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Me, myself, and my university: a multilevel analysis of individual and institutional determinants of academic performance

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Abstract Academic performance is widely considered a major predictor of a university's success. Matching individual primary data from an online questionnaire ($N = 1{,}057$ doctoral and postdoctoral junior faculty members of German business and economics faculties at 65 different universities) with secondary institutional data, we investigate and compare the influence of individual-level variables (i.e., gender, work motivation) and an organizational-level variable (i.e., involvement in the excellence initiative) on individual-level academic performance. By using hierarchical linear modeling for our data analyses, we consider interactions across individual and institutional levels and take institutional level variance into account. Our data indicate that on the individual level, women outperform male scholars and that both intrinsic and extrinsic work motivations are positively related to academic performance. On an institutional level, the involvement of business and/or economics faculties in the excellence initiative had no significant effect on academic performance. However, involvement in the excellence initiative (i.e., in graduate schools and/or clusters of excellence) moderated the relationship between extrinsic work motivation and academic performance in such a way that highly extrinsically motivated respondents employed by faculties that were involved performed significantly worse than highly extrinsically motivated respondents employed by non-involved faculties.

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1 Introduction

Investigating the potential determinants of academic performance is essential for research policy as well as for the governance of universities and research groups (e.g., Dilger 2001). First, the academic performance of scholars serves as a basis for the reputation of universities. Therefore, elucidating the determinants of academic performance provides universities with essential knowledge about the incentives they might want to provide to improve their reputation. Second, and closely related, academic performance can attract the most talented students and professors (Dräger 2009; Franck and Opitz 2000), thus further improving the reputation of the university. Third, university administrators, politicians and scientific grant agencies frequently use academic performance as a basis for making their funding decisions (Melo et al. 2010), making knowledge about the triggers of academic performance essential for the funding of universities and research projects. In this study, we deliberately take a broad perspective with regard to academic performance and define academic performance as performance regarding research, teaching, and other work duties in academia rather than focusing on research performance measured in terms of publications in peer-reviewed journals, which is highly criticized in the literature (e.g., Kieser 2010; Osterloh 2010, 2012).

Given the importance of academic performance, it is not surprising that previous research has analyzed the potential determinants of performance in academic settings. At the individual level, it has been found, for example, that successful scholars show a strong inner desire for exploration, a strong expression of creativity, originality and innovation, high levels of persistence and ambition, an emphasis on precision and accuracy, and sound organization and time management skills (Bazeley 2010; Busse and Mansfield 1984; Feist 1999; Fox 1983; Hancock et al. 1992; Levitan and Ray 1992; Pelz and Andrews 1966). At higher-order levels, previous research has observed, for instance, that the prestige and reputation of an institution or the supervising professor during early career stages can enhance productivity and overall performance (Allison and Long 1990; Buchmueller et al. 1999; Cole and Cole 1973; Creswell and Brown 1992; Heinze et al. 2009; Jungbauer-Gans and Gross 2013; Long 1978; Long et al. 1998) and that reducing the administrative burdens on faculty might enhance teaching quality (Ginsburg and Miles 2014). Thus, research at both the individual and institutional level is quite comprehensive and has identified numerous determinants of academic performance.

However, despite the great importance of understanding individual and institutional determinants of academic performance, prior research has been limited as it has focused on either potential individual or potential institutional determinants of performance rather than investigating the determinants of both levels in the same

model. Thus, most current research does not allow for examining the interplay between individual-level and organizational-level variables. The few studies that have simultaneously investigated potential individual and institutional determinants (e.g., Fiedler et al. 2008a, b) did not follow a hierarchical linear model approach, making it difficult to adequately attribute the variance explained either to individual or higher-level institutional characteristics. Research that is able to separate the effects of individual and institutional determinants on academic performance by using hierarchical linear modeling is important because it can consider interactions across different levels and take institutional level variance into consideration (van Dick et al. 2005). For example, predicting academic performance by individual-level predictors (e.g., work motivation) and institutional-level predictors (e.g., involvement of a university in the excellence initiative) at the same time bears the risk that errors in predicting academic performance might cluster by university. "When clustering occurs due to a grouping factor (e.g., the university at which a scholar works), then the standard errors computed for prediction parameters will be wrong" (Garson 2013, p. 3) in regression analyses, so that the use of hierarchical linear modeling is much more appropriate and delivers more reliable results. Thus, it is not surprising that comparable research (e.g., focusing on students at the individual level and on schools or universities at the institutional level) has already in the past few years started to use hierarchical linear modeling and to apply its methodological benefits (e.g., Areepattamannil and Kaur 2013; Bowman and Toms Smedley 2013; Chen et al. 2010; Eagan et al. 2011; Kek and Huijser 2011).

The goal of our study is to address this research gap by analyzing the cross-level interdependencies of specific potential individual and institutional determinants on individual academic performance. Specifically, we adopt a multilevel view and examine gender and work motivation as potential individual determinants. We also examine involvement of business and/or economics faculties in the excellence initiative as a potential institutional determinant of academic performance. Involvement in the excellence initiative appears to be particularly interesting because this variable is directly related to the financial resources available from the German state. Elucidating the effects of this finance-related variable on academic performance provides politicians and university managers with important knowledge about the impact of large-scale investments in the academic system. Because the state intends to promote females in academia, among others, by financial investments (e.g., as part of the program for women professors), investigating cross-level effects between an institutional variable that is directly related to financial resources and gender appears to be important. Additionally, analyzing work motivation appears to be interesting in this context because research highlights the importance of intrinsic motivation in academia (e.g., Amabile 1997; Lyness et al. 2013; Miner 2003), and extrinsic work motivation is also assumed to be existent in academia (Osterloh et al. 2002). Last, academic performance appears to be a particularly interesting criterion for the following reason. Previous higher education research has primarily focused on research performance (e.g., Backes-Gellner and Sadowski 1990; Fabel et al. 2008; Goodall 2009; Melo et al. 2010), although performance in academia is widely acknowledged as being multidimensional (e.g., Aguinis et al. 2012; Minssen and Wilkesmann 2003; Schmoch et al. 2010),

including dimensions such as research, teaching, administrative service, and third-party-funding. Focusing on academic performance bears the advantage of a comparatively comprehensive assessment taking the multidimensionality of academic performance into account.

By analyzing the cross-level interactive effects of individual-level and organization-level variables, we contribute to a better understanding of the influencing factors of academic performance across individual and institutional levels. Such an understanding is essential because it not only sheds light on which individual and institutional characteristics are favorable to academic performance but also on how individual and institutional characteristics interact. Analyzing an institutional moderator of the relationship between individual determinants and academic performance allows for drawing conclusions concerning the design of work environments in academia, concerning the recruitment of scholars that best suit a particular type of academic institution and concerning the tailoring of incentive systems that adequately suit the academic system.

The remainder of the paper is organized as follows. First, we present the theoretical foundations, develop our hypotheses and illustrate the model, which summarizes the relationships under investigation in this article. Second, we describe our sample and our measures and explain the method we use for our analyses. Third, we report our results for the individual and the organizational levels and the cross-level effects. Finally, we provide a discussion of our findings and outline suggestions for further research as well as implications.

