

# Female full professors in the Netherlands: differences between research areas

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# Female full professors in the Netherlands: differences between research areas

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## SUMMARY

In the Dutch academic world, the low amount of women in top positions is an issue that has received much attention in the past few years. Yet, despite of all the measures that have been taken by Dutch universities, the share of female full professors is still relatively low in this country compared to other European countries. Moreover, in the Netherlands there exist large differences between the research areas when it comes to the share of female full professors. In the Alpha area, also known as the humanities, we find the highest share of female full professors, namely 23 per cent in 2011. The Gamma area, also known as the social sciences, follows with 16 per cent female full professors in 2011. Lastly, the Beta area, also known as the natural sciences, shows the lowest share of female full professors, with 9 per cent female full professors in 2011 (VSNU, 2012).

In this research, we tested explanations for the differences between research areas in the share of female full professors. More specifically, we examined whether factors that contribute to the success or failure of women reaching top positions in general, could also account for the differences between Dutch research areas in the share of female full professors. We expected that the differences could on the one hand be explained by factors caused by women themselves, individual factors, and on the other hand by factors caused by the research areas, organisational factors. We subdivided the dichotomy of individual and organisational factors into four factors. First, individual factors can be related to restrictions female academics face. The individual factors related to restrictions we examined were human capital, social capital and masculinity. Second, individual factors can also be related to the preferences of female academics. The individual factor related to preferences we examined was ambition. Third, organisational factors can also be related to restrictions research areas face. The organisational factor related to restrictions we examined was the composition of the research area. Lastly, organisational factors can be related to preferences of research areas. The organisational factor related to preferences we examined was the supportive work environment. We answered the following research question:

*To what extent can differences between Dutch research areas in the share of female full professors be explained by individual and organisational factors?*

In order to answer our research question, we analysed secondary quantitative data on Dutch female academics (collected by Brouns, Bosman & Van Lamoen, 2004; Need, Visser & Fischer, 2001; Sanders, Willemsen & Millar, 2009; VSNU, 2000-2012; Willemsen & Sanders, 2007). In our analysis we included data on female full professors, associate professors, assistant professors and PhD students. We performed statistical analyses in order to find out whether female academics from different research areas differ in human capital, social capital, masculinity and ambition. Furthermore, we examined whether research areas differ in composition and the extent to which the work environment is supportive.

With regard to the results, in the first place we found that female academics from the Alpha area have a higher level of ambition than women from the other research areas. In the second place, the data showed that the share of potential women is higher in research areas with a relative high share of female full professors. We propose that ambition, an individual factor related to preferences, is the primary factor that explains the differences between Dutch research areas in the share of female full professors.



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## 1. INTRODUCTION

Figures on boardroom membership show that in 2011 only 4.8 per cent of Dutch board seats was occupied by women (OECD, 2012). When looking at figures for the academic world, we see a comparable distribution of men and women in top positions. In 2011, 14.8 per cent of full professors was female (VSNU, 2012). Compared to other EU countries, the Netherlands has one of the lowest proportions of women in high academic positions. The latest figures show that in 2010, only Belgium, Cyprus and Luxembourg had a lower proportion of women in high academic positions than the Netherlands. With 13.1 per cent female full professors in 2010, the Netherlands shows a lower share of women than the EU average of 19.8 per cent (European Commission, 2013). So, despite the European Commission's proposed target of 25 per cent women in leading positions in 2010 (European Commission, n.d.), the Netherlands has not complied with this target. It is expected that if the current trend continues, this target will only be reached around 2025 (Gerritsen, Van der Sanden, Verdonk & Visser, 2012).

Many researchers have investigated the reasons why Dutch female researchers fail to reach the top of universities and why their male counterparts don't fail (e.g. Bleijenbergh, Van Engen, Schulte & Blonk, 2010; Need, Visser & Fischer, 2001). To date, only one research has focused on the reasons for the differences between the Dutch research areas in the share of female full professors (Van den Brink, 2010). This is an interesting issue, as figures show that there exist large differences between the humanities, natural sciences and social sciences (VSNU, 2012). In the Netherlands, these three research areas are known as Alpha (humanities), Beta (natural sciences) and Gamma (social sciences) (Rigney, 2006). The Alpha area includes research concerning Language & Culture. The Beta area refers to Agriculture, Nature and Technology. Lastly, the Gamma research area consists of research related to Economics and Behaviour & Society. An overview of the total amount of full professors and the share of female full professors for each Dutch research area can be found in Table 1.

Table 1

*Full professors at Dutch universities in 2011*

Research area	Total amount of full professors (FTE)	Amount of female full professors (FTE)	Share of female full professors
Alpha	399.39	93.13	23.32%
Beta*	1003.59	85.45	8.51%
Gamma**	731.61	117.53	16.06%
<i>Total</i>	2134.59	296.11	13.87%

*Note.* \* Excluding medical domain figures

\*\* Excluding law domain figures

Adapted from *Personeelsgegevens per peildatum 31 december* by VSNU, 2012. Retrieved January 8, 2013 from [http://www.vsnu.nl/f\\_c\\_personeel\\_downloads.html](http://www.vsnu.nl/f_c_personeel_downloads.html)

From Table 1 can be concluded that there is a distinction between the three research areas when it comes to the share of female full professors. In particular the Beta area shows a very low share of female full professors compared to the Alpha and Gamma areas. The current research will focus on explanations for the differences between Dutch research areas in the share of female full professors.

One could obviously say that the reason why the share of full professors in the Beta and Gamma area is relatively low is that women show less interest in Beta and Gamma sciences than men (Booy, Jansen, Joukes & Van Schaik, 2011). Subsequently, there are fewer women in these research areas and therefore the amount of potential women is simply not as high as is the case for the Alpha sciences. Yet, it might be possible that other factors also contribute to the differences between the research areas in the share of female full professors. In the current research we will examine both individual and organisational factors as explaining factors for the differences between research areas. We will examine whether individual and organisational factors that explain the success or failure of women reaching top positions in general, can also account for the differences between research areas in the share of female full professors. With this research we will take a more broader perspective than Van den Brink (2010) has taken. Van den Brink (2010) has looked at the organisational side of the differences between the humanities, social sciences, natural sciences and medical sciences. For example, it has been observed that research areas differ in their appointment processes and promotion system. We will extend Van den Brink's (2010) research by also taking into account individual factors and by examining additional organisational factors.

The following research question will be answered:

*To what extent can differences between Dutch research areas in the share of female full professors be explained by individual and organisational factors?*

## **2. THEORETICAL FRAMEWORK**

The current research is aimed at explaining the differences in the share of female full professors between different research areas in the Netherlands. We will first look at factors that contribute to the success or failure of (academic) women reaching top positions in general. We will examine whether these factors can also explain the differences between Dutch research areas in the share of female full professors.

Existing literature shows that the success or failure of women reaching top positions can in the first place be caused by women themselves (Bain & Cummings, 2000; Oakley, 2000). These individual factors comprise human capital, social capital, masculinity and ambition. The underlying line of reasoning in the current research is that the macro-level phenomenon of the low share of female full professors can partly be explained by micro-level individual differences between women from different research areas (Coleman, 1988). In Figure 1 the causal relations between the macro and micro phenomena of our research can be found. We expect that women from different research areas differ in individual factors: human capital, social capital, masculinity and ambition. This is because research areas have an influence on the beliefs of female academics; also known as the situational mechanism in which external beliefs are internalised (arrow 1). Subsequently, these beliefs lead to certain actions; the action-formation mechanism (arrow 2). Lastly, the individual actions of female academics lead to a collective outcome; called the transformational mechanism (arrow 3) (Hedström & Swedberg, 1998).

In the second place, the success or failure of women reaching top positions can be explained by external factors, such as the organisation women are part of (Bain & Cummings, 2000; Oakley, 2000). In the current research we will examine whether the differences between research areas women are part of,

can explain the differences between research areas in the share of female full professors. This is the mechanism in which the research areas have a direct influence on the share of female full professors in their area (arrow 4). The organisational factors that will be examined are the composition of the research area and the support from the work environment.

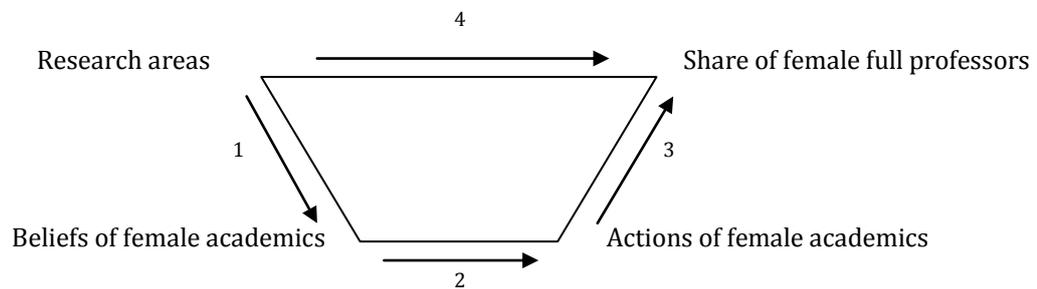


Figure 1. Causal relations between macro and micro phenomena

Our dichotomy of individual and organisational factors is subdivided into four factors. In their search for explanations of the underrepresentation of women in academic positions, Need et al. (2001) made a distinction between the restrictions and preferences of both individuals and organisations. Restrictions refer to the fact that in some cases women lack the capacity to reach a high position and/or organisations are not able to appoint women for these positions. Preferences can be found in the extent to which women do not want to have a high academic position and/or organisations do not want women to hold these positions. In Table 2 we subdivided the individual factors (human capital, social capital, masculinity & ambition) and the organisational factors (composition of the research area & supportive work environment) into factors that are related to restrictions and factors that are related to preferences. Referring to Figure 1, the restrictions and preferences related to individual factors can be found in the relation between research areas, beliefs of female academics, actions of female academics and the share of female full professors, as shown by arrow 1, 2 and 3. The restrictions and preferences related to organisational factors can be found in the relation between research areas and the share of female full professors, as shown by arrow 4. The next section outlines the individual and organisational factors.

Table 2

*Explaining factors of the low share of female full professors in the Netherlands*

	Individual factors	Organisational factors
Restrictions	<p><i>Women lack the capacity to become full professor:</i></p> <ul style="list-style-type: none"> <li>• Human capital</li> <li>• Social capital</li> <li>• Masculinity</li> </ul>	<p><i>Research areas lack the capacity to appoint women full professor:</i></p> <ul style="list-style-type: none"> <li>• Composition research area</li> </ul>
Preferences	<p><i>Women do not want to become full professor:</i></p> <ul style="list-style-type: none"> <li>• Ambition</li> </ul>	<p><i>Research areas do not want to appoint women full professor:</i></p> <ul style="list-style-type: none"> <li>• Supportive work environment</li> </ul>

*Note.* Adapted from “Kansloze ambities? Sekseverschillen in ambities, verwachtingen en inspanningen van promovendi aan de Universiteit van Amsterdam,” by A. Need, J. Visser & A. Fischer, 2001, *Tijdschrift voor Arbeidsvraagstukken*, 17(4), p. 5.

## 2.1. Individual factors - restrictions

### Human capital

As is visible in Table 2, we consider human capital an individual factor that is related to the restrictions of female academics. Human capital can be found in the actions of female academics, a micro-level phenomenon shown in Figure 1. Human capital is a form of intellectual capital (Burton-Jones & Spender, 2011), consisting of the skills, expertise and capabilities of an individual (Coleman, 1988). Becker (1993) refers to human capital as the resources in people. According to Coleman (1988), 'human capital is created by changes in persons that bring about skills and capabilities that make them able to act in new ways' (p. 100). The fundamental idea of human capital theory is that investments in people will lead to economic benefits for both individuals and society (Sweetland, 1996). Human capital is also important for organisations. Resource dependence theory suggests that it is essential for any organisation to have the right resources (Hillman & Dalziel, 2003). Organisations' human resources can provide economic growth, value and competitive advantage (Burton-Jones & Spender, 2011). Accordingly, organisations need individuals with the right resources (Dunn, 2010; Hillman, Cannella & Paetzold, 2000), such as human capital.

When looking from the employee's perspective, human capital theory explains that individuals can develop their own human capital (Becker, 1975). Moreover, investments in education and skills can lead to a successful career (Ballout, 2007). This is because employees with the right human capital perform better, so they are of value to an organisation and therefore obtain higher rewards. According to Becker (1993), the success of an individual's career depends on both the quantity and quality of his or her human capital.

Theory on human capital in relation to career success has been tested empirically many times before. Based on a literature review, Ballout (2007) concluded that 'human capital factors, including education level, work investment, work experience, and the number of hours worked are each positively related to career success' (p. 747). Moreover, Ng, Eby, Sorensen and Feldman (2005) performed a meta-analysis that included 140 articles that were published in 2003 or earlier. The articles included predictors of subjective (career satisfaction) or objective (salary & number of promotions) career success. It was found that human capital was a predictor of objective career success. Furthermore, in their study among female Australian bank employees, Metz and Tharenou (2001) found that in comparison to social capital, human capital explained career advancement better at both low and high levels of management. In this case career advancement was defined by managerial level, salary, number of subordinate staff, and total number of managerial promotions. Human capital consisted of the items occupation type, education, years of work experience, work hours, participation in training and development, results of performance assessments and career breakthrough events. Hence, human capital is important for people who want to attain a high position.

