to diversity=0.69). This is in accordance with the findings in the cross-sectional analysis: Gender diversity does not significantly affect performance measured as the growth in the number of publications. The gender diversity hypothesis is thus falsified for the studied research institutions.

The competitiveness hypothesis predicts that the association between the degree of financial piece rate incentive and the number of publications depends on the proportion of women in the research institution. In other words, it is expected that the interaction between the publication incentives and the proportion of female researchers to be significant. Model 4-2 in table 4 includes the financial piece rate incentive and its interaction with the absolute proportion of females. Notice that the absolute proportion of females is the *level* of female researchers in the research institution,

whereas the gender diversity variable measures the *change in diversity*. These variables are therefore uncorrelated (r=0.02).

[table 4 here]

Model 4-2 shows, as expected by the competitiveness hypothesis, an impact of the strength of the financial piece rate incentive in combination with the proportion of females: stronger financial piece rate incentives and higher proportion of female employees increase the number of scientific publications. Figure 6 below illustrates how the effect of the strength of the financial piece rate incentives differs for different proportions of females in the research institutions. Substantially, the effects are not negligible; for the research institutions with the highest proportion females, a one-point increase in piece rate incentive (on the five point scale) is estimated to increase the number of publications 49 per cent between 2000 and 2005.

[figure 6 here]

The regression coefficients for the interaction term between the proportion of female researchers and the degree of financial piece rate incentives are quite stable when other variables are included in the analysis: Model 4-3 includes the change in diversity, model 4-5 includes the Frey-variables (the perception of the financial piece rate incentive and its interaction term with the incentive variable), and model 4-6 includes both the Frey-variables and the change in diversity. The only changes seen are a minor decrease in the p-value and in the size of the regression coefficient of the interaction term between the proportion of women and the degree of piece rate incentive. The results thus

support the competitiveness hypothesis, and the interaction between gender and financial piece rate incentive thus seems to be the most important effect of organizational gender composition.

In sum, the results are quite clear: The gender diversity hypothesis is falsified for Danish research institutions: gender diversity does not significantly affect performance measured as the number of publications. The competitiveness hypothesis gains support: the proportion of female researchers does indeed seem to affect the relationship between the degree of introduced piece rate incentive and the growth in the number of journal articles.

Discussion

Before we turn to the implications of these findings, we need to make sure that the results are non-spurious. In addition to the control for scientific field in table 4, we consider the question of selection bias in the introduction of piece rate incentives at the research institutions, and we investigate whether gender matters for the perception of the incentives and the degree of piece rate incentives. Finally, we deal with the question of anticipated actions in 2000 among the research institutions which later (in 2001 and 2002) introduced piece rate incentives.

One objection to the results of the study is that the institutions which increased their degree of gender diversity also hired more young researchers. A general willingness to change could be a common causal operator. As young researchers need to qualify themselves for tenure, lower average age of the researchers could possibly explain the increased number of publications. For all the models in table 4, we therefore controlled for changes in the composition of staff (changing proportions of (a) full professors, (b) associate professors and (c) assistant professors). It did not change any of the results, and therefore it is not included in the table as none of the changes impacted the growth in the number of publications significantly.

As mentioned, selection bias in the implementation of piece rate incentives could be a problem as the incentives were not introduced randomly at the research institutions. Table 5 tests whether the degree of introduced publication incentive controlled for scientific field depends on the number of journal articles per researcher in 2000 (model 5-2 in table 5), the perception of the financial incentives (model 5-3 in table 5), the proportion of females before the introduction of the piece rate incentive (model 5-4) and the gender of the shop steward (model 5-5).

[table 5 here]

Only the scientific field matters for the introduction of piece rate incentives. Social science institutions introduced significantly stronger incentives to publish than the institutions on the other areas and this stresses the importance of including the scientific field in the regression analyses (which we did). Neither the proportion of females nor the initial publication patterns affects the degree of introduced piece rate incentive.

[table 6 here]

We also tested whether the impact of gender diversity and female proportion (the last-mentioned conjoint with the incentives) on the organizational performance could be due to gender effects on the perception of the incentives. As shown in table 6, gender does not have a statistically significant impact the perception of the incentive schemes; neither the gender of the shop steward nor the proportion of female employees is related to the perception of supportiveness of the incentive schemes.