2 Theoretical foundations and hypotheses

In the subsequent paragraphs, based on a thorough literature review, we develop our hypotheses. We begin with the individual level, followed by the institutional level and the cross-level interactions. The section ends with a graphical summary of the hypothesized model.

2.1 Individual determinants of academic performance

2.1.1 Gender

There is an extensive body of literature that focuses on gender differences with regard to academic performance. Overall, these findings draw a complex picture. On the one hand, most studies have found that men tend to be more productive than women. For example, based on a sample of 1,216 scholars, Blackburn et al. (1978) found that in a period of two years, men completed at least five more papers than women and were three times more likely to publish at least eleven articles during their career. Kyvik (1990), Leahey (2007), Levin and Stephan (1991), and more recently Schubert and Engelage (2011) obtained similar results. Examining boundary conditions, some studies have observed such significant advantages for men regarding research performance only under certain conditions (e.g., Fiedler et al. 2008a; Röbken 2011). One might argue that women are disadvantaged with

regard to research performance because traditionally they are responsible for child care. For example, Chlosta et al. (2010) showed that the number of children had an effect on the probability that postdoctoral junior faculty members exit academia. However, to look at a different indicator of academic performance, even though men published more than women, publications by women were more frequently cited (Long 1992) and thus might exert greater influence on academia. Against this background and in line with most previous research on gender differences regarding academic performance, we assume that men outperform women in academia; therefore, we pose the following hypothesis:

H1a: Gender influences academic performance in such a way that men outperform women.

2.1.2 Intrinsic work motivation

Studies have identified motivation, i.e., "the contemporary (immediate) influence on direction, vigor, and persistence of action" (Atkinson 1964, p. 2), as the main individual-level driver and determinant of performance next to ability (Cummings and Schwab 1973; Van Knippenberg 2000; Vroom 1964). Previous research on work motivation in an academic context is primarily conceptual or does not explicitly focus on intrinsic motivation [i.e., the motivation to do something due to an inner drive (Deci 1971)] and/or extrinsic motivation [i.e., the motivation to pursue a course of action as a means to an end (Deci 1971)]. Exceptions are the empirical studies by Lam (2011) and by Ringelhan et al. (2013). Lam (2011) analyzes how specific forms of scholars' work motivation relate to research commercialization and reports a favorable effect of reputation (i.e., extrinsic work motivation) in this context. Ringelhan et al. (2013) investigate mediation models of work motivation via job satisfaction on research performance (as well as from job satisfaction via work motivation on research performance) and conclude "that intrinsic work motivation and extrinsic work motivation are both adequate for increasing the qualitative aspects, rather than quantitative aspects, of job performance" (Ringelhan et al. 2013, p. 29).

However, most previous research conceptually argues why and how work motivation is related to academic performance. In an academic context, intrinsic motivation is considered to be of particular importance (Lyness et al. 2013; Minssen and Wilkesmann 2003; Osterloh and Frey 2000). One might argue that the enjoyment of trying to solve complex problems drawn from the activity itself as well as the perception that the daily work is involving and personally challenging (Amabile 1995, 1997;) facilitate mastering complex activities in academia. Moreover, the fact that performance outcomes are difficult to observe and to measure generally bears the risk that scholars only focus on those performance outcomes that pretend objectivity and are rewarded by the academic system (e.g., the number of published journal articles). Intrinsic motivation is important to avoid such extreme behavior and to additionally foster, for instance, the conduction of risky (but relevant) research projects or the responsible handling of academic self-governance and administration.

Intrinsic motivation is associated with performing a task for its own sake, i.e., the activity itself gains utility for the person in the sense that while accomplishing it, one feels a high level of interest, enjoyment, excitement, curiosity, or competence (Amabile 1993; Amabile et al. 1994; Deci and Ryan 2008). Accordingly, intrinsically motivated people are strongly committed to the process rather than to the final outcomes of their work. They might use their curiosity to explore new procedures and may be more willing to take risks (Amabile et al. 1994; Oldham and Cummings 1996). Nevertheless, they generally stay focused and stick to their work until they find an acceptable solution (Oldham and Cummings 1996). These characteristics of intrinsic motivation ultimately result in better quality outcomes (Amabile 1983; Amabile et al. 1990; Ryan and Deci 2000). Thus, we assume that intrinsic work motivation positively influences academic performance, and we propose the following hypothesis:

H1b: Intrinsic work motivation positively influences academic performance.

2.1.3 Extrinsic work motivation

We additionally consider extrinsic work motivation, which is also regarded as an essential determinant of human activity (Amabile 1993). Extrinsically motivated people focus on the outcome of a task rather than the activity itself (Amabile 1993; Calder and Staw 1975; Ryan and Deci 2000). They strive to win money, recognition, praise, or other rewards, or, on the negative side, they may be motivated by deadlines and sanctions (Amabile et al. 1994; Gagné and Deci 2005). That is, contrary to intrinsically motivated people, extrinsically motivated people do not accomplish their tasks out of their inner drive to perform them but rather feel driven by external factors (Brief and Aldag 1977; Deci and Ryan 2008).

In an academic context, numerous extrinsic motivators are prevalent. First, scholars might be motivated by the reputation they might gain in the scientific community, which might be expressed, for instance, by means of citations (Osterloh and Frey 2008) or by prizes for research or teaching (Frey and Neckermann 2008; Osterloh and Frey 2008). Second, they might be motivated by student evaluations for teaching performance. These examples of extrinsic motivators in the academic system demonstrate that extrinsic work motivation should not be neglected in academia because scholars might—even if to a lesser degree than in the private sector (Roach and Sauermann 2010)—put more effort into their work to achieve an excellent output and, finally, receive their external rewards for performance. Thus, although extrinsic motivators might cause a crowding out of intrinsic motivation (Amabile 1993; Frey and Jegen 2001; Kieser 2010; Minssen and Wilkesmann 2003), we suggest that extrinsic work motivation positively influences academic performance:

H1c: Extrinsic work motivation positively influences academic performance.

2.2 Involvement in the excellence initiative as institutional determinant of academic performance

In Germany, the Federal Ministry for Research and Education introduced the excellence initiative in 2004 to promote universities with outstanding research

activities (Forschungsgemeinschaft 2011). In doing so, they aimed to strengthen the international competitiveness and visibility of German universities (Forschungsgemeinschaft 2011).

Thus far, empirical research on the effects of the excellence initiative on the performance of universities is sparse. On a conceptual level, however, arguments for and against the excellence initiative have emerged (Hornbostel et al. 2008; Möller et al. 2012). On the one hand, Deutsche Forschungsgemeinschaft and Wissenschaftsrat note that the initiative is primarily supposed to encourage new research directions and to foster valuable research insights in line with several secondary goals, such as multidisciplinarity or support of young scholars (Möller et al. 2012; Sondermann et al. 2008). On the other hand, many scholars argue that the excellence initiative has triggered more vertical differentiation and intensified competition among universities (Hartmann 2006; Hornbostel et al. 2008; Möller et al. 2012). These criticisms were, however, primarily based on theoretical considerations and focused on the macro level rather than exploring the effects for single scholars.