Human capital is often measured in terms of work experience (McDonald, 2011), and education and training (Becker, 1993). This is also the case in the academic world; both educational attainment and work experience are important factors of human capital (Probert, 2005). When looking more specifically into

research concerning the appointment of full professors at Dutch universities, it becomes visible that having an excellent reputation is the most important criterion; there is a search for the most talented candidate (Van den Brink, 2010). This reputation mainly consists of what Van den Brink (2010) calls professional capital. This includes the experience and achievements in a certain research area, management experience, and the extent to which a candidate has contributed to the broader debate in society. Publications, track record in attaining funding for research, grants and rewards are found to be evidence for this capital. In addition, student evaluations for teaching and the score on a teaching assessment during the job interview are often taken into account.

To conclude, not having sufficient human capital can be a restricting factor for women who want to attain a high position. Women need to fulfil the requirements needed for a position as organisations are looking for people with certain human capital. We will examine whether differences in the amount of human capital of Dutch female academics, can also explain the differences between Dutch research areas in the share of female full professors. We will do this by applying the deductive-nomological model (Hempel, 1967; Ultee, Arts & Flap, 1996). Our phenomenon to be explained, the explanandum, is the differences between research areas in the share of female full professors. The explaining factors, the explains, consist in the first place of a general law, which is our first hypothesis, derived from theory on human capital:

*H1 The more human capital female academics in a research area have,  
the higher the share of female full professors in that research area.*

In the second place the explaining factors consist of a condition. We will test Hypothesis 1 by examining whether the following condition is true: *in the Alpha area female academics have the most human capital, in the Beta area female academics have the least human capital*. If this is the case then, according to the general law, we can deduce that the phenomenon of differences between Dutch research areas in the share of female full professors is the consequence.

### **Social capital**

In contrast to human capital theory, social capital theory suggests that in order to reach a top position 'it is not what you know, it is who you know' (Gamba & Kleiner, 2001, p. 102). We argue that the lack of social capital is an individual factor that restricts women from becoming full professor, as shown in Table 2. Social capital is related to the micro-level phenomenon of actions of female academics, as we have shown in Figure 1. Lin (1999) describes social capital as the 'access to and use of resources embedded in social networks' (p. 30). Social capital is about having social relations with productive benefits (Claridge, 2012). In contrast to human capital, social capital can be created by changes in the relations among persons (Coleman, 1988). The volume of the social capital an actor has is depended on the size of his or her network and on the volume of the capital of other actors in the network (Bourdieu, 1986). It is important for people to invest in social networks (Lin, 1999), because to increase one's social capital, access to certain networks is needed (Burt, 1998).

Social capital theory differs from other theories on capital due to its focus on relations between and among actors. Each actor has its own resources and interests in other resources. Social capital is then the availability of resources to an actor (Coleman, 1988). According to Lin (1999), social capital is about 'investments in social relations with expected returns' (p. 30). Furthermore, Bourdieu (1986) talks about the added value group membership can bring. This added value is further explained by Lin (1999) in his description of four features of social capital: information, influence, social credentials and reinforcement. First, social capital stimulates the flow of information. Social relations provide organisations and individuals with useful information which they otherwise would not have access to. Due to social ties, organisations are better able to recruit the right individuals and individuals are better able to find the organisation that suits them. Second, social ties can have an influence on those people who make critical decisions, for example recruiters that decide on who to hire. If an individual knows the right people, these people can put in a good word for him or her. Third, the resources of social ties and the relationships to the individual are often seen as so-called certifications of an individual's social credentials. This is, an individual can be of added value to an organisation due to access he or she has to other resources beyond his or her personal resources. Lastly, social relations can reinforce identify and recognition. If an individual is recognised as a member of a social group that shares similar interests and resources, this leads to both emotional support as well as the 'public acknowledgement of one's claim to certain resources' (Lin, 1999, p. 31).

Lin's (1999) literature review of social capital shows that there can be made a distinction in the literature on social capital with regard to the focus of the research. One approach focuses specifically on the resources that are available in the network, such as certain people that can help you finding the right job. The other approach is aimed at identifying network locations, or the positions of individuals within a network. One can see how close or how far an individual is from certain strategic locations in the network. For example, one can look at bridges or access to bridges, which are the positions at which an individual has access to more information from others. Seibert, Kraimer and Liden (2001) focused on both approaches mentioned by Lin (1999). The researchers wanted to find out whether and how career success was determined by social capital. Career success was measured by looking at current salary, the number of promotions received during the entire career, and career satisfaction. The researchers found that a strong network is positively related to respondents' number of contacts with other functions and at higher levels. These contacts, or social resources, lead to career success as contacts can provide network benefits such as access to information and resources. In addition, career sponsorship was found to be a network benefit. This is the extent to which respondents are provided with 'opportunities to engage in challenging assignments, career advice and coaching' (p. 224, Seibert et al., 2001). So, belonging to a network leads to benefits that can subsequently lead to a successful career.

When looking specifically at research concerning social capital and women, it is known that for women who would like to advance to high managerial levels, social capital is more important than for women who would like to advance to low levels of management (Metz & Tharenou, 2001). In this research social capital was measured in terms of mentor support, career encouragement, network membership, personal tactics used to get a promotion, and comfort level of the decision maker ('the extent to which decision

makers promote candidates with whom they feel comfortable' (p. 324)). Accordingly, social capital is important for women who want to reach the top of an organisation. However, acquiring social capital is not always easy, as many networks are known as old boy's networks, only composed of men (Burke, 1997; Durbin, 2011). Therefore, women should invite themselves to these networks of men, as is recommended by women who have reached the top (Baumgartner & Schneider, 2010). These successful women argued that women should not be afraid to initiate meetings, they should speak up and show themselves, otherwise men don't realise women are interested and, as a result, networks remain closed to women.

Furthermore, Dutch research concerning female academics shows that women' careers can be enhanced when women are more 'visible'. Visibility, in this case, refers to making oneself more remarkable. Women can do this by entering an academic network. It is implied that the visibility of women leads to more involvement in decision making and in research projects, and subsequently a higher number of publications. As a result, women will be literally more visible and will have an increased chance of gaining a higher position. The more visible the women in the network, the more women will join the network and subsequently, the women in the network will become more visible (Van Engen, Bleijenbergh & Pauwe, 2008).

To conclude, although investigating in networks is important for women, social capital is mainly a matter of having access to certain networks. Moreover, the networks women are member of, should be composed of the "right people", who have the "right" resources that can help other members in the network. This is why having insufficient social capital is a restricting factor for women who want to move up the corporate ladder. We will examine whether differences in social capital can explain the differences between research areas in the share of female full professors. Again, we will apply the deductive-nomological model. From the theory on social capital, we have derived the following general law and hypothesis:

*H2 The more female academics in a research area are surrounded by the "right" social capital, the higher the share of female full professors in that research area.*

We will test Hypothesis 2 by examining whether the following condition is true: *in the Alpha area female academics are surrounded by the "right" social capital the most, in the Beta area female academics are surrounded by the "right" social capital the least.* If this is the case then, according to the general law, we can deduce that the phenomenon of differences between Dutch research areas in the share of female full professors is the consequence.

## **Masculinity**

Gender plays an important role in social interaction (Lindsey, 2011). According to Acker (1992), 'gender is the patterning of difference and domination through distinctions between women and men that is integral to many societal processes' (p. 565). The division between masculinity and femininity comes from the preference of people to structure their complex world. Theory on the sociology of gender suggests that statuses and roles are key components of social structure; they help to live a predictable life (Lindsey, 2011). As we have shown in Table 2, we view masculinity as an individual factor that restricts women

from moving up the corporate ladder. Masculinity can be found in the beliefs and actions of female academics, two micro-level phenomena that are shown in Figure 1. Masculinity is especially important in male-dominated workplaces, such as the academic world (Atkinson, 2011). Schein (1985) describes the typical masculine organisational culture as characterised by individualism, competition and dedication to work. Status and material rewards are important, and in this type of culture there is a lot of work pressure. According to Marshall (1993), typical male values are, among other things, independence, focus and control. On the other hand, interdependence, cooperation and a work-life balance are typical female values (Schein, 1985).

There are different theories on the study of gender, we will elaborate on two theories. In the first place, according to the gender interactionist perspective, gender is constructed through social interaction. Masculinity and femininity are not fixed, pre-existing norms (Connell, 1987). Instead, interaction can confirm or undermine gender beliefs (Ridgeway & Smith-Lovin, 1999). Another approach is brought up by structural theorists. These theorists argue that institutions are gendered, because many of them have been developed by men. Law, politics and the economy are all historically defined by men. The only institution in which women historically played a role is the family (Acker, 1992).

Both theories on gender can also be found in research on leaders, managers and other people in top positions. In general, leaders and managers are expected to possess masculine personality traits (Schein, Mueller & Jacobson, 1989; Eagly & Karau, 2002). Senior positions are often characterised by autonomy, instrumentality and result-orientation (Billing & Alvesson, 2000). If we look into research concerning academics, it has been observed that due to the low amount of women in high academic positions, the behavioural norm for scientists in these positions is predominantly masculine. As a result, women who would like to reach the top do not conform to this norm and therefore it is harder for them to get a top position (Bleijenbergh et al., 2010). One can speak of a mismatch between the personality traits of women and the “typical scientist”. Therefore, women often do not meet the requirements of the ideal candidate (Van Engen et al., 2008). Here we see that universities, as historically founded by men, are gendered.

Research of Van den Brink (2010) shows that although Dutch universities are supposed to have women on professorial appointment committees, 44 percent of these committees was only composed of men between 1999 and 2003. Committees that are composed of both men and women are more likely to appoint women than committees in which there are no women involved (Van den Brink, 2010). A first reason for this can be that male full professors often prefer male candidates, because they can identify with these men. This is a matter of homophily: ‘preferring one’s own sex’ (Van den Brink, 2010, p. 152). Second, it is known that men adhere more to the stereotypical male image of a manager than women do (Schein et al., 1989). Lastly, Sing and Vinnicombe (2004) mention that because there are not that many women in top positions, male directors do only have limited experience of senior women that have the same potential as they have themselves. These women are different from the women they usually work with, such as their secretaries, mothers and wives, and men therefore do not see their potential. These three reasons can all be related to the social interaction perspective on gender. In male-dominated work places, the stereotypical ideas on masculinity and femininity are confirmed because interaction mainly takes places between men instead of men and women.

To conclude, male-dominated organisations are looking for people who fit into their masculine organisation. Although this aspect can be seen as an organisational factor, we argue this is more an individual factor. This is, as long as women are a minority group in the top of Dutch universities, it is important for women who would like to become full professor to possess masculine personality traits instead of feminine personality traits. Moreover, it is hard to examine whether organisations themselves prefer men over women, thereby discriminating female candidates. We will therefore examine the individual side of masculinity and femininity. Not being masculine enough and being too feminine can be a restriction for women who want to advance in their career. Our analysis will show whether differences in masculinity and femininity can also explain the differences between research areas in the share of female full professors. Again, we will apply the deductive-nomological model. We have derived the following general laws and hypotheses based on the theory presented above:

*H3a The more masculine female academics in a research area are, the higher the share of female full professors in that research area.*

*H3b The less feminine female academics in a research area are, the higher the share of female full professors in that research area.*

We will test Hypothesis 3a by examining whether the following condition is true: *in the Alpha area female academics are the most masculine, in the Beta area female academics are the least masculine*. If this is the case then, according to the general law, we can deduce that the phenomenon of differences between Dutch research areas in the share of female full professors is the consequence. With regard to Hypothesis 3b, we will examine whether the following condition is true: *in the Alpha area female academics are the least feminine, in the Beta area female academics are the most feminine*. If this is the case then, according to the general law, we can deduce that the phenomenon of differences between Dutch research areas in the share of female full professors is the consequence.

## **2.2. Individual factors - preferences**

### **Ambition**

In addition to human capital, social capital and masculinity, ambition is also of importance when examining careers of people in the top of an organisation (Tharenou, 1997; Sok, Blomme, Tromp & Van Muijen, 2011). We consider a lack of ambition an individual factor that is related to preferences, as we have shown in Table 2. Ambition is related to the micro-level phenomena of both beliefs and actions of female academics, as shown in Figure 1. With help of social cognitive career theory we will explain how ambition is constructed.

First, the basic idea of social cognitive career theory is that career-related actions of individuals are influenced by goals (Brown, n.d.). Ambitious people are known as those who engage in career-related actions, such as taking on extra tasks and who go beyond their job description (Benschop, Van den Brink, Doorewaard & Leenders, 2013). Goals refer to the question: How much do I want to do this? (Brown, n.d.). According to Elchardus and Smits (2008), 'People are considered ambitious when they entertain plans

and goals for their professional future, are intent on making promotion and on realizing a 'nice career' (p. 248).

Second, goals are for their part influenced by career interests people have, or 'people's pattern of likes, dislikes, and indifferences regarding various occupations and career-relevant activities' (Lent, Brown & Hackett, 2002, p. 264). So, ambitious individuals are those with an interest in realising a career and a willingness to invest in career-related activities that are needed in order to realise a career. Ambition is related to successful career making and is seen as the key success factor for promotion (Sools, Van Engen & Baerveldt, 2008). In their search for potential full professors, Dutch universities prefer candidates who show ambition and who are committed to science (Van den Brink, 2010). An often used explanation for the lack of women in top positions is that Dutch women are less ambitious than Dutch men (Stellinga, 2009). Yet, when looking specifically at literature concerning academia, men and women seem to have the same career aspirations. Research shows that there are no differences between Dutch male and female PhD students regarding the aspiration of an academic career and the aspiration to become an associate or full professor (Need, Visser & Fischer, 2001). The same results were found by Ellemers, Van den Heuvel, De Gilder, Maass and Bonvini (2004). Dutch male and female PhD students were found to be equally ambitious.