Another potential problem is anticipated action. If the researchers at the institutions which later introduced piece rate incentives anticipated this in 2000 and consequently detained submission

of their publications until the incentive was in place, this would bias the analysis. To throw light on this issue, we investigated whether we could identify a 'bump' after 2000 for institutions which did introduce piece rate incentives (and not for institution which did not introduce piece rate incentives). Figure 7 indicates that the development in the total number of articles in the two types of research institutions is quite similar.

[figure 7 here]

The results support the notion of a difference in how men and women respond to financial piece rate incentives. Overall, women (research institutions with a high proportion of women) respond to piece rate incentives, while men (research institutions with a low proportion of men) seem to ignore the piece rate incentives. Women do not seem to press more than men for the introduction of high-powered piece rate incentive schemes, and women do not perceive them differently than men do, but when the piece rate incentives are in place, women (research institutions with many women) publish more, especially if the incentives are perceived as being supportive.

Conclusion

This article investigates the impact of the gender composition and financial incentives at Danish research institutions and tests two hypotheses. The gender diversity hypothesis expects that research institutions with high levels of organizational gender diversity (close to an equal mix of male and females) publish more scientific publications than research institutions with lower levels of gender diversity, while the competitiveness hypothesis expects the piece rate financial incentives in the Danish New Wage schemes to affect the number of published scientific publications more at

research institutions with a high proportion of female researchers compared to research institutions with a low proportion of female researchers.

The gender diversity hypothesis does not receive much empirical support: None of the analyses shows a statistically or substantially significant effect of gender diversity on performance, measured as scientific publications. This is in line with earlier research which, if any, found very small, often positive effects.

More interestingly, we find that women (organizations with a high proportion of women) respond to financial incentives in the standard economic textbook way, while men (organizations with a low proportion of women) do not. This finding supports the notion that men and women are different with regard to their competitiveness: While men do not need incentives to compete, women respond to piece rate incentives. Of course, this finding begs the question: why it is that academic woman seems to be economic man? In this respect, our findings are in the negative: the different gender responses to financial incentives are neither reflected in the sense that women seem to press for the introduction of high-powered incentive schemes nor in the sense that women perceive financial incentives differently than men do. At the same time, the financial incentives are fairly modest (even for the most generous "New Wage" schemes, c.f. table 2). It raises the question whether it is the financial incentive *per se* that motivates women. Perhaps the modest piece rate incentives are surrogates for (lack of) management or collegial acknowledgement in academia.

Whether or not the financial incentives basically are a proxy for management or collegial acknowledgement, the findings may point to different conclusions from a perspective of maximizing organizational output. There is an argument for employing more men. At least in a competitive tournament environment, they seem to compete, regardless of the piece rate incentives. On the other hand, there is also an argument for employing more women: They are easier to control

or motivate with (modest) financial incentives as long as the incentives are framed as piece rate rewards.