In general, one might argue that funding from the excellence initiative is beneficial for academic performance of universities, faculties, and scholars. The major reason for this argument is that granting additional funds results in an expectation of professors that additional resources and the necessary equipment for high-quality research will be allocated to their chairs (Sieweke 2010), which appears to be one determinant for outstanding academic performance (Grbich 1998; Stephan 1996). Furthermore, newly created appointments or additional assistants might disburden one's academic work (Hottenrott and Thorwarth 2011; Roessler 2012), for instance, by facilitating research activities or by reducing the teaching load. Therefore, we present the following hypothesis:

H2: Involvement in the excellence initiative positively influences academic performance.

2.3 Cross-level interactions between individual and institutional determinants of academic performance

2.3.1 Cross-level interactions of involvement in the excellence initiative with gender

The excellence initiative, among others, was meant to be accompanied by more resources and better career advancement for younger scholars. Additionally, active involvement in the excellence initiative is generally associated with a gain of reputation and prestige in the scientific community.

There is a broad consensus that male scholars are much more focused on their career and academic achievements than female scholars (Judge et al. 1995; Konrad et al. 2000). Male scholars are supposed to be highly oriented toward monetary compensation (Huang et al. 2007; Konrad et al. 2000; Mainiero and Sullivan 2005) and to seek promotion or a rise in status (Judge et al. 1995; McGowen and Hart 1992). Moreover, they are more oriented toward competitive environments

(Niederle and Vesterlund 2007). Research indicates that prestige and peer recognition rank higher for men than for women (Fox 2010). By contrast, women care less about recognition, achievement, and competition (Judge et al. 1995; Niederle and Vesterlund 2007).

Against this background, we expect that involvement in the excellence initiative (i.e., in graduate schools and/or clusters of excellence) moderates the relationship between gender and academic performance. Specifically, we assume that male scholars outperform female scholars even more if they are employed by faculties that are involved in the excellence initiative. For female scholars, in turn, we expect non-involved faculties to be the more favorable work environment. Thus, we propose the following hypothesis:

H3: The relationship between gender and academic performance is moderated by involvement in the excellence initiative in such a way that men outperform women even more if they are employed by a faculty that is involved in a graduate school and/or a cluster of excellence funded by the excellence initiative.

2.3.2 *Cross-level interactions of involvement in the excellence initiative with intrinsic work motivation*

Due to the additional funds received from the excellence initiative, scholars working at faculties that are involved in the excellence initiative, on the one hand, might conduct extraordinary projects that would not have been possible without the additional funding opportunity. On the other hand, being less dependent on third-party funds, they might neglect, for example, conducting research projects that do not absolutely fit their preferences and instead work on projects they are truly interested in and excited about (Hottenrott and Thorwarth 2011). Another goal of the excellence initiative was to enable excellence universities to attract high-class professors (Sondermann et al. 2008). Although the expected number of appointments has not yet been reached, those young scholars who are fortunate enough to work with such a high-class professor will most likely experience a favorable work environment, making work even more enjoyable and challenging (Liefner 2003). Support in entering the international scientific community as well as interaction and professional exchange may enhance the value of work itself and further increase intrinsic work motivation.

Taken together, involvement in the excellence initiative is supposed to be accompanied by favorable working conditions, which might foster the relationship between intrinsic work motivation and individual academic performance. This leads to the following hypothesis:

H4: Involvement in the excellence initiative moderates the relationship between intrinsic work motivation and academic performance in such a way that the relationship is stronger for faculties that are involved in a graduate school and/or a cluster of excellence funded by the excellence initiative than for non-involved faculties.

2.3.3 Cross-level interactions of involvement in the excellence initiative with extrinsic work motivation

As mentioned previously, the excellence initiative yielded a considerable increase in prestige and reputation for universities and faculties that were awarded the excellence university status or participated in a graduate school and/or a cluster of excellence that was successful in the application process. According to Sieweke (2010), this image of high-quality research was also transmitted to scholars and enhanced their visibility and status in the international scientific community (Hornbostel et al. 2008). Thus, being involved in the excellence initiative creates a situation for universities, faculties and their scholars in which the external rewards typical for the academic system are especially pronounced. Therefore, one might argue that involvement in the excellence initiative strengthens the assumed positive relationship between extrinsic work motivation and academic performance because scholars employed by faculties that are involved in the excellence initiative might put even more effort into their work to achieve an excellent academic performance and receive the resulting external rewards. Against this background, we propose the following hypothesis:

> H5: Involvement in the excellence initiative moderates the relationship between extrinsic work motivation and academic performance in such a way that the relationship is stronger for faculties that are involved in a graduate school and/or a cluster of excellence funded by the excellence initiative than for non-involved faculties.

2.3.4 Summary of the hypothesized relations

Although other variables might be interesting in this context, we chose gender, work motivation and involvement in the excellence initiative for this particular study. The reason for this choice was that we wanted to take a first step toward a better understanding of academic performance by following a hierarchical linear model approach, and these variables appeared to be particularly interesting to us in this context (as outlined in the Sect. 1). Figure 1 illustrates the hypothesized model.

This model was tested by using hierarchical linear modeling, which anticipates the hierarchical structure of our dataset (Bryk and Raudenbush 1992).

3 Data and method

3.1 Sample and procedures

Data were available from a survey conducted at the end of 2012 in Germany. A detailed description of the data collection method can be found in Ringelhan et al. (2013). Prior to the analyses, we excluded data from participants (1) who did not completely respond to the variables under investigation in this article, (2) who did not explicitly indicate belonging to a German university, (3) who answered that they were employed by two or more universities, (4) who indicated that they did not

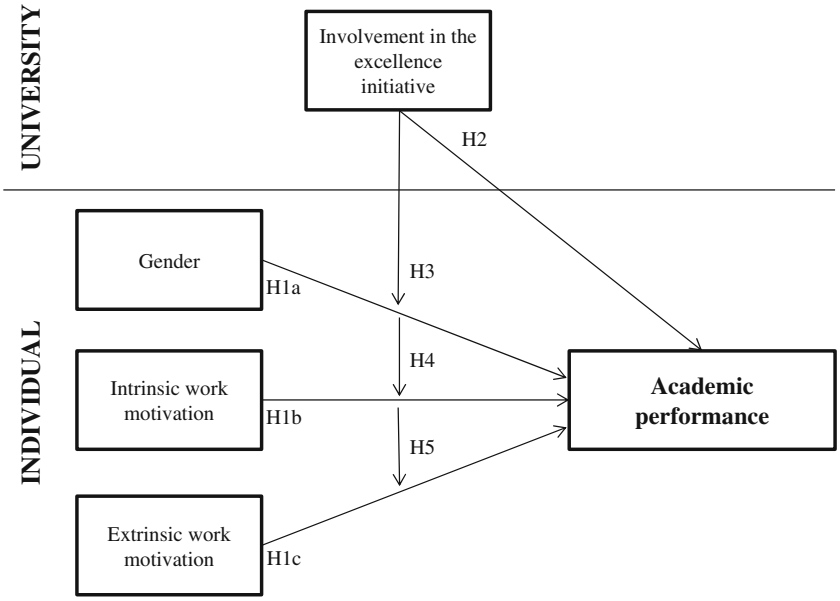

Fig. 1 Hypothesized model

undertake research, teaching or administrative service at a chair, (5) who held positions other than a (post)doctoral position at a German business or economics faculty (e.g., administrative positions), (6) who indicated they were not directly engaged in the research fields of business and economics (e.g., American Studies), and (7) who belonged to the target group for less than 1 month. Additionally, we excluded data from one participant who explicitly requested the retraction of his data from the study. Finally, data from participants who belonged to a university for which fewer than five observations were available were excluded from the dataset to obtain a reasonable group size for performing the multilevel analyses.