Third, in addition to interests and goals, social cognitive career theory suggests that both self-efficacy and outcome expectations also play a role in career-related actions. It is argued that self-efficacy and outcome expectations determine the formation of career interests. Self-efficacy refers to the extent to which an individual views him or herself as competent. Self-efficacy is about the question 'Can I do this? Outcome expectations is the perception of an individual toward the consequences of an action (Brown, n.d.). If performing an action, will it produce valued outcomes? (Lent et al., 2002). Both self-efficacy and outcome expectations are dependent on the success or failure of career-related actions performed in the past (Brown, n.d.). In relation to their career, women often show a lack of self-efficacy (Dickerson & Taylor, 2000; Hackett & Betz, 1981). Research shows that women tend to underestimate themselves. They think their chances are not that great and they will therefore not attempt to aspire a career goal (Fels, 2004). This phenomenon is also known as neuroticism. There is a relation between a high level of neuroticism and a low level of ambition (Fels, 2004). Neuroticism can be defined in terms such as worrying, self-conscious, insecure and temperamental (McCrae & Costa, 1987). It is important to have a low level of neuroticism if one wants to apply for the position of full professor. Candidates should not be too modest about their own capabilities (Van den Brink, 2010). We also know that, in general, managers have a low level of neuroticism (Bergner, Neubauer & Kreuzthaler, 2010; Ferguson & Patterson, 1998). The same results are found for effective leaders (Silverthorne, 2001) and charismatic managers (Crant & Bateman, 2000). Lastly, in their meta-analysis, Ng et al. (2005) found that there is a negative relation between neuroticism and career success, the latter defined by salary, promotions and career satisfaction.

We can conclude that being ambitious and having a low level of neuroticism is important for women who want to reach the top of an organisation. Ambitious people are those who are willing to perform career-related actions and who have an interest in making a career. Moreover, neuroticism negatively influences ambition. We will examine whether there are differences between women from different research areas in

ambition and neuroticism. We will do this by applying the deductive-nomological model. The discussed theory on career development leads us to the following general laws and hypotheses:

*H4a The more ambitious female academics in a research area are, the higher the share of female full professors in that research area.*

*H4b The less neurotic female academics in a research area are, the higher the share of female full professors in that research area.*

We will test Hypothesis 4a by examining whether the following condition is true: *in the Alpha area female academics are the most ambitious, in the Beta area female academics are the least ambitious*. If this is the case then, according to the general law, we can deduce that the phenomenon of differences between Dutch research areas in the share of female full professors is the consequence. With regard to Hypothesis 4b, we will examine whether the following condition is true: *in the Alpha area female academics are the least neurotic, in the Beta area female academics are the most neurotic*. If this is the case then, according to the general law, we can deduce that the phenomenon of differences between Dutch research areas in the share of female full professors is the consequence.

### **2.3. Organisational factors - restrictions**

#### **Composition of the research area**

In addition to factors that can be influenced by women themselves, there are also external factors that might stimulate or hinder women to get a top position. We will first explain the composition of the research area; a restricting factor for organisations, as shown in Table 2. In Figure 1, the composition of the research area can be found in the macro-level phenomenon of the research area.

It is a logical assumption that if the share of women in an organisation is low, the share of potential female candidates for a high position is also low. When looking at academic positions, it has been observed that the higher a position, the lower the share of women. This phenomenon is also known as the 'leaky pipeline' theory (Rees, 2002; Blickenstaff, 2005). The more senior women become, the lower the number of women (PwC Gender Advisory Council, 2008). In the Netherlands in 2011, 44.7 per cent of the PhD students was female, 33.2 per cent of the assistant professors was female and 21.5 per cent of the associate professors was female (VSNU, 2012). As a result, universities are simply less able to appoint women a high position, as there are not that many women to choose from compared to men. Van den Brink (2011) calls the lack of women a myth. It is often thought that because there are too few women, the share of female full professors is relatively low. But, this is not the case. Figures show that there many talented women in the research areas. What is of concern is that there are differences between research areas in the amount of potential women. Especially the Beta sciences have a lower share of potential women. This is due to the fact that Dutch women show less interest in Beta sciences than Dutch men (Booy et al., 2011). For example, in 2012, only 21.1 per cent of the students who follow a study related to technology was female (VSNU, 2013).

We will further examine the role of the composition of Dutch research areas in relation to the share of female full professors. The relative low share of female academics in some research areas might restrict organisations to appoint female full professors. Again, we will apply the deductive-nomological model. We have formulated the following hypothesis with regard to the composition of the research area:

*H5 The higher the share of potential female academics in a research area,  
the higher the share of female full professors in that research area.*

We will test Hypothesis 5 by examining whether the following condition is true: *in the Alpha area the share of potential female academics is the highest, in the Beta area the share of potential female academics is the lowest.* If this is the case then, according to the general law, we can deduce that the phenomenon of differences between Dutch research areas in the share of female full professors is the consequence.

## **2.4. Organisational factors - preferences**

### **Supportive work environment**

Another organisational factor is the extent to which the work environment is supportive for people who have the ambition to attain a high position. This factor is related to the preferences of organisations, as shown in Table 2. We consider the supportive work environment a macro-level phenomenon, as we have shown in Figure 1.

Earlier we discussed social cognitive career theory. The extended model of Lent et al. (2002) suggests that context also plays a role in career development, in addition to career-related actions, goals, interests, self-efficacy and expected outcomes. Contextual supports and barriers are 'perceived and objective environmental factors that affect ability to pursue one's goals' (Brown, n.d., p. 3). Contextual supports and barriers influence the career interests, goals and career-related actions of individuals (Lent, Brown & Hackett, 2000). In our research we will examine the influence of supports and barriers created by the work environment of female academics.

First, training and development, promotion policies and compensation practices, all contribute to barriers or opportunities for women (Oakley, 2000). Ng et al. (2005) refer to this as organisational sponsorship. This concerns career sponsorship, supervisor support, training and skill development opportunities, and organisational resources. It is known that organisational sponsorship is positively related to career success. Second, based on an extensive literature review, Ballout (2007) proposes that: 'There will be a positive relationship between perceived organizational support and career success. Employees who perceive high levels of organizational support will report greater career success than employees who perceive low levels of support' (p. 755). Tharenou et al. (1994) found that career encouragement has a positive effect on training and development, which subsequently leads to managerial advancement. This effect was higher for women than for men, so especially for women it is important to be encouraged by others around them. Thus, people need to be encouraged by their environment and should be given opportunities to fulfil their ambition.

The past few years, Dutch universities have implemented many policies aimed at a better representation of female academics. Different measures have been taken: exit interviews, workshops and training, grants for female academics, and the set-up of female networks (Willemsen & Timmers, 2009). With regard to these formal measures, no differences are expected between the research areas as all universities aim at creating a supportive work environment, albeit in different ways (Timmers, 2007). Still, there are differences between research areas when it comes to selection and recruitment procedures. Van den Brink (2010) found that in the Alpha area, about 65% of the new professors are appointed as a result of open competition. In the Beta and Gamma area, on the other hand, the closed procedure is the dominant recruitment method, with 63% and 64% respectively. Van Engen et al. (2008) argue that closed procedures will lead to a smaller chance for women to get appointed, because women are less part of formal and informal networks. But, analysis of Van den Brink (2010) shows that both men (64%) and women (60%) are mostly recruited via closed procedures. Therefore, open or closed procedures do not have any effect on the differences between the research areas when it comes to the share of female full professors.

Another point in which Dutch research areas differ is the promotion system. In the Netherlands, there are two types of systems: the so-called formation principle and the career principle (Willemsen & Timmers, 2009). According to the formation principle, talented people get promoted only in case there is a position available for them. The career principle, on the other hand, is based on the idea that people should get promoted when they meet the job requirements, irrespective of the amount of other people in that position (Van Balen & Van den Besselaar, 2007). The limited amount of available positions is an obstacle for academics in general (Willemsen & Timmers, 2009), but specifically for women, as is shown by research from Bleijenbergh et al. (2010). After their research at a Dutch university, the researchers concluded that at faculties where the formation principle is used this has negative consequences for the flow of women to top positions. The actual choice for the career principle or the formation principle is a financial matter. Faculties with more financial resources are better able to create new chairs (Van Engen et al., 2008). It is known that Beta faculties have more financial resources compared to Alpha and Gamma areas, because Beta faculties are more often financed by second and third-stream funding than the other areas (Van Balen & Van den Besselaar, 2007).

Based on the above we can conclude that the formal side of the supportive work environment cannot clearly explain the differences between the research areas concerning the share of female full professors. We will therefore examine the informal side of a supportive work environment: support and encouragement from colleagues. Having people that support and encourage them is important for women who want to reach senior positions at universities (Chesterman & Ross-Smith, 2006). Also, as (academic) women tend to be less confident (Van den Brink, 2010), and have a lower level of self-efficacy (Dickerson & Taylor, 2000) than men, they might need support from others around them. Support is often referred to as mentoring, which can either be informally or formally arranged. Informal mentoring means that there is 'little or no intervention by the organisation other than an initial introduction' (Singh, Bains & Vinnicombe, 2002, p. 390). Mentoring can be very beneficial for protégées as it helps them with career planning, how to make the next step and learning what is going on in the organisation and how to find

your way (Eby & Lockwood, 2005). Higgins and Kram (2001) take a broader perspective and mention the idea of the developmental network: 'the set of people a protege names as taking an active interest in and action to advance the protege's career by providing developmental assistance' (p. 268). Moreover, women who want to move to the top can learn from senior women in management (Baumgartner & Schneider, 2010). Research of Lockwood (2006) has shown that female role models can have a more positive impact on women than male role models. For men, a gender match is not of importance. On the other hand, women can also be a barrier for each other, also known as the queen bee syndrome. This means that women who have been successful themselves in a male-oriented environment, often tend to hold a competitive attitude towards other women and are opposed the women's movement. These women act as queen bees, restricting the opportunities for other ambitious women (Ellemers et al., 2004; Johnson & Mathur-Helm, 2011).

We can conclude that being supported is important for women who want to fulfil their ambition. If the work environment is not supportive enough, this might restrict women from attaining a high position. We will further examine the role of the supportive environment as an explaining factor for the differences between research areas in the share of female full professors. Again, we will apply the deductive-nomological model. We have derived the following general law and hypothesis from the theory presented above:

*H6 The more supportive the work environment in a research area,  
the higher the share of female full professors in that research area.*

We will test Hypothesis 6 by examining whether the following condition is true: *in the Alpha area the work environment is the most supportive, in the Beta area the work environment is the least supportive*. If this is the case then, according to the general law, we can deduce that the phenomenon of differences between Dutch research areas in the share of female full professors is the consequence.

### **3. METHODOLOGY**

The current research aims to explain the differences between Dutch research areas in the share of female full professors. During the past few years, several researchers have examined the careers of Dutch female full professors and other academics (e.g. Brouns, Bosman & Van Lamoen, 2004; Need et al., 2001). As a lot of data are already available, we used data that have been gathered in previous studies. We combined existing data to test the hypotheses that have been formulated. Below, the selection of the data, the data analysis procedure, and the operationalisation of the dependent and independent variables are explained.

#### **3.1. Selection of data**

First of all, in order to find relevant existing data, we used Scopus and the Dutch search engine Picarta to search for research articles that included Dutch female academics. Second, we checked the literature list of each article that we found for other relevant studies. The search strategy was restricted to quantitative studies that were carried out in the Netherlands. Furthermore, the surveys had to include information

about the research area or faculty of the female academics. In addition to the research articles, we collected data from the association of Dutch universities (VSNU).

In our study we looked at data concerning women from different academic levels. We assumed that between the levels, there would be no differences (e.g. PhD students are equally ambitious as women who have already obtained their PhD). We made this assumption, because we propose that women in different research areas differ from each other due to their work environment; their research area. As we have shown in Figure 1, the research area female academics are part of has an influence on the beliefs and actions of these women.

### **3.2. Procedure**

For each dataset we first determined which items related to individual and organisational factors would be relevant to test which hypothesis. Items that were not answered by at least 30 respondents were left out, so we would have sufficient data to compare. Men were excluded from the datasets; the same goes for respondents employed in the Health and Law domains. We will elaborate on our reason to exclude respondents from the Health and Law domains in chapter 3.3 Operationalisation. The next step was to determine to which of the three research areas (Alpha, Beta or Gamma) respondents belong, if necessary. Some datasets only included the faculties or domains in which women work. Based on the classification in education clusters from Statistics Netherlands (CBS, 2004), we assigned these faculties and domains to each of the three research areas. An overview of the assignment of the faculties and domains can be found in Table 38 and Table 39 in the appendix.

In order to test the hypotheses, we foremost used statistical techniques to compare groups. As the sample sizes were relatively small and often lacked to show a normal distribution, according to Shapiro Wilk tests, we performed non-parametric tests. For the nominal data, we performed chi square tests. We analysed the scale data with Kruskal-Wallis tests. Lastly, in order to test Hypothesis 5, we performed a multiple hierarchical regression analysis. We performed this analysis because we wanted to examine in the first place whether the share of potential female academics is an indicator of the share of female full professors and in the second place whether there exist differences between the research areas.

### **3.3. Operationalisation**

#### **Dependent variable**

*The share of female full professors in research areas* – In the Netherlands, research areas are divided in eight different domains. These are Agriculture, Nature, Technology, Health, Economics, Law, Behaviour & Society, and Language & Culture. On a higher level, these domains can be divided into the Alpha, Beta and Gamma area. We decided to exclude the Health domain from the analysis, as most people in this domain are physicians instead of scientists. In the past few years, there has been a shift in employers; Dutch universities have made room for academic hospitals as employers (VSNU, 2012) and therefore people working in the Health domain cannot be considered scientists. We also excluded the Law domain from the analysis, as most people in this domain are lawyers and judges instead of scientists. For example, many academics related to the Faculty of Law at the University of Groningen are also employed at solicitor's

offices or courts (Rijksuniversiteit Groningen, 2013). Subsequently, five domains remained left for analysis. The Alpha research area included the Language & Culture domain. The Beta area included Agriculture, Nature and Technology. Lastly, the Gamma research area consisted of Economics and Behaviour & Society.