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Figure 1: Theoretical model

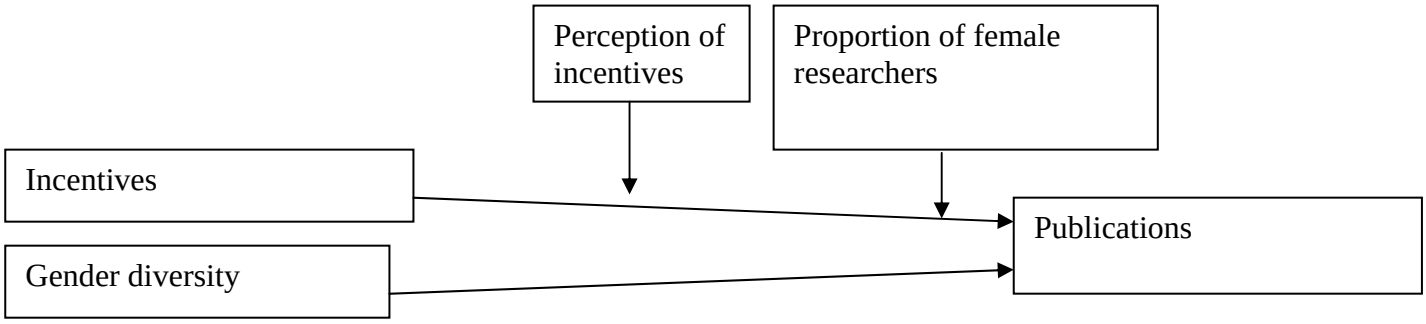


Figure 2: Degree of gender diversity 2004

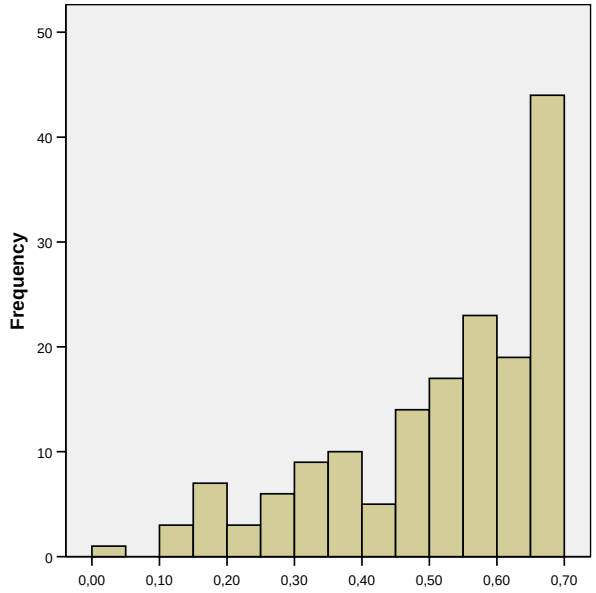


Figure 3: Change in gender diversity 2000-2004