The exclusion of these data resulted in a final sample size of $N = 1{,}057$ doctoral and postdoctoral junior faculty members of German business and economics faculties: 867 internal doctoral students (82.03 %), 159 postdoctoral junior faculty members (15.04 %), and 31 other academic positions (2.93 %). The sample consisted of 644 male (60.9 %) and 413 female (39.1 %) junior faculty members, ranging in tenure from 1 to 300 months ($M = 31.06$; $SD = 28.47$) with an average age of 29.58 years ($SD = 3.75$).

These 1,057 doctoral and postdoctoral junior faculty members were employed at 65 different German institutions; in the first round of the excellence initiative, a total of 8 of the 65 institutions (12.31 %) were excellence universities. At 9 of the 65 institutions (13.85 %), business and/or economics faculties were involved in a graduate school, and at 4 of the 65 institutions (6.15 %), business and/or economics were listed as participating subject areas for a cluster of excellence in which the

respective institution was involved.[1] The number of respondents per university ranged from 5 to 53 ($M = 16.26$, SD $= 9.32$).

3.2 Measures

3.2.1 Criterion

To measure *academic performance*, we used the general work performance scale by Keller (2012), which was originally designed for the assessment of work performance of employees by their team leaders. The scale was translated into German by two independent persons, and the translations were subsequently reviewed by two independent reviewers who were not involved in the preceding translation. Specifically, we asked participants to self-assess their academic performance with regard to five indicators, such as quality and quantity of work performance. We instructed our participants to think about the fields of research, teaching, and other work duties when self-assessing their overall work performance on the five-item scale. The scale contained five response options from 1 (very low) to 5 (very high). We assessed academic performance by calculating the mean of these five items ($\alpha = 0.69$).

3.2.2 Predictors

We included independent variables at two different hierarchical levels: gender and (intrinsic and extrinsic) work motivation at the individual level and involvement in the excellence initiative (not involved vs. involved) at the institutional level.

We directly asked our respondents to indicate their *gender* in the questionnaire. Gender was included as a dummy variable (0 = woman, 1 = man).

We operationalized *work motivation* with eight items taken from the Work Preference Inventory by Amabile et al. (1994). We used the two items with the highest factor loadings on the primary factor each for the subscales of intrinsic (challenge and enjoyment) and extrinsic (compensation and outward) work motivation. *Intrinsic work motivation* was measured by taking the mean of the following four items: (1) The more difficult the problem, the more I enjoy trying to solve it (challenge subscale); (2) I enjoy trying to solve complex problems (challenge subscale); (3) Curiosity is the driving force behind much of what I do (enjoyment subscale); and (4) It is important for me to have an outlet for self-expression (enjoyment subscale) ($\alpha = 0.72$). *Extrinsic work motivation* was measured by calculating the mean of the following four items: (1) I am strongly motivated by the money I can earn (compensation subscale); (2) I am keenly aware of the income goals I have for myself (compensation subscale); (3) I am strongly motivated by the recognition I can earn from other people (outward subscale); and (4) I want other people to find out how good I really can be at my work (outward subscale) ($\alpha = 0.39$). Although the reliability of this scale is low, we consider it a valid measure for extrinsic work motivation for the following reasons. First, the work motivation scale by Amabile et al. (1994) is well established and was successfully used

[1] HLM is able to deal with unequal group sizes (please also see Snijders and Bosker 2011).

in several previous studies (Brownlow and Reasinger 2000; Conti 2001; Dik et al. 2008). Second, each single item closely resembles the central characteristics of extrinsic work motivation noted by Amabile et al. (1994) and Deci (1972). Third, low reliability cannot inflate correlations but rather attenuates results (Cohen et al. 2003, p. 57). Thus, findings based on this measure tend to be conservative estimates.

The eight work motivation items were translated into German by two independent persons and were subsequently reviewed by two additional independent reviewers. The scale encompassed four response options, ranging from 1 (never true of me) to 4 (always true of me).

At the institutional level, we considered whether the business and/or economics faculty of a university was involved in a graduate school or whether business and/or economics were listed as participating subject areas for a cluster of excellence in which an institution was actively involved in the initiative's first round.[2] A discussion with the responsible contact person at Deutsche Forschungsgemeinschaft revealed that the best source to obtain these data was the Deutsche Forschungsgemeinschaft annual report of 2012 (i.e., the last report before funding of the initiative's second round began, so that all graduate schools and clusters of excellence funded as part of the excellence initiative's first round were included). Specifically, we manually checked all graduate schools and clusters of excellence in this annual report for the participating subject areas. If business and/or economics were listed as participating subject areas in either a graduate school or a cluster of excellence, we coded this as 1; otherwise we coded this as 0. That is, we included *involvement in the excellence initiative* as a dummy variable (0 = not involved, 1 = involved). We directly asked our respondents to (voluntarily) indicate the name of their institution to ensure that secondary and primary data could be matched.

3.2.3 Control variables

First, we included the standard control variable *age* (in years) in our analyses. Second, we included *research age* as a control variable. We operationalized research age by the number of months our respondents had worked at a university (not necessarily the current), starting from the beginning of their Ph.D. work. These control variables were included to control for potential effects resulting from job experience or perceived knowledge and skills accumulated during the years of university employment (Bayer and Dutton 1977; Chlosta et al. 2010; Levin and Stephan 1991).

3.3 Data analysis

The requirement that the dependent variable is normally distributed for performing hierarchical linear modeling was fulfilled in our study: the skewness and kurtosis

[2] Additionally, we built two variables that separately measure (1) whether the business and/or economics faculty of a university was involved in a graduate school (i.e., involvement in a graduate school) and (2) whether business and/or economics were listed as participating subject area for a cluster of excellence in which an institution was actively involved (i.e., involvement in cluster of excellence). Both variables were included as dummy variables (0 = not involved, 1 = involved).

values for academic performance were within the range of −1.00 and +1.00. We used estimates with robust standard errors to report our results. Furthermore, we applied full maximum likelihood estimation (Hox 2002) and grand-mean centered individual-level measures (except for gender because gender was dummy coded) as well as the control variables for better interpretability.

Additionally, the requirement of the existence of significant between-group variance (Hofmann 1997; Whitener 2001) for using hierarchical linear modeling was fulfilled in our study: an analysis of variances (ANOVA) with academic performance as the dependent variable and institution as the independent variable revealed a significant variation regarding academic performance, $F(64, 992) = 1.33$, $p < 0.05$.

To check whether multilevel modeling is appropriate and needed in our study, we considered the intraclass correlation coefficient (ICC). The proportion of institutional variance in self-assessed academic performance was rather small in our study, ICC = 1.82 %. However, a Chi square test investigating whether the variance residing between universities is different from zero revealed that the intercept term varied significantly for self-assessed academic performance, $\chi^2\ (64) = 84.95$, $p < 0.05$. The ICC showed that the largest variance was caused by individual determinants; however, universities also caused part of the variance, although to a lesser extent. Accordingly, the application of hierarchical linear modeling appears to be appropriate for analyzing individual and institutional determinants of academic performance.