### Independent variables

*Human capital* – In the current research human capital is defined as having the “right” resources that are needed for a high academic position. Human capital refers to skills, expertise and capabilities (Coleman, 1993), gained via training, education (Becker, 1993) and work experience (McDonald, 2011). The 3 items related to human capital we used from the datasets were: ‘full time equivalents’ of female full professors, associate professors and assistant professors, ‘actual work hours per week’ of female PhD students, and female PhD students’ ‘expectation of the number of Dutch and English publications at the time of obtaining their PhD’. The latter item was created by adding the items ‘expectation of the number of Dutch publications at the time of obtaining one’s PhD’ and ‘expectation of the number of English publications at the time of obtaining one’s PhD’. We were not able to include other human capital items in our analysis, as no data were available.

Table 3 shows an overview of the items, the datasets from which data were used, and the target group that was included in the datasets. Second, Table 3 displays for each item the minimum and maximum scores, and the level of measurement. Lastly, the tables in which the results can be found are given.

Table 3

*Overview of the datasets, target groups, items, maximum-minimum scores, levels of measurement & table numbers related to human capital*

Dataset	Target group	Items	Minimum – maximum scores	Level of measurement	Table number
VSNU (2012)	Full professors, associate professors & assistant professors	<ul style="list-style-type: none"> <li>• Full time equivalents</li> </ul>	< 0.25 – > 0.9	Nominal	11
Need et al. (2001)	PhD students	<ul style="list-style-type: none"> <li>• Actual work hours per week</li> <li>• Expectation of the number of Dutch &amp; English publications at the time of obtaining one’s PhD. Own calculation, sum of items: <ul style="list-style-type: none"> <li>○ Expectation of the number of Dutch publications at the time of obtaining one’s PhD</li> <li>○ Expectation of the number of English publications at the time of obtaining one’s PhD</li> </ul> </li> </ul>	Open question	Scale	12
			Open question	Scale	13

*Social capital* – We defined social capital as having relations with productive benefits (Clardige, 2012). Social capital is about the added value of group membership (Bourdieu, 1986), so when looking at the networks female academics have access to, especially the group members and their resources are important for women who want to attain a high position. For the hypothesis related to social capital we examined in the first place the role of female full professors in networks, as these are the women that can help other female academics to move up the organisational ladder. Full professors are the ones with access to resources needed for other ambitious women. The items included in our analysis were: ‘familiarity with LNVH and activities’ (as measured by averaging the items ‘I am familiar with the LNVH’ & ‘I am familiar with the activities organised by the LNVH’ ( $\alpha = .856$ )), ‘I often attend LNVH meetings’, and ‘I don’t devote much time to activities from the LNVH’. In the second place, we examined the extent to which women who obtained PhD were helped by their network in advancing their career. The following items were used: ‘help of contacts within the university in getting first job after obtaining one’s PhD’ and ‘help of contacts outside the university getting first job after obtaining one’s PhD’.

Table 4 shows the items we used to measure social capital, and the related datasets and target groups. Furthermore, for each item the minimum and maximum scores and the level of measurement are given. Finally, the tables in which the results of the items can be found are shown.

Table 4

*Overview of the datasets, target groups, items, maximum-minimum scores, levels of measurement & table numbers related to social capital*

Dataset	Target group	Items	Minimum - maximum scores	Level of measurement	Table number
Willemsen & Sanders (2007) + Sanders et al. (2009)	Full professors	<ul style="list-style-type: none"> <li>• Familiarity with LNVH and activities. Own calculation, average of items: <ul style="list-style-type: none"> <li>○ I am familiar with the LNVH</li> <li>○ I am familiar with the activities organised by the LNVH</li> </ul> </li> <li>• I often attend LNVH meetings</li> <li>• I don’t devote much time to activities from the LNVH</li> </ul>	1 – 5	Scale	14
Brouns et al. (2004)	Women who obtained their PhD	<ul style="list-style-type: none"> <li>• Help of contacts within the university in getting first job after obtaining one’s PhD</li> <li>• Help of contacts outside the university getting first job after obtaining one’s PhD</li> </ul>	0/1	Nominal	15
			0/1	Nominal	15

*Masculinity* – We examined the extent to which women show typical masculine personality traits. The more masculine female academics are, the better they fit the masculine organisation in which they work. Masculinity is characterised by individualism, competition, dedication to work and material rewards (Schein, 1985). In the first place we analysed the following items, answered by female PhD students: ‘I like working on my own’, ‘I like it when people make great demands of me’, ‘I think it is important that I earn

good money’, and ‘I think it is normal that scientists work during spare time’. A new item, ‘preference for competition’, was created by averaging the items ‘I try my best to perform better than colleagues’ and ‘I like competition between PhD students’ ( $\alpha = .74$ ). In the second place we examined the opinion of women who obtained their PhD on the items ‘importance of salary in accepting first job’, and ‘importance of autonomy in accepting first job’.

Table 5 shows the items related to masculinity and their accompanying datasets and target groups. In addition, for each item the minimum and maximum score can be found, as well as the level of measurement and the table in which the results can be found.

Table 5

*Overview of the datasets, target groups, items, maximum-minimum scores, levels of measurement & table numbers related to masculinity*

<b>Dataset</b>	<b>Target group</b>	<b>Items</b>	<b>Minimum – maximum scores</b>	<b>Level of measurement</b>	<b>Table number</b>
Need et al. (2001)	PhD students	• I like working on my own	0 – 10	Scale	16
		• I like it when people make great demands of me	0 – 10	Scale	16
		• I think it is important that I earn good money	0 – 10	Scale	16
		• I think it is normal that scientists work during spare time	0 – 10	Scale	16
		• Preference for competition. Own calculation, average of items: <ul style="list-style-type: none"> <li>○ I try my best to perform better than colleagues</li> <li>○ I like competition between PhD students</li> </ul>	0 – 10	Scale	16
Brouns et al. (2004)	Women who obtained their PhD	• Importance of salary in accepting first job	1 – 4	Scale	17
		• Importance of autonomy in accepting first job	1 – 4	Scale	17

In addition to masculine personality traits, we examined feminine personality traits. The less feminine female academics are, the better they fit the masculine organisation in which they work. Femininity is characterised by interdependence, cooperation and a work-life balance (Schein, 1985). First, we examined the following items that were answered by female PhD students: ‘I think a good atmosphere at work is important’, ‘I think a good cooperation with colleagues is important’, ‘I prefer having enough time for activities besides work’, and ‘I think my private life is equally important as my career’. Second, we included data concerning women who already obtained their PhD. We analysed the following items: ‘importance of social contacts at work in accepting first job’, ‘importance of working in a team in accepting first job’, and ‘importance of flexible job’. The latter item was created by averaging the items ‘importance of possibility of flexible work hours’ and ‘importance of possibility of working from home’ ( $\alpha = .893$ ).

In Table 6 the aforementioned items, and the related datasets and target groups can be found. Furthermore, the minimum and maximum scores and the level of measurement are given for each item. Lastly, the tables in which the results can be found are shown in Table 6.

Table 6

Overview of the datasets, target groups, items, maximum-minimum scores, levels of measurement & table numbers related to femininity

Dataset	Target group	Items	Minimum – maximum scores	Level of measurement	Table number
Need et al. (2001)	PhD students	• I think a good atmosphere at work is important	0 – 10	Scale	18
		• I think a good cooperation with colleagues is important	0 – 10	Scale	18
		• I prefer having enough time for activities besides work	0 – 10	Scale	18
		• I think my private life is equally important as my career	0 – 10	Scale	18
Brouns et al. (2004)	Women who obtained their PhD	• Importance of social contacts at work in accepting first job	1 – 4	Scale	19
		• Importance of working in a team in accepting first job	1 – 4	Scale	19
		• Importance of flexible job. Own calculation, average of items: <ul style="list-style-type: none"> <li>○ Importance of possibility of flexible work hours</li> <li>○ Importance of possibility of working from home</li> </ul>	1 – 4	Scale	19

*Ambition* – Our analysis of the theory on career development showed that ambition is related to career success. Ambitious people have an interest in career making and are willing to take the necessary career-related actions (Lent et al., 2002). In the first place ambition was examined as the willingness to aspire an academic career. Data that included female PhD students were analysed. These data consisted of the following items: ‘willingness to become full professor’, ‘willingness to stay at university after obtaining one’s PhD’, and ‘willingness to continue research after obtaining one’s PhD’. Second, ambition is about the willingness to put effort into a career, in other words, to gain more human capital. With regard to data including female PhD students, we examined the following items: ‘I am willing to go abroad for my career’, ‘I have the intention to write research proposals’, ‘I am willing to put a lot of effort in getting an academic job’, and ‘for the time being I will only apply for academic jobs’. We also examined the willingness of women who obtained their PhD ‘to move for their career’, ‘to go abroad for their career’, and ‘to submit research proposals’.

In Table 7 the aforementioned items related to ambition can be found, together with the related datasets and target groups. Furthermore, the minimum and maximum scores are given, as well as the level of measurement and the table in which the results can be found.

Table 7

Overview of the datasets, target groups, items, maximum-minimum scores, levels of measurement & table numbers related to ambition

Dataset	Target group	Items	Minimum – maximum scores	Level of measurement	Table number
Need et al. (2001)	PhD students	<ul style="list-style-type: none"> <li>• Willingness to become full professor</li> </ul>	0/1	Nominal	20
Brouns et al. (2004)	Women who obtained their PhD	<ul style="list-style-type: none"> <li>• Willingness to stay at university after obtaining one's PhD</li> </ul>	0/1	Nominal	21
		<ul style="list-style-type: none"> <li>• Willingness to continue research after obtaining one's PhD</li> </ul>	0/1	Nominal	22
Need et al. (2001)	PhD students	<ul style="list-style-type: none"> <li>• I am willing to go abroad for my career</li> </ul>	0 – 10	Scale	23
		<ul style="list-style-type: none"> <li>• I have the intention to write research proposals</li> </ul>	0 – 10	Scale	23
		<ul style="list-style-type: none"> <li>• I am willing to put a lot of effort in getting an academic job</li> </ul>	0 – 10	Scale	23
		<ul style="list-style-type: none"> <li>• For the time being I will only apply for academic jobs</li> </ul>	0 – 10	Scale	23
Brouns, et al. (2004)	Women who obtained their PhD	<ul style="list-style-type: none"> <li>• Willingness to move for career</li> </ul>	0/1	Nominal	24
		<ul style="list-style-type: none"> <li>• Willingness to go abroad for career</li> </ul>	0/1	Nominal	24
		<ul style="list-style-type: none"> <li>• Willingness to submit research proposals</li> </ul>	0/1	Nominal	25

In addition to ambition, we analysed neuroticism. We assumed that neuroticism is an important underlying factor of ambition. Neuroticism is defined as the negative perception on the chance of attaining a high academic position. We examined data on female PhD students, including the following items: 'expectancy to become full professor', 'expectancy chance being appointed postdoc', 'expectancy chance being appointed assistant professor', 'expectancy chance being appointed associate professor', and 'expectancy chance being appointed full professor'.

Table 8 shows in the first place the items related to neurotic and the accompanying dataset and target group. Second, for each item the minimum and maximum scores are given, as well as the level of measurement. Lastly, the tables in which the results of the analyses can be found are shown.

Table 8

Overview of the datasets, target groups, items, maximum-minimum scores, levels of measurement & table numbers related to neuroticism

Dataset	Target group	Items	Minimum – maximum scores	Level of measurement	Table number
Need et al. (2001)	PhD students	<ul style="list-style-type: none"> <li>• Expectancy to become full professor</li> </ul>	0/1	Nominal	26
		<ul style="list-style-type: none"> <li>• Expectancy chance being appointed postdoc</li> </ul>	0 – 100	Scale	27
		<ul style="list-style-type: none"> <li>• Expectancy chance being appointed assistant professor</li> </ul>	0 – 100	Scale	27
		<ul style="list-style-type: none"> <li>• Expectancy chance being appointed associate professor</li> </ul>	0 – 100	Scale	27
		<ul style="list-style-type: none"> <li>• Expectancy chance being appointed full professor</li> </ul>	0 – 100	Scale	27

*Composition of the research area* – When examining the composition of the research area, first we looked at the share of potential women per research area, as this is an important indicator for the share of future female professors. In our analysis we included data on the average share of female full professors, associate professors and assistant professors between 1999 and 2011. Second, for the years 2004 until 2011, we calculated to what extent the share of female full professors could be explained by the share of female associate professors five years earlier; the latter group being potential future full professors. We did this by performing a regression analysis that included the share of female full professors and the share of female associate professors. Third, we examined the effect of the research area by calculating regression coefficients from the model predicting share of full professors.

Table 9 shows the items we used for our analyses and their related dataset and target groups. Furthermore, the level of measurement and the tables in which the results can be found are given.