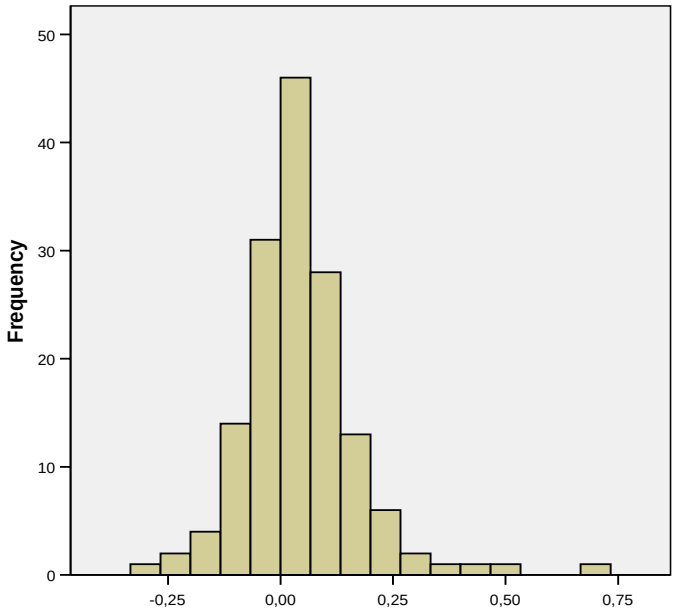


Figure 4: Proportion of female researchers, 2004

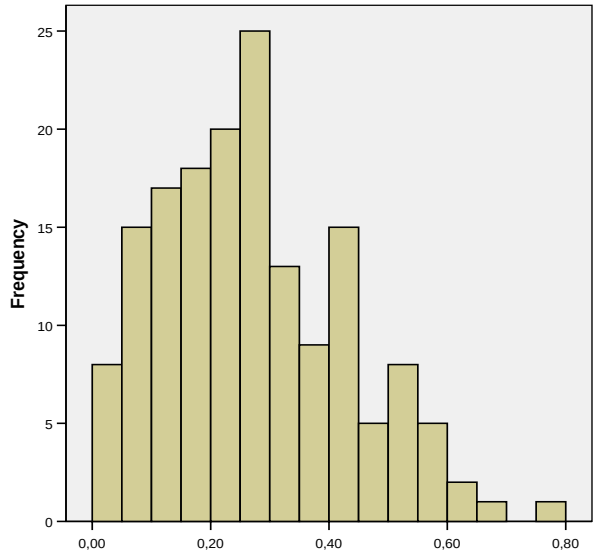
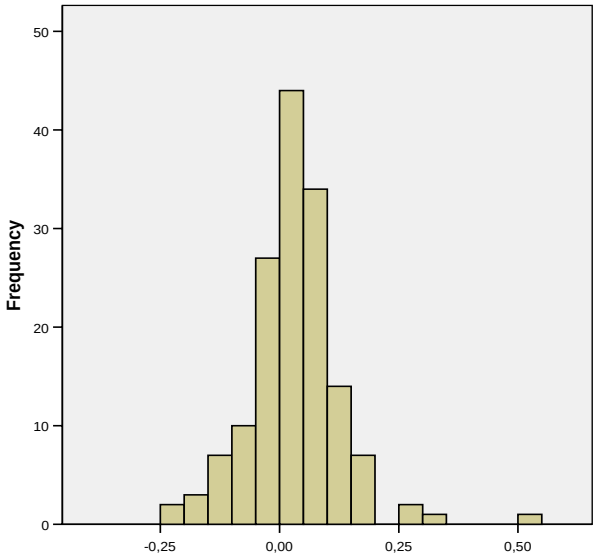
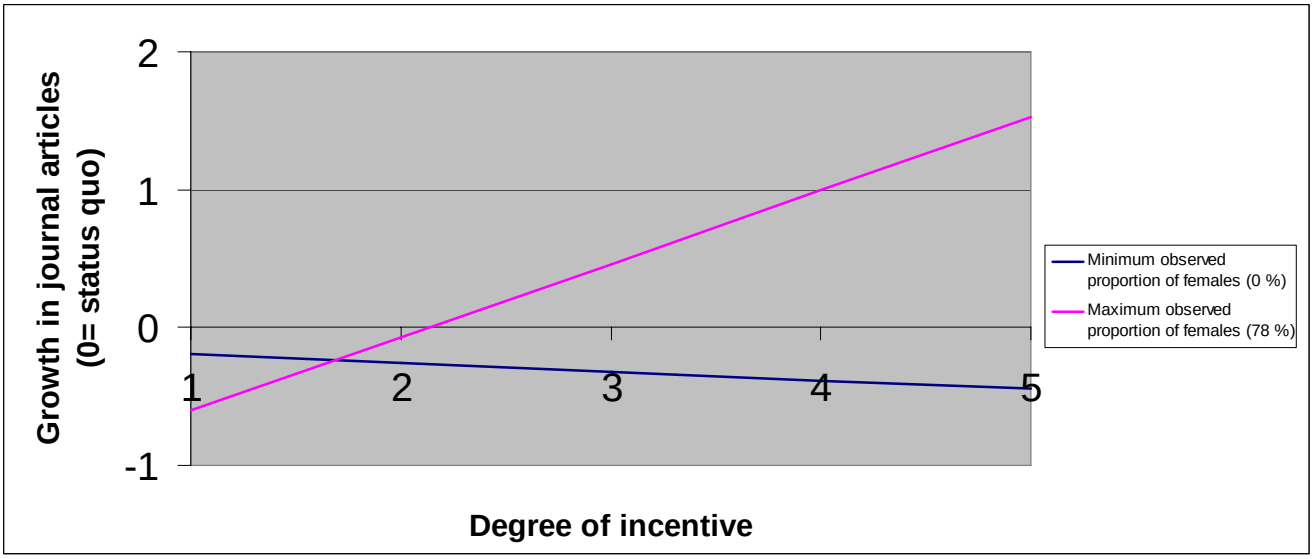