4 Results

4.1 Descriptives

Table 1 shows the descriptive statistics, reliabilities of our measures and correlations among the variables used in our study.

Gender was negatively correlated with academic performance ($r = -0.08$, $p < 0.05$), indicating that women reported higher performance than men. Self-assessed academic performance was positively related to intrinsic ($r = 0.23$, $p < 0.01$) and extrinsic ($r = 0.23$, $p < 0.01$) work motivation. Overall, these correlations demonstrate that the individual level variables are significantly associated with academic performance.

4.2 Results of the hierarchical level modeling analyses

Table 2 presents the results of our multilevel analyses using hierarchical linear modeling.

4.2.1 Results for the individual level

Our hypotheses at the individual level state that men generally outperform women regarding academic performance (H1a) and that both intrinsic (H1b) and extrinsic

Table 1 Descriptive statistics, reliabilities, and correlations among variables

	Min	Max	*M*	SD	Skewness	Kurtosis	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Age	23	62	29.58	3.75	2.01	8.97	–						
(2) Research age	1	300	31.06	28.47	2.81	15.18	0.65**	–					
(3) Gender (1 = male)	0	1	0.61	0.49	−0.45	−1.80	0.11**	0.04	–				
(4) Intrinsic work motivation	1.50	4.00	3.27	0.52	−0.50	−0.35	0.11**	0.06*	0.06†	(0.72)			
(5) Extrinsic work motivation	1.00	4.00	2.86	0.50	−0.13	0.09	−0.15**	−0.12**	0.04	0.10**	(0.39)		
(6) Involvement in excellence initiative (1 = yes)	0	1	0.20	0.40	1.54	0.37	0.05	0.04	0.02	−0.01	−0.04	–	
(7) Academic performance	2.20	5.00	4.13	0.47	−0.49	0.39	0.02	0.05†	−0.08*	0.23**	0.23**	−0.02	(0.69)

Cronbach's alpha (α) reliability estimates are reported within main diagonal

M mean, *SD* standard deviation, $N = 1{,}057$ (for the variable involvement in the excellence initiative, *M*, *SD*, *Skewness* and *Kurtosis* were calculated based on $N = 65$ institutions)

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; two-tailed tests

Table 2 Results of the hierarchical linear modeling analyses with academic performance as the criterion

Variables	Academic performance															
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8	
	Gamma	SE	Gamma	SE	Gamma	SE	Gamma	SE	Gamma	SE	Gamma	SE	Gamma	SE	Gamma	SE
Constant	4.13***	0.02	4.13***	0.02	4.19***	0.02	4.19***	0.02	4.19***	0.02	4.19***	0.02	4.19***	0.02	4.19***	0.02
Age			−0.00	0.01	−0.00	0.00	−0.00	0.00	−0.00	0.00	−0.00	0.00	−0.00	0.00	−0.00	0.00
Research age			0.00	0.00	0.00†	0.00	0.00†	0.00	0.00†	0.00	0.00†	0.00	0.00†	0.00	0.00†	0.00
Gender (1 = male)					−0.10***	0.02	−0.10***	0.02	−0.11***	0.03	−0.10***	0.02	−0.10***	0.02	−0.11***	0.03
Intrinsic work motivation					0.19***	0.02	0.19***	0.02	0.19***	0.02	0.19***	0.03	0.19***	0.02	0.19***	0.03
Extrinsic work motivation					0.20***	0.02	0.20***	0.02	0.20***	0.02	0.20***	0.02	0.24***	0.03	0.24***	0.03
Involvement in excellence initiative (1 = yes)							−0.00	0.03	−0.03	0.04	−0.00	0.03	−0.01	0.03	−0.03	0.04
Gender × involvement in excellence initiative									0.03	0.05					0.04	0.05
IM × involvement in excellence initiative											−0.00	0.06			0.01	0.06
EM × involvement in excellence initiative													−0.12*	0.05	−0.12*	0.05

Variables	Academic performance							
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept variance u_0	0.0041*	0.0046*	0.0029†	0.0029†	0.0031†	0.0029†	0.0026†	0.0028†
Level 1 variance r	0.2201	0.2189	0.1969	0.1969	0.1968	0.1969	0.1965	0.1963
Deviance	1,414.31	1,410.37	1,293.86	1,293.84	1,293.58	1,293.84	1,290.16	1,289.78

$N = 1{,}057$ at the individual level; $N = 65$ at the institutional level. Coefficients are unstandardized

IM intrinsic work motivation, *EM* extrinsic work motivation

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

(H1c) work motivation positively influence academic performance. Contrary to our assumption, we observed that women ($M = 4.17$, SD = 0.46) outperformed men ($M = 4.10$, SD = 0.48) in our sample, $\gamma = -0.08$, SE = 0.03, $p < 0.01$.[3] Accordingly, H1a was not confirmed. However, in line with our assumptions, both intrinsic work motivation, $\gamma = 0.21$, SE = 0.03, $p < 0.001$,[4] and extrinsic work motivation, $\gamma = 0.22$, SE = 0.02, $p < 0.001$,[5] were positively related to academic performance, thus supporting H1b and H1c.[6] The predictor variances were fixed to zero, i.e., the effects were supposed to be equal across universities (Hox 2002, p. 51). The proportion of the individual-level variance explained by the incorporated predictors was 10.54 % compared with the null model. The deviance was reduced by 120.45 (=1,414.31–1,293.86), thus indicating a better model fit.

4.2.2 Results for the organizational level

According to H2, involvement in the excellence initiative positively influences academic performance. We used the intercept as outcome model to analyze whether this institutional predictor was associated with the variance of the intercept on the individual level. Specifically, we added the institutional-level predictor involvement in the excellence initiative to the model after controlling for the individual-level predictors and control variables (see Model 4). We observed that involvement in the excellence initiative did not significantly influence academic performance, $\gamma = -0.00$, SE = 0.03, ns.[7,8] This finding was also supported by inspecting the random intercept of Model 3 and the corresponding Chi square test, $u0 = 0.0029$,

[3] This result is robust when the control variables are not included in the model, $\gamma = -0.08$, SE = 0.03, $p = 0.01$. However, this result is not robust when self-assessed research performance (for the measurement of this variable, please see Ringelhan et al. (2013)) is used as the criterion (instead of academic performance), $\gamma = 0.27$, SE = 0.05, $p < 0.001$; using research performance rather than academic performance as the criterion, H1a was confirmed. Please note that the sample size reduced to $N = 1{,}028$ for all analyses using self-assessed research performance rather than academic performance as criterion in this manuscript because some respondents included in the sample of our study did not (completely) respond to the scale measuring self-assessed research performance.

[4] This result is robust when the control variables are not included in the model, $\gamma = 0.21$, SE = 0.03, $p < 0.001$. This result is also robust when self-assessed research performance is used as the criterion, $\gamma = 0.34$, SE = 0.05, $p < 0.001$.

[5] This result is robust when the control variables are not included in the model, $\gamma = 0.21$, SE = 0.03, $p < 0.001$. This result is also robust when self-assessed research performance is used as the criterion, $\gamma = 0.23$, SE = 0.05, $p < 0.001$.