Table 9

*Overview of the datasets, target groups, items, maximum-minimum scores, levels of measurement & table numbers related to the composition of the research area*

<b>Dataset</b>	<b>Target group</b>	<b>Items</b>	<b>Level of measurement</b>	<b>Table number</b>
VSNU (2000 - 2012)	Full professors, associate professors & assistant professors	• Average share of female full professors, associate professors and assistant professors between 1999 and 2011	Scale	28
		• Amount and share of female full professors compared to the amount and share of female associate professors 5 years earlier	Scale	29
		• Regression coefficients from the model predicting share of full professors	Scale	30

*Supportive work environment* – The variable supportive work environment refers to the extent to which women are given the opportunity to aspire an academic career. It is about the support and barriers of the work environment (Lent et al., 2000). In the first place we examined data concerning female PhD students. We created a new item: feeling supported by supervisors. This item was created by averaging the following items: ‘supervisors stimulate me in continuing my research’, ‘supervisors think along about my academic career’, ‘supervisors do their best to keep me working in the scientific field’, and ‘supervisors let me know I perform well’ ( $\alpha = .92$ ). In the second place we took into account data that included women who obtained their PhD. The item that was analysed was ‘the help of promoters in getting first job after obtaining one’s PhD’. Lastly, we examined data on female full professors. The following items were included in the analysis: ‘difficulty to become full professor’, ‘there are people at my university who consciously prevent the appointment of female academics’, ‘my faculty is female friendly’, ‘my department is female friendly’, and ‘my university is female friendly’. The other items we analysed concerning female full professors were related to the queen bee syndrome: ‘I would like to become mentor for female associate professors and starting full professors’ and ‘I would like to become more active, locally or in a network, to increase the share of female full professors’.

Table 10 shows the aforementioned items, their related datasets and target groups. The minimum and maximum scores per item and the level of measurement can also be found in Table 10. Lastly, the tables in which the results can be found are shown.

Table 10

*Overview of the datasets, target groups, items, maximum-minimum scores, levels of measurement & table numbers related to the supportive work environment*

Dataset	Target group	Items	Minimum – maximum scores	Level of measurement	Table number
Need et al. (2001)	PhD students	<ul style="list-style-type: none"> <li>• Feeling supported by supervisors. Own calculation, average of items: <ul style="list-style-type: none"> <li>○ Supervisors stimulate me in continuing my research</li> <li>○ Supervisors think along about my academic career</li> <li>○ Supervisors do their best to keep me working in the scientific field</li> <li>○ Supervisors let me know I perform well</li> </ul> </li> </ul>	0 – 10	Scale	31
Brouns et al. (2004)	Women who obtained their PhD	<ul style="list-style-type: none"> <li>• Help of promoters in getting first job after obtaining one's PhD</li> </ul>	0/1	Nominal	32
Willemsen & Sanders (2007) + Sanders et al. (2009)	Full professors	<ul style="list-style-type: none"> <li>• Difficulty to become full professor</li> <li>• There are people at my university who consciously prevent the appointment of female academics</li> <li>• My faculty is female friendly</li> <li>• My department is female friendly</li> <li>• My university is female friendly</li> <li>• I would like to become mentor for female associate professors and starting full professors</li> <li>• I would like to become more active, locally or in a network, to increase the share of female full professors</li> </ul>	1 – 5	Scale	33
			1 – 5	Scale	34
			1 – 5	Scale	35
			1 – 5	Scale	35
			1 – 5	Scale	36
			1 – 5	Scale	37

## 4. RESULTS

Below we will discuss our results. First, we will discuss the individual factors: human capital, social capital, masculinity and ambition. Second, we will present the results concerning the organisational factors: composition of the research area and supportive work environment.

### 4.1. Human capital

With regard to human capital we expected that *H1 The more human capital female academics in a research area have, the higher the share of female full professors in that research area*. For Hypothesis 1 we analysed

the full time equivalents of female academics in 2011, the actual work hours of female PhD students in 1999, and the number of expected publications of female PhD students in 1999.

We examined in the first place the work hours of female academics, as shown in Table 11. Due to agreements on the reporting to third parties, the VSNU could not provide us detailed figures for full professors, associate professors and assistant professors separately. As these figures contain the entire population of female full professors, associate professors and assistant professors, we did not perform statistical analyses. From Table 11 we can deduce that full professors, associate professors and assistant professors from the Beta area work most hours, whereas female academics from the Alpha area work least hours.

Table 11

*Full time equivalents – Female full professors, associate professors & assistant professors (2011)*

Research area	<0.25 FTE	% of total	0.25-0.5 FTE	% of total	0.5-0.75 FTE	% of total	0.75-0.9 FTE	% of total	>=0.9 FTE	% of total	Total
Alpha	62	3.81%	98	6.03%	314	19.31%	397	24.42%	755	46.43%	1626
Beta	73	2.05%	70	1.96%	232	6.51%	418	11.73%	2770	77.74%	3563
Gamma	139	4.21%	220	6.66%	372	11.26%	606	18.34%	1968	59.55%	3305
<i>Total</i>	413	3.82%	536	4.96%	1228	11.37%	1748	16.19%	6873	63.65%	10798

*Note.* Source = M. Nieuwenhuizen (VSNU), personal communication, April 8, 2013. Own calculations.

Second, we obtained data on the actual work hours of PhD students, as shown in Table 12. Marginal significant differences were found between the research areas ( $\chi^2(2, N = 76) = 5.757, p = .056$ ). From Table 12 we can deduce that female PhD students from the Beta area work most hours and female academics from the Alpha area work least hours.

Table 12

*Actual work hours per week – Female PhD students (1999)*

Research area	N	M	SD
Alpha	20	38.90	9.77
Beta	17	43.94	6.09
Gamma	39	39.08	5.82
<i>Total</i>	76	40.12	7.32

*Note.* Source = Need, Visser & Fischer (2001). Own calculations.

Third, we looked at the expected amount of publications of PhD students. In Table 13 we see that PhD students from the Alpha area expect to publish the largest amount of Dutch and English publications at the time of obtaining one's PhD. However, no significant differences were found between the research areas ( $\chi^2(2, N = 77) = .922, p = .631$ ).

Table 13

*Expectation of the number of Dutch and English publications at time of obtaining one's PhD – Female PhD students (1999)*

Research area	N	M	SD
Alpha	20	4.25	2.43
Beta	18	3.83	1.10
Gamma	39	3.90	2.17
<i>Total</i>	<i>77</i>	<i>3.97</i>	<i>2.03</i>

*Note.* Source = Need, Visser & Fischer (2001). Own calculations.

To conclude, with regard to human capital, we found significant differences between the research areas when it comes to FTEs and marginally significant differences when it comes to actual work hours of PhD students. Contrary to our expectations, we found that female academics from the Beta area work most hours, whereas female academics from the Alpha area work least hours. Hypothesis 1 was rejected as we did not find evidence that female academics from the Alpha area have the most human capital and female academics from the Beta area the least.

## 4.2. Social capital

Our expectation with regard to social capital was that *H2 The more female academics in a research area are surrounded by the "right" social capital, the higher the share of female full professors in that research area.* Social capital was in the first place examined by analysing the attitude of female full professors in 2006 toward the LNVH, the Dutch network for female professors and associate professors. Items that were taken into account were the familiarity with the LNVH, the attendance of LNVH meetings and the devotion of time to activities from the LNVH. In the second place, the role of networks in stimulating female academics' careers was examined. We looked at the help of contacts academic women got within and outside the university in getting their first job after obtaining their PhD, as measured in 2002.

First, in Table 14 we find the extent to which female full professors are familiar with the LNVH and its activities. We see that female full professors hardly differ from each other in familiarity with the LNVH. No significant differences between the research areas were found ( $\chi^2(4, N = 98) = 1.301, p = .522$ ). Second, in Table 14 we find the extent to which female full professors attend LNVH meetings. Although the table shows differences between the research areas, these differences were found to be insignificant ( $\chi^2(4, N = 99) = .826, p = .662$ ). Lastly, when looking at the time female full professors spend on activities organised by the LNVH, no significant differences were found between the research areas ( $\chi^2(4, N = 99) = .777, p = .678$ ).

Table 14

*Familiarity with LNVH and activities, attendance LNVH meetings, and devotion of time to activities LNVH (on a scale from 1 = totally disagree to 5 = totally agree) – Female full professors (2006)*

	Research area	N	M	SD
<b>I am familiar with the LNVH and its activities</b>				
	Alpha	33	4.67	.55
	Beta	27	4.50	.64
	Gamma	38	4.66	.55
	<i>Total</i>	98	4.62	.57
<b>I often attend LNVH meetings</b>				
	Alpha	33	2.15	1.23
	Beta	28	2.46	1.45
	Gamma	38	2.11	1.11
	<i>Total</i>	99	2.22	1.25
<b>I don't devote much time to activities from the LNVH</b>				
	Alpha	33	4.30	1.02
	Beta	28	4.07	1.12
	Gamma	38	4.13	1.10
	<i>Total</i>	99	4.17	1.07

*Note.* Source = Willemsen & Sanders (2007) and Sanders, Willemsen & Millar (2009). Own calculations.

In Table 15 the help women who obtained their PhD got from their network within and outside the university in getting their first job after obtaining their PhD can be found. With regard to the network within the university, we see that in all research areas most women indicated they were stimulated by the network. Only within the Alpha area some women said they were hindered by their network. Fisher's exact test showed no significant differences between the research areas ( $p = .273$ ). The lower part of Table 15 shows the help of the network outside the university. None of the women indicated to be hindered by the network, most of them were either stimulated, or nor stimulated nor hindered. Fisher's exact test showed no significant differences between the research areas ( $p = .194$ ).

Table 15

*Help of contacts in getting first job after obtaining one's PhD – Women who obtained their PhD (2002)*

	Hindering		Nor hindering, nor stimulating		Stimulating		Not applicable	
<b>Contacts within the university</b>								
Research area	Amount of women	% within research area	Amount of women	% within research area	Amount of women	% within research area	Amount of women	% within research area
Alpha	1	7.7%	2	15.4%	9	69.2%	1	7.7%
Beta	0	0.0%	5	35.7%	6	42.9%	3	21.4%
Gamma	0	0.0%	3	18.8%	7	43.8%	6	37.5%
<i>Total</i>	1	2.3%	10	23.3%	22	51.2%	10	23.3%

Table 15 (continued)

	Hindering		Nor hindering, nor stimulating		Stimulating		Not applicable	
<b>Contacts outside the university</b>								
Research area	Amount of women	% within research area	Amount of women	% within research area	Amount of women	% within research area	Amount of women	% within research area
Alpha	0	0.0%	7	53.8%	4	30.8%	2	15.4%
Beta	0	0.0%	4	28.6%	5	35.7%	5	35.7%
Gamma	0	0.0%	2	12.5%	9	56.3%	5	31.3%
<i>Total</i>	0	0.0%	13	30.2%	18	41.9%	12	27.9%

Note. Source = Brouns, Bosman & Van Lamoen (2004). Own calculations.

Based on the available data, we found no evidence for differences between research areas in terms of social capital. Therefore, Hypothesis 2 was rejected.

### 4.3. Masculinity

With regard to masculinity, we expected that *H3a The more masculine female academics in a research area are, the higher the share of female full professors in that research area*. We examined masculinity in the first place by looking at the extent to which female PhD students in 1999 have a preference for autonomy, great demands, salary, working during spare time, and competition. In the second place, we examined the importance of autonomy and salary of women who already obtained their PhD, as measured in 2002.

We also proposed that *H3b The less feminine female academics in a research area are, the higher the share of female full professors in that research area*. First, femininity was examined by looking at the preference of female PhD students in 1999 for a good work atmosphere, cooperation, the private life, and having a flexible job. Second, the importance of social contacts at work, working in a team and a flexible job of women who obtained their PhD for, as measured in 2002, was taken into account.

First, in Table 16 we find the extent to which female PhD students have a preference for masculine traits such as autonomy, great demands, salary, dedication and competition. When looking at the preference for autonomy we find that PhD students from the Alpha and Gamma areas gave higher scores than students from the Beta area. The differences between the categories were found to be significant ( $\chi^2(2, N = 79) = 6.979, p = .031$ ). Mann-Whitney U tests indicated that women from the Alpha area scored marginally significantly higher than women from the Beta area ( $U = 118.5, p = .042$ ). Moreover, women from the Gamma area scored significantly higher than women from the Beta area ( $U = 225.5, p = .011$ ). No significant differences were found between the Alpha and Gamma area ( $U = 398, p = .974$ ). Second, when examining the extent to which women like it when people make great demands of them, we found no significant differences between the research areas ( $\chi^2(2, N = 79) = 1.437, p = .487$ ). Third, Table 16 shows the preference for salary of female PhD students. No significant differences were found between the categories ( $\chi^2(2, N = 79) = .812, p = .666$ ). Fourth, when examining the preference for working during spare time, no significant results were found between the categories ( $\chi^2(2, N = 79) = .819, p = .664$ ).

Lastly, the importance of competition consisted of 2 items. We did not detect significant differences between the research areas ( $\chi^2(2, N = 79) = 3.553, p = .169$ ). When looking at the item level we find the same results: 'I try my best to outperform my colleagues' ( $\chi^2(2, N = 79) = 2.569, p = .277$ ); 'I think the competition between PhD students is pleasant' ( $\chi^2(2, N = 79) = 3.734, p = .155$ ).

Table 16

*Preference for autonomy, great demands, salary, working during spare time and competition (on a scale from 0 = absolutely disagree to 10 = absolutely agree) – Female PhD students (1999)*

	Research area	N	M	SD
<b>I like working on my own</b>				
	Alpha	20	6.80	2.84
	Beta	19	5.11	2.79
	Gamma	40	7.00	2.35
	<i>Total</i>	79	6.49	2.67
<b>I like it when people make great demands of me</b>				
	Alpha	20	7.90	1.25
	Beta	19	7.68	1.20
	Gamma	40	7.18	1.95
	<i>Total</i>	79	7.48	1.65
<b>I think it is important that I earn good money</b>				
	Alpha	20	5.45	2.52
	Beta	19	5.79	2.37
	Gamma	39	6.31	1.92
	<i>Total</i>	78	5.96	2.20
<b>I think it is normal that scientists work during spare time</b>				
	Alpha	20	6.65	2.23
	Beta	19	5.89	2.18
	Gamma	40	6.35	2.45
	<i>Total</i>	79	6.32	2.32
<b>Preference for competition</b>				
	Alpha	20	4.53	2.73
	Beta	19	3.42	2.42
	Gamma	40	3.33	2.18
	<i>Total</i>	79	3.65	2.41

*Note.* Source = Need, Visser & Fischer (2001). Own calculations.