Figure 5: Change in proportion of female researchers



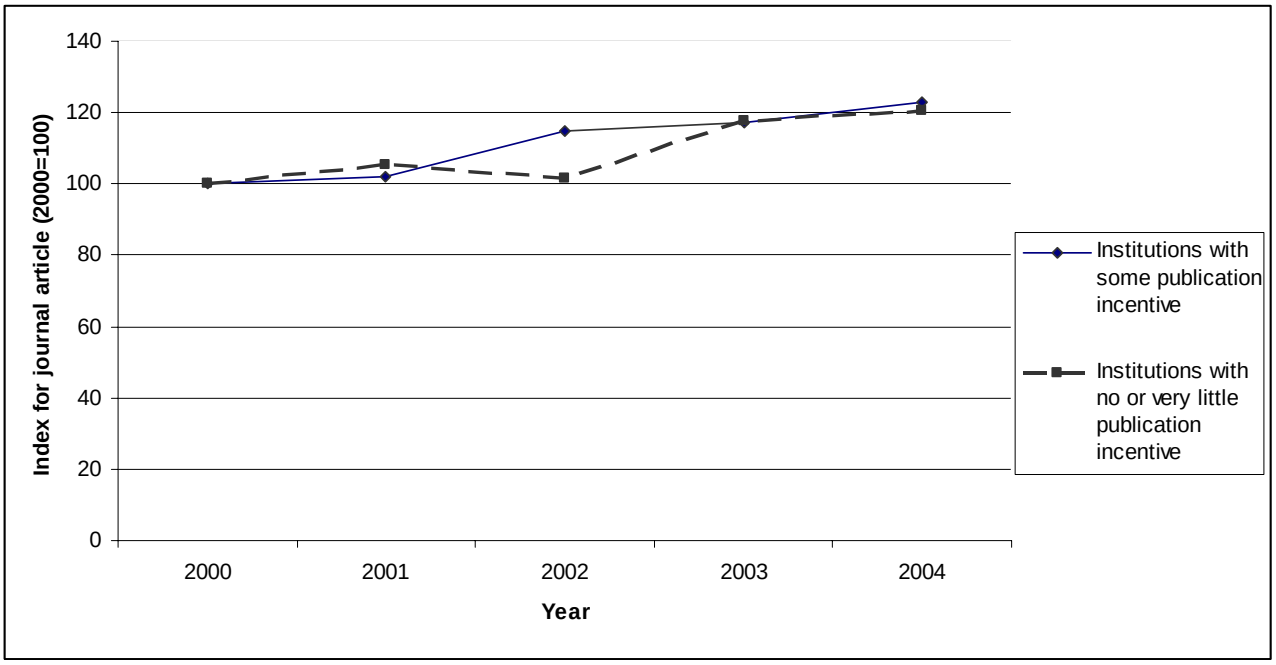
Note: The calculation of gender diversity is as follows: Diversity = $\sum -P_i(\ln(P_i))$, where Pi represents the proportion of each diversity characteristic (men and women).

Figure 6: Illustration of model 2 in table 3 (varying only the strength of the incentive for institutions with minimum and maximum percentage of women)



Note: The illustration is for no changes in number of researchers or diversity, for 'other' scientific field and for the mean value of the perception of the incentive (3.55). For positive change in diversity or number of researcher and for social science, health science and science, the intercepts are higher (the slope does not change).

Figure 7: The development in the total number of journal articles at Danish research institutions with different levels of publication incentive



Note: The comparison is for the same 137 research institutions from which we have valid data for the years between 2000 and 2004. The index is for the total number of journal articles (year 2000 is 100).

Table 1. Classification of New Wage schemes

Category	Definition	Examples (quotations from agreements)	Frequency
1. No publication incentive in the agreement	The agreement does not mention publications or research output of any kind	Researchers with seniority between 11 and 12 years are paid a supplement of 6,000 DKK (800 EUR) per year	N=38 (23.5 per cent)
2. Modest publication incentive	Employees must make a minimum research effort to get some of the pay supplements	The supplement is given after 10 years' employment, unless the employee has not done his job satisfactory with regard to research, teaching and administration	N=57 (35.2 per cent)
3. Some publication incentive	Broadly defined publishing demands to obtain pay supplements	A one-time payment can be given to employees who are considered to have made a special effort. To be qualified for such a payment, the employee must have … done something special relating to research, teaching, communication or administration	N=38 (23.5 per cent)
4. Strong publication incentive	Specific demands to publications to obtain bonus, but discretionary bonus release	The supplement (30,000 DKK~ 4,000 EUR) is given for foremost positions in international research (based on articles in reviewed journals)	N=6 (3.7 per cent)
5. Very strong publication incentive	Specific demands to obtain bonus and non-discretionary release of publication bonus	Publication of an international (not Scandinavian) article in a journal with anonymous peer-review: 7,000 DKK (950 EUR) per article.	N=3 (1.9 per cent)

Table 2: Component matrix: Perception of financial incentives to publish as supportive/controlling

Items	**Loadings**
Head of departments and institutions use New Wage bonuses as an appreciation of outstanding employee effort	0.832
New Wage bonuses for publications is a pat on the shoulder for the individual researcher	0.812
The coupling of pay and publications in the New Wage system is a management control device (answers turned)	0.737

Notes: Extraction method: Principal component analysis. One component extracted with Eigen value higher than 1 (1.89). N=67 shop stewards (some of whom represent more than one institution).

Table 3: Regression analyses of different measures of publications per researcher with PhD.

Unstandardized regression coefficients and max. substantial differences. 2005.