[6] The results reported here slightly differ from the results displayed in Model 3 because in Model 3, gender, intrinsic work motivation and extrinsic work motivation are all included in the model at once. By contrast, the results reported here refer to models where either gender or intrinsic work motivation or extrinsic work motivation is included as a predictor at the individual level. However, the results are robust when including all individual-level predictors at once.

[7] This result is robust when the control variables are not included in the model, $\gamma = -0.00$, SE = 0.03, ns. This result is also robust when self-assessed research performance is used as the criterion, $\gamma = 0.14$, SE = 0.07, ns. However, using research performance, the result is at least marginally significant ($p = 0.06$).

[8] This result is robust when the predictor variable "involvement in the excellence initiative" is replaced by the variable "involvement in a graduate school", $\gamma = 0.01$, SE = 0.03, ns, or by the variable "involvement in a cluster of excellence", $\gamma = -0.03$, SE = 0.03, ns.

$\chi^2(64) = 81.32$, $p < 0.10$. Insignificance in this test implies that no additional variables need to be integrated to explain the between-group variance (Hofmann 1997). The deviance was reduced by 0.02, and compared with Model 3, the portion of group level variance explained by the additional institutional variable did not improve the model fit. In summary, this finding did not support H2, so the hypothesis was rejected.

4.2.3 Results for the cross-level interactions

H3 to H5 state our assumptions regarding cross-level interactions between predictors at the institutional and individual levels. To test these hypotheses, we first investigated whether the corresponding varying slopes could be predicted by the institutional-level variables (Snijders and Bosker 2011). In a first step, we added a random error term for gender according to intrinsic and extrinsic work motivation in the outcome model to show that the slopes differ for universities. We observed no significant variance components for the slopes (gender: $\chi^2(64) = 54.16$, ns; intrinsic work motivation: $\chi^2(64) = 61.50$, ns; and extrinsic work motivation: $\chi^2(64) = 54.87$, ns). Moreover, no significant improvements to the model were found based on the deviance tests (gender: $\chi^2(2) = 1.68$, ns; intrinsic work motivation: $\chi^2(2) = 0.12$, ns; extrinsic work motivation: $\chi^2(2) = 0.19$, ns). Despite these non-significant findings, we investigated the assumed cross-level interactions. Snijders and Bosker (2011) and Raudenbush and Bryk (2002) state that even if there is no significance in the random slopes, cross-level interactions can still be present because the test for a random slope has a weaker power than the test for interactions. Such a situation yields non-randomly varying slopes, meaning that they are strictly related to the institutional-level variable.

We included the interaction terms step-by-step for each individual predictor (Models 5–7). One of the three cross-level interactions was significant. In total, the full model (Model 8) explains 11.20 % of the total variance in the null model.

Gender H3 states that the relationship between gender and academic performance is moderated by involvement in the excellence initiative in such a way that men perform better at faculties that are involved in a graduate school and/or a cluster of excellence, whereas women perform better at faculties that are not involved in a graduate school and/or a cluster of excellence funded by the excellence initiative. We tested this hypothesis in Model 5 and observed that the interaction between gender and involvement in the excellence initiative was not significant, $\gamma = 0.03$, SE = 0.05, ns.[9,10] That is, involvement in the excellence initiative did not influence the relationship between gender and academic performance in our sample, so H3 was not confirmed.

[9] This result is robust when the control variables are not included in the model, $\gamma = 0.03$, SE = 0.05, ns. This result is also robust when self-assessed research performance is used as the criterion, $\gamma = -0.02$, SE = 0.05, ns.

[10] This result is robust when the predictor variable "involvement in the excellence initiative" is replaced by the variable "involvement in a graduate school", $\gamma = 0.01$, SE = 0.06, ns, or by the variable "involvement in a cluster of excellence", $\gamma = -0.07$, SE = 0.05, ns.

Intrinsic work motivation H4 states that involvement in the excellence initiative enhances the relationship between intrinsic work motivation and academic performance. We tested this hypothesis in Model 6 and observed that the interaction between intrinsic work motivation and involvement in the excellence initiative was not significant, $\gamma = -0.00$, SE $= 0.06$, ns.[11,12] That is, involvement in the excellence initiative did not influence the relationship between intrinsic work motivation and academic performance in our sample, so H4 was not confirmed.

Extrinsic work motivation H5 states that involvement in the excellence initiative moderates the relationship between extrinsic work motivation and academic performance in such a way that the relationship is stronger for faculties that are involved in a graduate school and/or a cluster of excellence funded by the excellence initiative than for non-involved faculties. We tested this hypothesis in Model 7 and observed that the relationship between extrinsic work motivation and academic performance was not strengthened by involvement in the excellence initiative, $\gamma = -0.12$, SE $= 0.05$, $p < 0.05$.[13,14] Instead, highly extrinsically motivated respondents employed by faculties that are involved in a graduate school and/or a cluster of excellence funded by the excellence initiative performed significantly worse than highly extrinsically motivated respondents employed by non-involved faculties. Thus, H5 was not confirmed.

5 Discussion and conclusion

This study sought to analyze specific individual and institutional determinants of academic performance, thereby contributing to a better understanding of potential antecedents of scholars' and universities' success. Specifically, using hierarchical linear modeling, we analyzed the effects of gender, work motivation, and involvement in the excellence initiative on self-reported academic performance. Overall, we observed significant relations between individual predictors (i.e., gender and work motivation) and self-reported academic performance but not between the institutional predictor (i.e., involvement in the excellence initiative) and self-reported academic performance. Interestingly, our findings supported the general assumption that individual and institutional predictors interact in their influence on academic performance.

[11] This result is robust when the control variables are not included in the model, $\gamma = 0.00$, SE $= 0.05$, ns. This result is also robust when self-assessed research performance is used as the criterion, $\gamma = 0.08$, SE $= 0.12$, ns.

[12] This result is robust when the predictor variable "involvement in the excellence initiative" is replaced by the variable "involvement in a graduate school", $\gamma = -0.01$, SE $= 0.07$, ns, or by the variable "involvement in a cluster of excellence", $\gamma = 0.03$, SE $= 0.07$, ns.

[13] This result is robust when the control variables are not included in the model, $\gamma = -0.12$, SE $= 0.05$, $p < 0.05$. This result tends to be robust when self-assessed research performance is used as the criterion, $\gamma = -0.14$, SE $= 0.08$, $p = 0.10$.

[14] This result is robust when the predictor variable "involvement in the excellence initiative" is replaced by the variable "involvement in a graduate school", $\gamma = -0.14$, SE $= 0.05$, $p < 0.01$, but it is not robust when the predictor variable is replaced by the variable "involvement in a cluster of excellence", $\gamma = -0.02$, SE $= 0.11$, ns.

At the individual level, contrary to our assumption, women outperformed men. A plausible reason for this finding is that, during the last few years, work environments for women as well as their career expectancies have changed (Konrad et al. 2000). On the one hand, this change might be accompanied by greater effort. On the other hand, gender initiatives at universities as well as more flexible work designs (Majcher 2003; Ruschenburg et al. 2011) may explain the equalizing of women's and men's academic performance.[15] Another finding at the individual level was that, in line with our assumptions, both intrinsic and extrinsic work motivation were positively related to self-reported academic performance. This finding is in line with Amabile's (1993) argument that people are not only motivated by external rewards and final outcomes but also by fun and challenges during their work.