Table 17 shows the importance of autonomy and salary of women who already obtained their PhD. No significant differences were found between the categories when it comes to the preference for autonomy ( $\chi^2(2, N = 30) = 2.405, p = .300$ ). Moreover, when looking at the opinions toward salary, we again find no differences between the research areas ( $\chi^2(2, N = 30) = 1.146, p = .564$ ).

Table 17

*Importance of autonomy and salary, in accepting first job after obtaining one's PhD (on a scale from 1 = not important to 4 = very important) – Women who obtained their PhD (2002)*

	Research area	N	M	SD
<b>Autonomy</b>				
	Alpha	8	3.13	.64
	Beta	10	3.00	.67
	Gamma	12	3.42	.67
	<i>Total</i>	30	3.20	.66
<b>Salary</b>				
	Alpha	8	2.00	.54
	Beta	10	1.90	.57
	Gamma	12	1.75	.45
	<i>Total</i>	30	1.87	.51

*Note.* Source = Brouns, Bosman & Van Lamoen (2004). Own calculations.

We also examined typical feminine traits. In Table 18 we find, in the first place, PhD students' preference for a good work atmosphere. Differences between the categories were not significant ( $\chi^2(2, N = 79) = 2.136, p = .344$ ). Second, no differences between the research areas were found concerning the preference for cooperation with colleagues ( $\chi^2(2, N = 79) = 1.875, p = .392$ ). Third, in Table 18 we see the extent to which PhD students prefer having time for activities besides their work. We did not find significant differences between the research areas for this item ( $\chi^2(2, N = 79) = .247, p = .884$ ). Lastly, no significant differences between the categories were found in the preference of the private life and career ( $\chi^2(2, N = 77) = 1.944, p = .378$ ).

Table 18

*Preference for a good work atmosphere, cooperation with colleagues, time for activities besides work & private life vs. career (on a scale from 0 = absolutely disagree to 10 = absolutely agree) – Female PhD students (1999)*

	Research area	N	M	SD
<b>I think a good atmosphere at work is important</b>				
	Alpha	20	5.65	3.13
	Beta	19	5.89	2.38
	Gamma	40	6.75	2.76
	<i>Total</i>	79	6.27	2.79
<b>I think a good cooperation with colleagues is important</b>				
	Alpha	20	8.60	1.19
	Beta	19	9.05	.91
	Gamma	40	8.85	1.63
	<i>Total</i>	79	8.84	1.37

Table 18 (continued)

	Research area	N	M	SD
<b>I prefer having enough time for activities besides work</b>				
	Alpha	20	7.10	2.27
	Beta	19	7.37	1.57
	Gamma	40	7.40	1.97
	<i>Total</i>	79	7.32	1.95
<b>I think my private life is equally important as my career</b>				
	Alpha	20	6.45	2.87
	Beta	18	6.72	2.40
	Gamma	39	7.23	2.76
	<i>Total</i>	77	6.91	2.70

Note. Source = Need, Visser & Fischer (2001). Own calculations.

In Table 19 the importance of women who already obtained their PhD of social contacts, working in a team and having a flexible job can be found. In the first place we found no significant differences between the categories when it comes to the importance of social contacts ( $\chi^2(2, N = 30) = .607, p = .738$ ). In the second place, the importance of working in a team was equal among the research areas ( $\chi^2(2, N = 30) = 3.153, p = .207$ ). Lastly, the importance of having a flexible job was measured with 2 items. Again, no significant differences were found between the research areas ( $\chi^2(2, N = 29) = .148, p = .929$ ). When looking at the item level we find the same results: possibility of working flexible work hours ( $\chi^2(2, N = 29) = .124, p = .940$ ) and possibility of working from home ( $\chi^2(2, N = 29) = .313, p = .855$ ).

Table 19

Importance of social contacts at work, working in a team & a flexible job, in accepting first job (on a scale from 1 = not important to 4 = very important) – Women who obtained their PhD (2002)

	Research area	N	M	SD
<b>Social contacts at work</b>				
	Alpha	8	2.63	.52
	Beta	10	2.50	.71
	Gamma	12	2.42	.79
	<i>Total</i>	30	2.50	.68
<b>Working in a team</b>				
	Alpha	8	2.13	.64
	Beta	10	2.10	.74
	Gamma	12	2.67	.78
	<i>Total</i>	30	2.33	.76
<b>Flexible job</b>				
	Alpha	8	2.19	1.22
	Beta	10	2.17	.90
	Gamma	12	2.00	.93
	<i>Total</i>	29	2.10	.98

Note. Source = Brouns, Bosman & Van Lamoen (2004). Own calculations.

To conclude, we did not find evidence for Hypothesis 3a. The only significant difference we found between the research areas was that PhD students from the Alpha and Gamma areas find autonomy significantly more important than PhD students from the Beta area. Yet, we did not find significant differences between the Alpha and Gamma area. Moreover, we did not detect any differences regarding autonomy for women who have already obtained their PhD. Therefore Hypothesis 3a was rejected. With regard to Hypothesis 3b we did not find any evidence based on our collected data. We can therefore say that women from difference research areas are equally feminine.

#### 4.4. Ambition

Ambition was thought to have an influence on the share of female full professors for two reasons. In the first place we expected that *H4a The more ambitious female academics in a research area are, the higher the share of female full professors in that research area.* The items related to ambition were the willingness of female PhD students in 1999 to become full professor and the willingness of women who already obtained their PhD to stay at the university and to continue research after obtaining their PhD, as measured in 2002. Also, we examined female PhD students' willingness to gain more human capital by going abroad for their career, writing research proposals for second and third-stream funding, putting effort in getting an academic job, and applying only for academic jobs for the time being. Lastly, ambition was measured by examining the willingness of women who obtained their PhD, as measured in 2002, to move for their career and to go abroad for their career.

Ambition is negatively influenced by neuroticism. Therefore, in the second place, we expected that *H4b The less neurotic female academics in a research area are, the higher the share of female full professors in that research area.* Neuroticism was measured twofold. First, we looked at the expectancy of female PhD students in 1999 to become full professor. Second, we examined the expectancy of female PhD students toward the chance of being appointed a postdoc, assistant professor, associate professor and full professor.

First, in Table 20 we find the willingness of PhD students to become full professor. No significant differences between the research areas were found ( $\chi^2(2, N = 78) = 1.236, p = .539$ ). So, the percentage of PhD students that would like to become full professor does not differ by research area.

Table 20  
Willingness to become full professor – Female PhD students (1999)

Research area	Would like to become full professor		Would not like to become full professor	
	Amount of women	% within research area	Amount of women	% within research area
Alpha	7	35.0%	13	65.0%
Beta	4	22.2%	14	77.8%
Gamma	9	22.5%	31	77.5%
<i>Total</i>	20	25.6%	58	74.4%

Note. Source = Need, Visser & Fischer (2001). Own calculations.

Second, we examined the degree of ambition of women who already obtained their PhD. In Table 21 the willingness to continue the career at a university after obtaining one's PhD can be found. Fisher's exact test showed that the differences between the research areas were significant ( $p = .04$ ). From Table 21 we can deduce that women from the Alpha area are more willing to stay at the university than women from the other areas. Moreover, women from the Beta area show the least willingness.

Table 21  
Willingness to stay at university after obtaining one's PhD – Women who obtained their PhD (2002)

Research area	University		Outside university		Combination university and other employer	
	Amount of women	% within research area	Amount of women	% within research area	Amount of women	% within research area
Alpha	11	100.0%	0	0.0%	0	0.0%
Beta	6	46.2%	5	38.5%	2	15.4%
Gamma	8	53.3%	4	26.7%	3	20.0%
<i>Total</i>	25	64.1%	9	23.1%	5	12.8%

Note. Source = Brouns, Bosman & Van Lamoen (2004). Own calculations.

Third, Table 22 displays the willingness of women to continue their career in research after obtaining their PhD. No significant differences between the categories were found with Fisher's exact test ( $p = .462$ ). At the time of doing the doctoral research, all women were all equally ambitious when it comes to doing research.

Table 22  
Willingness to continue research after obtaining PhD – Women who obtained their PhD (2002)

Research area	Research		No research	
	Amount of women	% within research area	Amount of women	% within research area
Alpha	11	91.7%	1	8.3
Beta	10	71.4%	4	28.6%
Gamma	12	75.0%	4	25.0%
<i>Total</i>	33	78.6%	9	21.4%

Note. Source = Brouns, Bosman & Van Lamoen (2004). Own calculations.

Fourth, we examined the willingness of female PhD students to gain more human capital. In the upper part of Table 23 we find the willingness of PhD students to go abroad for their career. We can conclude that PhD students from the Alpha show the highest intention. The differences between the research areas were found to be marginally significant ( $\chi^2(3, N = 79) = 5.366, p = .068$ ). Mann Whitney U tests indicated that the difference between the Alpha and Gamma area was marginally significant ( $U = 260.5, p = .027$ ). No significant differences were found between Beta and Gamma ( $U = 290.5, p = .141$ ) or Alpha and Beta ( $U = 181, p = .813$ ). In the second place, Table 23 displays the intention to write research proposals. We did not find significant differences between the research areas ( $\chi^2(3, N = 78) = 3.885, p = .143$ ). In the third place, Table 23 shows the extent to which women are willing to put effort in their career. PhD students from the Alpha area are more willing to put effort in their career than students from the other areas. Analysis

shows that the research areas differ significantly from each other ( $F(2, 72) = 6.306, p = .043$ ). Mann-Whitney U tests indicated that the difference between the Alpha area and the other areas, Beta ( $U = 104, p = .045$ ) and Gamma ( $U = 245.5, p = .020$ ), were marginally significant. Moreover, no differences were found between the Beta and Gamma area ( $U = 317, p = .795$ ). It can be concluded that women from the Alpha area are more willing to put a lot of effort in their career. Lastly, with regard to the application for academic positions only, no significant differences between the research areas were found ( $\chi^2(3, N = 78) = 2.806, p = .246$ ).

Table 23

*Willingness to go abroad for career, to write research proposals for second and third-stream funding, to put effort in getting an academic job & to only apply for academic jobs (on a scale from 0 = this is not applicable to my situation at all to 10 = this is completely applicable to my situation) – Female PhD students (1999)*

	Research area	N	Mean	SD
<b>I am willing to go abroad for my career</b>				
	Alpha	20	7.20	3.12
	Beta	19	6.47	3.85
	Gamma	40	5.08	3.57
	<i>Total</i>	79	5.95	3.61
<b>I have the intention to write research proposals</b>				
	Alpha	20	6.05	2.95
	Beta	19	4.84	3.29
	Gamma	39	4.13	3.77
	<i>Total</i>	78	4.79	3.51
<b>I am willing to put a lot of effort in getting an academic job</b>				
	Alpha	20	7.80	1.88
	Beta	17	5.71	3.26
	Gamma	39	5.97	2.92
	<i>Total</i>	76	6.39	2.87
<b>For the time being I will only apply for academic jobs</b>				
	Alpha	20	5.90	3.29
	Beta	19	5.68	3.67
	Gamma	39	4.46	3.54
	<i>Total</i>	78	5.13	3.53

*Note.* Source = Need, Visser & Fischer (2001). Own calculations.

We also obtained data on the willingness of women have obtained their PhD to gain more human capital. Table 24 shows in the first place the willingness of women who have obtained a PhD to move for their career. No significant differences were found between the research areas with Fisher's exact test ( $p = .759$ ). In Table 24 we find in the second place the willingness of women who got their PhD to go abroad for

their career. Again, no significant differences were found between the research areas with Fisher's exact test ( $p = .841$ ).

Table 24

*Willingness to move for career & to go abroad for career – Women who obtained their PhD (2002)*

<b>Willingness to move for career</b>		<b>Willing to move</b>		<b>Not willing to move</b>	
Research area	Amount of women	% within research area	Amount of women	% within research area	
Alpha	8	66.7%	4	33.3%	
Beta	11	78.6%	3	21.4%	
Gamma	11	68.8%	5	31.3%	
<i>Total</i>	30	71.4%	12	28.6%	

<b>Willingness to go abroad for career</b>		<b>Willing to go abroad</b>		<b>Not willing to go abroad</b>	
Research area	Amount of women	% within research area	Amount of women	% within research area	
Alpha	9	75.0%	3	25.0%	
Beta	8	61.5%	5	38.5%	
Gamma	11	68.8%	5	31.3%	
<i>Total</i>	28	68.3%	13	31.7%	

*Note.* Source = Brouns, Bosman & Van Lamoen (2004). Own calculations.

Lastly, in Table 25 we find the willingness of women who got their PhD to submit research proposals. Fisher's exact test showed no significant differences between the three research areas ( $p = .170$ ).

Table 25

*Willingness to submit research proposals – Women who obtained their PhD (2002)*

<b>Research area</b>	<b>Has submitted a research proposal(s)</b>		<b>Has not submitted research proposals, but has considered this</b>		<b>Has never considered submitting a research proposal</b>	
	Amount of women	% within research area	Amount of women	% within research area	Amount of women	% within research area
Alpha	8	66.7%	1	8.3%	3	25.0%
Beta	3	21.4%	3	21.4%	8	57.1%
Gamma	7	43.8%	1	6.3%	8	50.0%
<i>Total</i>	18	42.9%	5	11.9%	19	45.2%

*Note.* Source = Brouns, Bosman & Van Lamoen (2004). Own calculations.