		Model 3-1 Journal articles per researcher	**Model 3-2 Publications per researcher**	**Model 3-3 International journal articles per researcher**	**Model 3-4 International publications per researcher**
Intercept		0.624	3.122	0.143	1.320
Scientific field	Social science	0.207	0.026	0.224	0.354
	Science/techniques	0.845 ***	0.119	1.214 ***	1.591***
	Health science	1.492 ***	-0.340	2.343 ***	1.787 ***
	Others	Ref.	Ref.	Ref.	Ref.
Degree of diversity		0.742	1.215	0.454	0.513
Adj. R^2		0.20	0.0	0.54	0.21
N		161	161	106	105
Difference between no and total gender diversity (number of publications)		0.51	0.84	0.31	0.36
Difference between no and total gender diversity (percentage of average)		31 %	22 %	26 %	14 %

Notes: * p<0.1 ** p<0.05 ***p<0.01.

Table 4: Regression analyses of the relative change in the number of articles (from 2000 to 2005).

Unstandardized regression coefficients and significance levels (OLS)

		Model 4-1 (gender diversity)	**Model 4-2** (compe-titiveness)	**Model 4-3** (competitiveness and diversity)	**Model 4-4** (diversity and Frey)	**Model 4-5** (competitiveness and Frey)	**Model 4-6** (full model)
Intercept		-0.023	0.085	0.078	0.844	1.304	1.313
Scientific field	Social science	0.141	0.031	0.060	0.018	0.008	0.010
	Science/techniques	0.110	0.136	0.155	0.295 *	0.389 **	0.394 **
	Health science	0.191	0.081	0.096	0.131	0.156	0.165
	Others	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Relative change in researchers with PhD		0.244 *	0.200	0.239 *	0.465 **	0.441 **	0.465 **
Change in diversity		-0.284		-0.453	-0.247		-0.179
Publication incentives in agreements			-0.034	-0.033	-0.600 *	-0.854 **	-0.855 **
Proportion females 2005			-1.496 *	-1.419 *		-1.400 *	-1.348 *
Interaction: Incentives/proportion females			0.649 **	0.626 **		0.783 *	0.766 *
Incentives perceived as supportive (Frey)					-0.355 *	-0.377 *	-0.383 *
Interaction: Incentives/perception (Frey)					0.211 **	0.216 **	0.218 **
Adj. R^2		0.01	0.07	0.07	0.16	0.21	0.20
N		140	121	121	72	72	72

Notes: * p<0.1 ** p<0.05 ***p<0.01. The results are almost similar if all analyses are done with the 72 cases for which we have valid data for all the variables.

Table 5: Publication incentives in agreements. Regression coefficients and significance levels (OLS)

		Model 5-1 (scientific field)	Model 5-2 (field+previous research)	Model 5-3 (model 2 plus perception)	Model 5-4 (field and females)	Model 5-5 (field and shop steward gender)
Intercept		1.943	2.036	2.111	1.867	2.025
Scientific field	Social science	0.444 *	0.589 **	1.146 ***	0.606 **	0.908 ***
	Science/techniques	0.182	0.186	0.208	0.214	-0.245
	Health science	0.257	0.424	0.237	0.344	-0.596
	Others	Ref.	Ref.	Ref.	Ref.	Ref.
Journal articles per researcher in 2000			-0.128	-0.129		
Incentives perceived as supportive (measured in 2006)				0.009		
Proportion females in 2000					0.216	
Gender of shop steward						-0.143
Adj. R^2		0.01	0.02	0.11	0.02	0.18
N		142	131	78	132	86

Notes: * p<0.1 ** p<0.05 ***p<0.01.

Table 6**:** OLS regressions of the perception of the incentives. Regression coefficients and significance levels (OLS). Research institutions, 2006

		Model 6-1	**Model 6-2**
Intercept		3.588	3.860
Scientific field	Social science	-0.636 **	-0.430
	Science/techniques	-0.251	-0.315
	Health science	0.457 *	-0.351
	Others		
Proportion females		0.392	
Gender of shop steward (1= female)			0.120
Adj. R^2		0.12	-0.005
N		98	68

Notes: * p<0.1 ** p<0.05 ***p<0.01. The degree of piece rate incentive varies from 1 (minimum) to 5 (maximum). The perception of the incentive varies from 1 (maximum controlling) to 5 (maximum supportive).