In our sample, the effect sizes for intrinsic and extrinsic work motivation were nearly equal. The nearly equal effect sizes are noteworthy because the reliability of our extrinsic work motivation scale was low, and low reliability attenuates results (Cohen et al. 2003, p. 57). Thus, it is even more surprising that the effect of extrinsic work motivation is nearly equal to the effect of intrinsic work motivation. It is reasonable to assume that our specific sample of doctoral and postdoctoral junior faculty members is responsible for the nearly equal effect sizes, which is not in line with the general observation that intrinsic work motivation appears to be the more prevalent work motivation type in academia (e.g., Bland et al. 2005). Because the future career of doctoral and postdoctoral junior faculty members is difficult to predict, doctoral and postdoctoral junior faculty members might be more receptive to extrinsic rewards than tenured people in the academic system. If junior faculty members leave the academic system after the completion of their Ph.D., they might profit from the academic title regarding occupational advancement (Mangematin 2000) or regarding salaries in future (non-academic) jobs. By contrast, if they stay in the academic system, an excellent reputation concerning research and teaching might be essential for obtaining an appointment to a chair. That is, independent of their future career development, junior faculty members might be extrinsically motivated by receiving the academic title or an excellent reputation, which might explain the comparably strong effect of extrinsic work motivation in our model.

At the institutional level, our hypothesis was not confirmed: involvement in the excellence initiative did not significantly influence self-reported academic performance. The non-significant result for involvement in the excellence initiative might be explained by the fact that faculties did not necessarily benefit from the excellence initiative in the expected way. One might argue that the excellence initiative has not reached (or cannot reach) the expected outcomes thus far. In a survey conducted in 2010, the majority of scholars agreed that the excellence initiative is not an adequate means to stimulate research (Böhmer et al. 2011). Moreover, despite the benefits of the excellence initiative, one might argue that the strong focus on research disadvantages teaching, which might, in turn, result in negative effects of the

[15] Please note that this finding was not robust when self-assessed research performance was used as the criterion (instead of academic performance); using research performance rather than academic performance as the criterion, H1a was confirmed. Thus, the arguments mentioned here should be considered with care.

excellence initiative in terms of teaching (which, together with research and other duties, was integrated into our criterion).[16]

Across individual and institutional levels, we found a significant cross-level effect between extrinsic work motivation and involvement in the excellence initiative, but neither between gender and involvement in the excellence initiative nor between intrinsic work motivation and involvement in the excellence initiative.

The cross-level effect between extrinsic work motivation and involvement in the excellence initiative confirmed our assumption that employment at a faculty that is involved in a graduate school and/or a cluster of excellence influences the relationship between extrinsic work motivation and academic performance. Surprisingly, however, the cross-level effect between extrinsic work motivation and involvement in the excellence initiative revealed that the relationship between extrinsic work motivation and academic performance was not strengthened by involvement in the excellence initiative. Instead, highly extrinsically motivated respondents employed by faculties involved in the excellence initiative performed significantly worse than those employed by non-involved faculties. To explain this counter-intuitive effect, one might argue that highly extrinsically motivated scholars working at faculties that profit from the excellence initiative use more ambitious reference points for self-assessing their academic performance. For example, if they compare themselves to peers with several publications in A or A+ journals whereas others use lower reference points for self-assessing their academic performance, the same performance might be assessed differently, causing the effect of extrinsic work motivation on academic performance to weaken. Further research is required to see whether this rather speculative argument holds.

The non-significant cross-level effect for gender might be explained by the fact that we measured involvement of business and/or economics faculties in graduate schools or clusters of excellence promoted by the excellence initiative rather than excellence university status. On the one hand, our proxy for measuring involvement in the excellence initiative appears to be advantageous in our study because our sample consists of doctoral and postdoctoral junior faculty members of business and economics faculties—in accordance with our sample, our measurement of involvement in the excellence initiative focuses on business and/or economics faculties and thus accounts for the fact that faculties might not necessarily profit from the excellence university status. On the other hand, involvement of faculties in graduate schools and/or clusters of excellence might not bear reputation effects that are generally ascribed to the excellence university status. Thus, for example, arguments that prestige and peer recognition rank higher for men than for women (Fox 2010), might be valid for reasoning a moderation of the relationship between gender and involvement in the excellence initiative if one measures involvement in the excellence initiative by means of excellence university status but to a lesser extent if one measures involvement of business and/or economics faculties in the excellence initiative.

[16] Please note that, however, this result is robust when self-assessed research performance is used as the criterion.

The non-significant cross-level effect for intrinsic work motivation might be explained, on the one hand, by the fact that the extraordinary status related to working at a faculty that is involved in the excellence initiative might come along with increased perceived competition and pressure to perform well (Deci et al. 1981; Reeve and Deci 1996). Doctoral and postdoctoral junior faculty members might experience such a situation as a controlling, external force that reduces their autonomy and causes a crowding out of intrinsic motivation (Amabile 1993; Frey B and Jegen 2001; Kieser 2010; Minssen and Wilkesmann 2003). Accordingly, the joy of conducting research and teaching might be lost. These counteracting effects might offset the positive effects that we expected when we developed our hypotheses.

Our study provides several valuable contributions to the literature. First, we contribute to research in the field of academic performance by analyzing the cross-level effects of important individual and institutional predictors of academic performance. In contrast to previous research, which investigated potential individual and institutional determinants simultaneously, we followed a hierarchical linear model approach, thereby addressing the shortcoming of the difficulty in adequately attributing the variance to either individual or higher-level institutional characteristics.

Second, we measured academic performance rather than research performance, thereby contributing to the literature on higher education, which, until now, has primarily focused on research performance. Third, our study supports arguments that academic performance is a multilevel phenomenon that is jointly influenced by individual and institutional variables. Closely connected to the aforementioned argument, by using hierarchical linear modeling and anticipating the nested data structure, our study provides a comparatively more comprehensive and differentiated overview of individual, institutional, and cross-level effects on academic performance. Although multilevel analyses have been widely used in education research for explaining the performance outcomes of students (Kreft 1993; Lau and Nie 2008; Lee and Bryk 1989; Rumberger 1995), this research method is not widespread in a university context. Here, multilevel analyses appear to be very valuable because the theory largely proposes contextual influences on academic performance.

There are some limitations that are worth considering regarding the interpretation and generalization of our results. First, although the χ^2-test indicated substantial between-group significance for academic performance, the ICC was relatively small, implying that less than 2 % of the outcome variance was attributable to the context. In education studies, ICCs normally range from 13 to 25 % (Hedges and Hedberg 2007), and some scholars argue that a multilevel analysis should be applied only if the ICC is larger than 10 % (Roberts et al. 2010). However, because the intercept component was significant, the ICC was also significant, "indicating that a multilevel model is appropriate and needed" (Garson 2013, p. 64). Because we found a significant cross-level interaction, hierarchical linear modeling provided additional value to the standard regression analyses.