As explained, we also looked at neuroticism as part of ambition. First, in Table 26 we find the expectancy of female PhD students to become full professor. Fisher's exact test showed no significant differences between the research areas ( $p = .725$ ).

Table 26

*Expectancy to become full professor – Female PhD students (1999)*

Research area	Expect to become full professor		Do not expect to become full professor	
	Amount of women	% within research area	Amount of women	% within research area
Alpha	1	5.9%	16	94.1%
Beta	0	0.0%	17	100.0%
Gamma	1	2.6%	37	97.4%
<i>Total</i>	2	2.8%	70	97.2%

*Note.* Source = Need, Visser & Fischer (2001). Own calculations.

Second, neuroticism was examined by looking at the perception of female PhD students on the chance of becoming a postdoc, assistant professor, associate professor and full professor. Table 27 shows in the first place that the perception on the chance of becoming a postdoc is highest for the PhD students from the Beta area. Contrary to our expectations, this difference was significantly high as differences between the categories were found ( $\chi^2(3, N = 74) = 9.206, p = .010$ ). Results of Mann-Whitney U tests showed that the Beta area significantly differed from the Alpha ( $U = 86, p = .010$ ) and Gamma area ( $U = 163.5, p < .001$ ). The Alpha and Gamma area showed no significant differences ( $U = 367, p = .960$ ). In the second place, when looking at the perception on the chance of becoming an assistant professor, we found no significant differences between the research areas ( $\chi^2(3, N = 74) = .932, p = .628$ ). In the third place, Table 27 displays the expectancy of female PhD students on the chance to be appointed associate professor. We found no significant differences between the research areas ( $\chi^2(3, N = 73) = 1.116, p = .572$ ). Lastly, with regard to the perception on the chance to be appointed full professor, we again found no significant differences between the research areas ( $\chi^2(3, N = 72) = 0.094, p = .954$ ).

Table 27

*Expectancy chance being appointed a postdoc, assistant professor, associate professor & full professor (on a scale from 0 to 100 per cent) – Female PhD students (1999)*

Research area	N	M	SD
<b>Postdoc</b>			
Alpha	20	45.35	27.95
Beta	17	71.18	30.60
Gamma	37	45.81	29.94
<i>Total</i>	74	51.51	31.11
<b>Assistant professor</b>			
Alpha	19	29.21	21.02
Beta	18	27.78	28.96
Gamma	37	34.92	30.29
<i>Total</i>	74	31.72	27.70

Table 27 (continued)

	Research area	N	M	SD
<b>Associate professor</b>				
	Alpha	18	12.28	13.26
	Beta	18	16.67	22.69
	Gamma	37	20.24	23.82
	<i>Total</i>	73	17.40	21.39
<b>Full professor</b>				
	Alpha	18	6.22	9.09
	Beta	18	8.17	15.27
	Gamma	36	8.75	16.07
	<i>Total</i>	72	7.97	14.28

Note. Source = Need, Visser & Fischer (2001). Own calculations.

To conclude, we found that women from the Alpha area who have already obtained their PhD are most willing to stay at a university whereas women from the Beta area are least willing to stay. Moreover, PhD students from the Alpha area are most willing to go abroad for their career. We also found that these women are more willing to put effort in their career compared to women from the other research areas. Based on this we can say that, as was expected from Hypothesis 4a, the more ambitious female academics in a research area, the higher the share of female full professors in that research area. Yet, our condition is only partly true: in the Alpha area female academics are the most ambitious, but both female academics from the Beta and Gamma area resemble each other when it comes to their lower level of ambition.

We did not find any evidence for Hypothesis 4b. Based on the available data we can say that PhD students from the Alpha, Beta and Gamma area are equally neurotic. In general, their expectations with regard to becoming full professor are rather low. Only PhD students from the Beta area showed a more positive and higher perception toward the chance of becoming a postdoc.

#### 4.5. Composition research area

Our expectation regarding the composition of the research area was that *H5 The higher the share of potential female academics in a research area, the higher the share of female full professors in that research area*. We measured this hypothesis in the first place by examining the composition of each research area between 1999 and 2011. We examined figures on potential future full professors: female associate professors and female assistant professors. In the second place, we further examined the effect of the potential group of associate professors as indicator for the share of female full professors 5 year later by using figures of female full professors between 2004 and 2011, and figures of associate professors between 1999 and 2006. Lastly, we measured the influence of the research areas on the effect the share of associate professors has on the share of female full professors.

We first examined the composition of each research across the past 12 years, as shown in Table 28. As these figures contain the entire population of female full professors, associate professors and assistant professors, we did not perform statistical analyses. When looking at the share of female associate professors of each research area, we find the same pattern as with the share of female full professors:

Alpha shows the highest share of associate professors, Gamma a lower share, and Beta has the lowest share of associate professors. We also find the same results when looking at the figures for assistant professors. Based on these data we can say that in the Alpha area the share of potential women is higher than the share of potential women in the other two areas.

Table 28

*Average share of female full professors, associate professors and assistant professors between 1999 and 2011*

Research area	Full professors	Associate professors	Assistant professors
Alpha	17.27%	27.40%	32.26%
Beta	5.53%	7.52%	17.44%
Gamma	10.97%	17.72%	31.90%
<i>Total</i>	9.54%	13.66%	25.48%

*Note.* Source = VSNU ( 2000 - 2012). Own calculations.

Second, we examined the share of potential women as an indicator of the share of full professors more thoroughly. We did this by comparing the share of female full professors to the share of associate professors five years earlier. We were not able to include the share of female assistant professors, as we would need figures from before 1999, which were not available. An overview of the comparison between full professors and associate professors can be found in Table 29.

Table 29

*Amount and share of female full professors compared to the amount and share of female associate professors 5 years earlier*

	Year	Alpha		Beta		Gamma	
		FTE	Share	FTE	Share	FTE	Share
<b>Full professors</b>	2011	93.13	23.32%	85.45	8.51%	117.53	16.07%
<b>Associate professors</b>	2006	69.45	31.25%	71.30	7.99%	116.62	18.97%
<b>Full professors</b>	2010	83.18	20.20%	79.05	7.87%	110.68	14.96%
<b>Associate professors</b>	2005	66.91	29.94%	65.41	7.41%	110.08	18.06%
<b>Full professors</b>	2009	77.25	19.42%	70.15	7.25%	101.09	13.85%
<b>Associate professors</b>	2004	62.29	27.41%	57.71	6.15%	101.41	16.09%
<b>Full professors</b>	2008	73.23	18.39%	61.95	6.60%	86.64	12.73%
<b>Associate professors</b>	2003	60.27	26.24%	60.18	6.41%	97.74	15.81%
<b>Full professors</b>	2007	67.27	17.74%	58.77	6.41%	80.75	12.54%
<b>Associate professors</b>	2002	57.00	24.26%	66.00	6.77%	93.00	15.35%
<b>Full professors</b>	2006	62.59	17.27%	52.37	5.80%	72.99	11.37%
<b>Associate professors</b>	2001	46.00	19.33%	52.00	5.31%	75.00	13.25%
<b>Full professors</b>	2005	57.51	16.79%	45.75	5.19%	68.70	11.02%
<b>Associate professors</b>	2000	41.00	17.01%	45.00	4.55%	75.00	13.51%

Table 29 (continued)

		Alpha		Beta		Gamma	
	Year	FTE	Share	FTE	Share	FTE	Share
<b>Full professors</b>	2004	57.81	16.27%	45.14	4.93%	71.35	11.22%
<b>Associate professors</b>	1999	37.00	15.1%	38.00	3.85%	48.00	9.28%
<b>Average full professors</b>	2004-2011	71.50	18.68%	62.33	6.57%	88.72	12.97%
<b>Average associate professors</b>	1999-2006	54.99	23.82%	56.95	6.06%	89.61	15.04%

Note. Source = VSNU (2000 - 2012). Own calculations.

Regression analysis showed that the share of associate professors explained 96.8 per cent of the variance in the share of full professors ( $R^2 = .968$ ,  $F(1, 22) = 327.689$ ,  $p < .010$ ). It was found that the share of associate professors significantly predicted the share of full professors 5 years later ( $\beta = .622$ ,  $p < .010$ ).

Lastly, we examined the effect of the research areas. The first model in Table 30 shows the difference between the three research areas in the share of female full professors, without taking into account the influence of the research areas. We used Beta and Gamma as dummy variables. Both the effects of Beta and Gamma decreased after controlling for the share of associate professors, as is shown in our second model. Moreover, our second model could explain the influence of the share of associate professors on the share of full professors better ( $R^2 = .970$ ) than our first model ( $R^2 = .891$ ). To conclude, the share of associate professors is one of the reasons for the differences between the research areas. So, we found evidence for Hypothesis 5.

Table 30

Regression coefficients from the model predicting share of full professors ( $n = 24$ )

	Model 1		Model 2	
	b	se	b	se
<b>Alpha (constant)</b>	18.675*	.654	9.238*	1.337
<b>Beta</b>	-12.104*	.925	-5.066*	1.082
<b>Gamma</b>	-5.706*	.925	-2.228*	.686
<b>Associate professors</b>			.396*	.054
<b>R<sup>2</sup></b>	.891		.970	

\*  $P < 0.001$

#### 4.6. Supportive work environment

The last factor we examined was the role of the supportive work environment. We expected that *H6 The more supportive the work environment in a research area, the higher the share of female full professors in that research area*. The supportive work environment was in the first place measured by examining the extent to which female PhD students in 1999 feel supported by their supervisors. Second, we examined the extent to which women who obtained their PhD were helped by their promoters in getting their first job after obtaining their PhD, as measured in 2002. Lastly, data that included female full professors were used for the analyses, as measured in 2006. Items that were taken into account were the extent to which female full professors have experienced difficulties in becoming full professor, the extent to which full

professors think people at their university prevent the appointment of female academics, and full professors' opinion on the female friendliness of their department, faculty and university. Furthermore, we examined the extent to which female full professors would like to become mentor for other female academics and to become more active to increase the share of female full professors. The latter items are indicators of the earlier discussed queen bee syndrome.

First, in Table 31 we find the extent to which female PhD students feel supported by their supervisors. This variable was measured by averaging 4 items. We did not find significant differences between the research areas ( $\chi^2(2, N = 79) = .441, p = .802$ ). Also, when looking at the item level we did not find any significant differences between the areas: 'Supervisors stimulate me in continuing my research' ( $\chi^2(2, N = 78) = 1.239, p = .538$ ); 'Supervisors think along about my academic future' ( $\chi^2(2, N = 79) = .470, p = .791$ ); 'Supervisors do their best to keep me working in the scientific field' ( $\chi^2(2, N = 78) = .531, p = .767$ ); 'Supervisors let me know I perform well' ( $\chi^2(2, N = 79) = .247, p = .884$ ).

Table 31

*Feeling supported by supervisors (on a scale from 0 = this is not applicable to my situation or experiences at all, to 10 = this is very applicable to my situation or experiences) – Female PhD students (1999)*

Research area	N	M	SD
Alpha	20	5.75	2.49
Beta	19	5.17	2.87
Gamma	40	5.68	2.82
<i>Total</i>	79	5.57	2.73

*Note.* Source = Need, Visser & Fischer (2001). Own calculations.

Second, in Table 32 we see the way in which promoters played a role in getting the first job after the doctoral research. Fisher's exact test showed significant differences between the research areas concerning the help of the promoter ( $p = .011$ ). When examining the table more closely we find that within the Alpha area most women were helped by their promoter. In addition, within the Beta area most women were nor hindered nor stimulated. In the Gamma area most women said the promoter did not play a role in getting the first job.

Table 32

*Help of promoters in getting first job after obtaining one's PhD – Women who obtained their PhD (2002)*

Research area	Hindering		Nor hindering, nor stimulating		Stimulating		Not applicable	
	Amount of women	% within research area	Amount of women	% within research area	Amount of women	% within research area	Amount of women	% within research area
Alpha	0	0.0%	5	38.5%	7	53.8%	1	7.7%
Beta	0	0.0%	7	50.0%	1	7.1%	6	42.9%
Gamma	2	12.5%	2	12.5%	5	31.3%	7	43.8%
<i>Total</i>	2	4.7%	14	32.6%	13	30.2%	14	32.6%

*Note.* Source = Brouns, Bosman & Van Lamoen (2004). Own calculations.

Third, we examined data on full professors. Table 33 shows the extent to which female full professors have experienced difficulty in becoming a full professor. No significant differences were found between the categories ( $\chi^2(4, N = 97) = 1.392, p = .498$ ).

Table 33

*Difficulty to become full professor (on a scale from 1 = very difficult to 5 = very easy) – Female full professors (2006)*

Research area	N	M	SD
Alpha	31	2.74	.86
Beta	28	2.86	1.01
Gamma	38	3.03	1.00
<i>Total</i>	97	2.89	.96

*Note.* Source = Willemsen & Sanders (2007) and Sanders, Willemsen & Millar (2009). Own calculations.

Fourth, the opinion of full professors toward the extent to which people at their universities prevent the appointment of female academics can be found in Table 34. We did not find significant differences between the research areas ( $\chi^2(4, N = 95) = 2.060, p = .357$ ).

Table 34

*There are people at my university who consciously prevent the appointment of female academics (on a scale from 1 = strongly disagree to 5 = strongly agree) – Female full professors (2006)*

Research area	N	M	SD
Alpha	32	3.06	1.24
Beta	25	2.64	1.29
Gamma	38	2.74	1.01
<i>Total</i>	95	2.82	1.17

*Note.* Source = Willemsen & Sanders (2007) and Sanders, Willemsen & Millar (2009). Own calculations.