Second, the number of observations and group sizes represent a limitation of our study. Although, prior to the analyses, we excluded data from respondents who

belonged to an institution for which less than five observations were available, the group sizes in our sample were rather unequal. Our final sample ($N = 1{,}057$) consisted of 65 groups (universities) with unequal group sizes and a range of 48 observations.[17] To properly detect cross-level interactions, Maas and Hox (2005) recommend 50 groups with 20 individuals each; 30/30 might also be sufficient (Bassiri 1988; Van der Leeden and Busing 1994). Snijders and Bosker (2011) state that the number of individuals per group is not a severe problem for analyses; however, smaller groups have a smaller influence on the results than larger groups. In most cases, a larger number of groups is more crucial for the accuracy and power of the analyses than the number of respondents per group (Hox 2002; Maas and Hox 2005; Richter and Naumann 2002; Snijders and Bosker 2011). Thus, we are confident in our results, which were obtained with 65 groups with a different (and rather small) number of observations. Nevertheless, the sample sizes bear some risk of estimation inaccuracies.

Third, the remaining variance at the individual level in the hierarchical linear modeling analyses indicates that important predictors have not been included in the model (Bryk and Raudenbush 1992; Richter and Naumann 2002). For example, cognitive ability and dispositional skills (Cummings and Schwab 1973; Hunter and Hunter 1984) or the Big Five personality traits (Digman 1990; McCrae and John 1992) were not included in our model, although these variables might have a strong influence on academic performance. Future research should gather data regarding these additional potential predictors of academic performance and add them to our model.

Fourth, one might argue that the effects reported in our study are too low for meaningful interpretations, despite the fact that they are significant. However, though acknowledging that this might be a potential limitation of our study and that thus our findings should be interpreted with care, we feel confident in our results for the following reasons. First, because the effects are significant, the effects appear to be existent. Second, there is broad evidence that weak effects often lead to larger practical effects (c.f., Harter et al. 2002).

Fifth, our hypotheses were only partly confirmed, so that one might argue that the knowledge created by our study is partly limited. The rejection of interesting hypotheses is a problem of many empirical studies. In recent years, practices such as HARKing (=*h*ypothesizing *a*fter the *r*esults are *k*nown) are increasingly discussed and criticized in the literature, and the value-added of reporting negative results is emphasized (e.g., Kerr 1998). There is an emerging consensus that non-significant findings contribute to the accumulation of knowledge as long as they are robust. For example, Kerr (1998, p. 208) notes that failed hypotheses at the very least may "help prevent others from traveling down paths that have been discovered to be dead ends […] [and that] they may serve the vital function of narrowing the range of plausible hypotheses." Against this background, we feel that our study contributes to the literature, on the one hand, by confirming some hypotheses that were developed based on the current literature but also, on the other hand, by reporting hypotheses that were not confirmed in our study.

[17] Only 14 universities had more than 20 scholars respond and indicate their affiliation.

Sixth, because we included data from the excellence initiative in our model, one might argue that our findings are only relevant in a German context. The excellence initiative is indeed a German phenomenon. However, the findings regarding whether financially supporting universities or the granting of a designation reflecting their excellence influence academic performance might also have implications for academic systems in other countries. Although our findings might not be directly transferable to different academic systems, they serve as a starting point for further investigations in different countries that also have very reputable and well-known universities.

Seventh, for clusters of excellence, we cannot rule out that business and/or economics were participating subject areas but that nevertheless business and/or economics faculties at a specific institution were not directly involved in the respective cluster of excellence. So, involvement in graduate schools might be a slightly more reliable variable because for this variable, more specific data were available. Additionally, we cannot rule out that indirect effects (e.g., due to higher competition or less money) of the excellence initiative might have been present.

Eighth, given that academic performance and (intrinsic and extrinsic) work motivation were measured based on self-assessments, the correlations between these variables appear rather low. On the one hand, one might argue that this is a strength of our study because the correlations indicate that the self-assessments for academic performance and for work motivation differed. That is, it appears that participants were able to differentiate between the different constructs. On the other hand, one might argue that self-assessments of academic performance depend on the reference group that one has in mind when assessing his or her own academic performance. The choice of a reference group might be influenced by different context factors, so that our participants might have had different reference groups in mind when assessing their academic performance. The range for the different variables as well as the normal distribution of the variables in our data tends to support the first argument. However, our data do not allow drawing any conclusions regarding the reason for the rather low correlations.

Ninth, a limitation is our reliance on self-assessments with regard to our more qualitative-oriented dependent variable, academic performance. Using self-assessments for measuring academic performance allows for a comparatively comprehensive assessment of academic performance (Farh et al. 1988). Performance self-assessments bear the advantages that a broad range of activities can be considered at once and that the performance assessment is conducted by the person who has the deepest insight into these activities and therefore appears to be best suited to report the manifold and partly intangible working results (Janssen 2000). Furthermore, research shows that self-assessments of performance are moderately related to other measures, such as supervisors' or chairpersons' ratings (Farh et al. 1988; Harris and Schaubroeck 1988). However, although self-assessments bear the aforementioned advantages, one might argue that self-assessments are very subjective and thus biased in favor of the person who undertakes the self-assessment. Thus, findings based on data from self-assessments should always be interpreted with care.

To address the limitation of self-assessments, future research should use objective performance measures. For instance, one might replicate our study with a

sample of professors and take the number (and perhaps the "quality" according to different rankings) of journal publications as an objective performance measure. Similarly, one might think of taking the scores from teaching evaluations by students as the criterion, although these data might be much more difficult to obtain.

Additionally, replicating our findings in a different research field (e.g., natural or engineering sciences) might be a fruitful avenue for future research. The fact that business and economics faculties profited less from the excellence initiative than natural and engineering faculties might be the reason for the weak results in our study.[18] Therefore, investigating whether our result that university belongingness explains little variation in the academic performance outcomes can be confirmed seems to be especially interesting. Given that the largest part of projects and clusters as part of the excellence initiative are promoted in the natural or engineering sciences (Hartmann 2006), we would expect that the effects relating to the excellence initiative in our study are stronger in the natural and engineering sciences.

Moreover, future research might choose, for example, single chairs or institutes rather than universities as the highest grouping level. Several scholars have highlighted the importance of group effects on individual performance, especially engagement in building up networks or agile communication and group cohesiveness for mutual mind sharing, knowledge exchange and multidisciplinary solutions (Carayol and Matt 2004; Harvey et al. 2002; Keller 1986). Taking single chairs or institutes as the highest grouping level might also enable analyses of Leader-Member Exchange (Graen et al. 1982; Scandura and Schriesheim 1994; Tierney et al. 1999) and its consequences on performance. Characteristics of professors often influence their assistants in a significant way. Specifically, professors serve as intellectual and visionary mentors who support and enhance the academic outcomes of their protégées and stimulate their scientific desire through effective management or provision of feedback and training (Creswell and Brown 1992; Heinze et al. 2009; Long and McGinnis 1985; Scandura 1992).

In conclusion, our study represents a first step toward a better understanding of specific individual and institutional determinants of academic performance. Using hierarchical linear modeling allowed us to analyze individual-level and institutional-level predictors of academic performance at the same time, while adequately attributing the variance explained to the individual or institutional-level predictors. According to our findings, in addition to effects at the individual level, cross-level effects are worthwhile when considered in this context and should be the focus of future research. Further investigations that examine determinants on several levels, thereby anticipating the highly complex, nested belongingness of scholars at universities, are regarded as a promising avenue for future research.

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