Fifth, Table 35 shows female full professors' opinion regarding the female friendliness of their department, as well as their faculty and university. With regard to the female friendliness of the faculty no significant differences were found between the research areas ( $\chi^2(4, N = 97) = 1.597, p = .450$ ). This was also the case for the female friendliness of the department ( $\chi^2(4, N = 96) = .249, p = .883$ ) and the university ( $\chi^2(4, N = 97) = .505, p = .777$ ).

Table 35

*Female friendliness of faculty, department and university (on a scale from 1 = totally disagree to 5 = totally agree) – Female full professors (2006)*

	Research area	N	M	SD
<b>My faculty is female friendly</b>	Alpha	33	3.03	1.24
	Beta	26	3.31	1.09
	Gamma	38	3.11	1.06
	<i>Total</i>	97	3.13	1.12

Table 35 (continued)

	Research area	N	M	SD
<b>My department is female friendly</b>				
	Alpha	33	3.55	1.39
	Beta	25	3.80	1.08
	Gamma	38	3.63	1.26
	<i>Total</i>	96	3.65	1.26
<b>My university is female friendly</b>				
	Alpha	33	2.91	1.13
	Beta	27	3.11	1.01
	Gamma	37	2.97	1.07
	<i>Total</i>	97	2.99	1.07

Note. Source = Willemsen & Sanders (2007) and Sanders, Willemsen & Millar (2009). Own calculations.

Sixth, we examined the queen bee syndrome of female full professors. When looking in the first place at the willingness of female full professors to become mentor for other women, as shown in Table 36, we found no significant differences between the research areas ( $\chi^2(2, N = 99) = 1.937, p = .380$ ).

Table 36

*I would like to become mentor for female associate professors and starting full professors (on a scale from 1 = totally disagree to 5 = totally agree) – Female full professors (2006)*

Research area	N	M	SD
Alpha	33	2.85	1.30
Beta	28	3.14	1.33
Gamma	38	2.71	1.25
<i>Total</i>	99	2.88	1.29

Note. Source = Willemsen & Sanders (2007) and Sanders, Willemsen & Millar (2009). Own calculations.

In the second place, with regard to the queen bee syndrome, we examined the extent to which full professors would like to become more active to increase the share of female full professors, as shown in Table 37. We did not find significant differences between the research areas ( $\chi^2(4, N = 99) = 1.744, p = .418$ ).

Table 37

*I would like to become more active, locally or in a network, to increase the share of female full professors – Female full professors (2006)*

Research area	N	M	SD
Alpha	33	2.55	1.12
Beta	28	2.89	1.23
Gamma	38	2.61	1.03
<i>Total</i>	99	2.67	1.12

Note. Source = Willemsen & Sanders (2007) and Sanders, Willemsen & Millar (2009). Own calculations.

To sum up, with regard to Hypothesis 6, we hardly found any evidence. We can only say that Alpha women who have obtained their PhD were more helped by their promoters in getting their first job after

obtaining their PhD, than women from the other areas. As the sample sizes for this item were relatively small and we did not find any results concerning the other items, we conclude that there are no differences between research areas with regard to the support of the work environment. Therefore, Hypothesis 6 was rejected.

## 5. CONCLUSION & DISCUSSION

In the current research we examined the reasons for the differences between Dutch research areas in the share of female full professors. We first looked at factors that contribute to the success or failure of (academic) women reaching top positions in general. In our research we examined whether these factors can also explain the differences between Dutch research areas in the share of female full professors. We expected that differences between research areas in the share of female full professors could to a certain extent be explained by individual differences between female academics. We hypothesised that the more human capital, social capital, masculine personality traits and ambition female academics in a research areas have, the higher the share of female full professors in that area. Also, we expected that research areas themselves might differ. We hypothesised that the higher the share of female academics in a research area and the more supportive the work environment in a research area, the higher the share of female full professors in that area.

Our findings indicate that both individual and organisational factors have an influence on the differences between research areas in the share of female full professors. With regard to individual factors, in the first place we found that female academics from the Alpha area are more ambitious than women from the other research areas. This is contrary to the results of research that focused on the ambition of female academics in general. Both Need et al. (2010) and Ellemers et al. (2004) found no differences in ambition between male and female PhD students. Unexpectedly, we found that female academics from the Beta and Gamma partly resemble each other in their lower level of ambition. We conclude that ambition explains the differences between the Alpha area and the other research areas in the share of female full professors, but not the difference between the Beta and Gamma area. In the second place, although not hypothesised, as for human capital we found that female academics from the Beta area work most hours, whereas female academics from the Alpha area work least hours. We did not find evidence for differences between research areas with regard to the other individual factors: social capital and masculinity.

When looking at organisational factors we found evidence for the composition of the research area as an explaining factor for the differences between research areas in the share of female full professors. There is a greater lack of potential Gamma and Beta women compared to Alpha women. This is contrary to Van den Brink's (2011) conclusion that the lack of potential women is a myth. We did not detect any significant differences between the research areas in the support they give to women.

Let us return to our research question:

*To what extent can differences between Dutch research areas in the share of female full professors be explained by individual and organisational factors?*

We can say that ambition, an individual factor that is related to preferences, can partly account for the differences between research areas in the share of female full professors. This is also the case for the composition of the research area, an organisational factor that is related to restrictions. Hence, in research areas with a relative high amount of female full professors, female academics have more ambition to become full professor and research areas are better able to appoint women full professor. Now, to what extent can ambition and the composition of the research areas explain the differences between Dutch research areas in the share of female full professors? Moreover, to what extent can work hours, a human capital factor related to restrictions, explain the differences between research areas in the share of female full professors? We will first discuss the composition of the research area.

In her research, Van den Brink (2010) examined the issue of the lack of potential women in Dutch research areas from the organisational side. Figure 2 shows the share of appointed female professors between 1999 and 2005, the share of female associate professors between 1999 and 2005, and the share of female PhD students between 1986 and 1992 for each research area. The group of PhD students is considered the group of potential women. The most salient aspect of Figure 2 is that the gap between the share of female potential and the share of women appointed is the smallest for the natural sciences, followed by the social sciences (leaving aside the medical sciences). In our research, we found the same results, as is visible in the lower part of Table 29. If we look at the average share of female full professors between 2004 and 2011, as explained by the average share of associate professors between 1999 and 2006, we find the largest gap between the associate and full professors from the Alpha area (-5.14%). The differences for the Beta and Gamma areas are +0.52% and -2.07%, respectively. We would expect that all gaps would be more or less equal. We could therefore say that although the share of potential women is lower in the Beta and Gamma areas, this is not that much of influence in the appointment of female full professors in these areas as we might expect. Moreover, in the Beta area we even found a positive difference between female associate professors and full professors. A possible explanation for this could be that assistant professors in the Beta area have accelerated in their career and skipped the position of associate professor. Also, Van Den Brink (2010) argues that the Beta area employs more full professors from outside the Netherlands. This could be a reason why the potential group of women is smaller than the actual share of female full professors in the Beta area.

With regard to ambition we would argue that this is the primary explaining factor for the differences between research areas in the share of female full professors. More specifically, ambition explains the difference between the Alpha area and the other research areas. A lack of ambition is really an issue. After all, ambition is needed for a successful career (Judge, Cable, Boudreau & Bretz, 1995). When looking at our analyses, we for example saw that Alpha women are more willing to go abroad than women from the other research areas. We know that going abroad can be considered the norm. Without this experience, women are not able to grow their international network. Moreover, not wanting to go abroad can be a reason for women to quit a scientific career (Stobbe, Van den Brink & Van Duijnhoven, 2004).

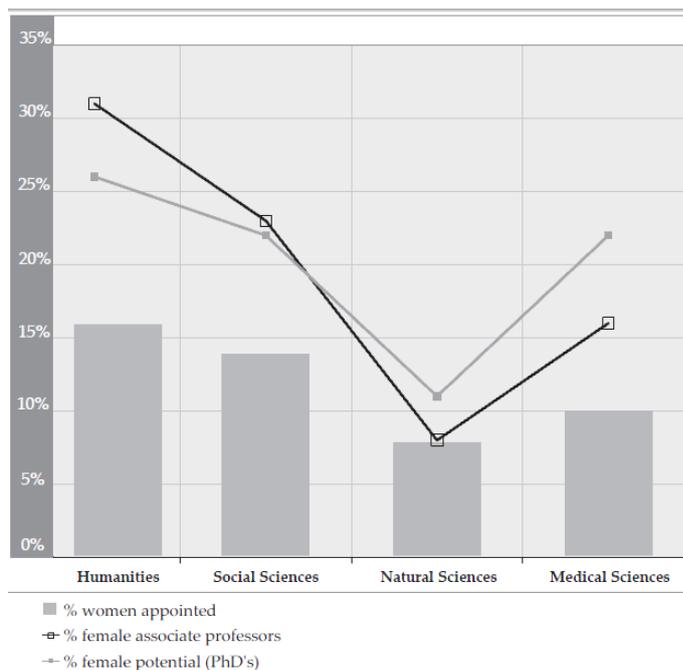


Figure 2. Difference between % appointed female professors (1999-2005) and % female associate professors (1999-2005) and % female PhD's (1986-1992).

Note. Reprinted from *Behind the scenes of science: Gender practices in the recruitment and selection of professors in the Netherlands* (p. 57) by M. Van den Brink, 2010. Amsterdam: Pallas Publications.

The lower level of ambition of Beta and Gamma women leads us to an additional question: why are Beta and Gamma women less ambitious than Alpha women? On the one hand, this could just be a fact, these women are simply less ambitious. Yet, it is more likely that their work environment also plays a role in this. First, we already proposed in Figure 1 that research areas have an influence on the beliefs and actions of female academics that work in these areas (Coleman, 1988). Second, social cognitive career theory suggests that the context by which individuals are surrounded has an influence on career interests, goals and career-related actions of individuals (Lent et al., 2000). The work environment of female academics can function as a supporter or barrier toward female academics' ambition. The explanation for the work environment as a barrier of women's ambition is threefold.

In the first place, in our opinion, the high amount of work hours of female academics in the Beta and Gamma area can have an influence on the ambition of women in that area. Beta and Gamma female academics are surrounded by women who work relatively many hours; working fulltime can be considered the norm. This is confirmed by Van den Brink (2010): in the Beta area human capital is most important, as Beta women can otherwise not compete with their competitive male counterparts. We think this might also be the case for Gamma women, as these women are also more often surrounded by men, compared to Alpha women. We think the level of ambition of Beta and Gamma women might decrease as soon as these women can no longer combine having children and working according to the required norm. If you cannot meet the standard of working full time, then why even consider being ambitious?

In the second place, according to Kanter (1977), in male-dominated environments, women often attract more attention than men, because they form the minority. Female academics who show ambition are even more visible. This is because in male-dominated environments, such as the Beta area and, to a lesser degree, the Gamma area, the adherence to stereotypes is more prevalent than in other

environments. In these environments, women are often seen as tokens: 'symbols of how-women-can-do, stand-ins for all women' (Kanter, 1997, p. 382). Tokens are more easily stereotyped and differences between the majority group and the minority group are often exaggerated. As a result, it might be the case that women from the Beta and Gamma area are less ambitious, because they do not want to be perceived as tokens. Also, women, the minority, are often expected not to outperform their male colleagues, the majority. Women who do so are often seen as aggressive, while men who show the same behaviour are valued for this (Kanter, 1977). This is because according to prevailing norms, women should be unselfish and friendly, whereas men should be independent and assertive (Fiske, 1998).

In the third place, a lower level of ambition might be caused by the fact that there are less role models, women who did reach the top, in the Beta and Gamma areas. A shortage of women in top positions can contribute to a lack of ambition for women in lower positions (European Commission, Directorate-General for Employment, Social Affairs and Equal Opportunities, 2010). Having role models is important, so that possibly ambitious women can identify with other ambitious women (Stobbe et al., 2004). Role models can provide motivation and inspiration (Gibson, 2004). Also, results of an Australian research that included universities with over 30 per cent women in top positions, show that having a critical mass of other women in senior positions is crucial. Women who are appointed a senior position bring other women in; a snowball-effect (Chesterman & Ross-Smith, 2006) in which 'women attract other women' (Stobbe et al., 2004, p. 20).

To conclude, their work environment might hinder Beta and Gamma women to develop their ambition. The preferences of these women are partly influenced by the restrictions they face at work. Due to their environment, Beta and Gamma women are (unconsciously) less ambitious than women from the Alpha area.

## **5.1. Suggestions for future research**

With this research we have tried to enlarge our understanding of the role of individual and organisational factors in explaining the differences between Dutch research areas in the share of female full professors. Despite careful construction of the current research, there are certain limitations to our study. We will discuss these limitations as point of departure for future research.

First of all, in gathering datasets we were confronted with non-response. Other researchers who were approached to share their data sets could not do so for different reasons: researchers did not have time to sort out specific data, they did not possess the original data, or the universities where data were collected did not allow them to share the data due to issues of privacy. Consequently, we could only analyse a limited amount of datasets. We think it is important that if we want to increase the share of female academics in general and, more specific, reduce the gap between the research areas, both researchers and universities have to share the information that is already there. We argue that sharing data should be the norm. Only in this way we can discover what is really going on in the academic world. Moreover, we encourage other researchers to also analyse secondary data; the availability of data saves costs and time (Gorard, 2002), and can lead to new insights.

Second, in the current research we have assumed that between the different academic levels there would be no differences between women with regard to individual factors. For example, when examining

the differences in ambition of PhD students from different areas, we expect to find more or less the same differences between research areas if we would have asked assistant professors instead. So, we have generalised our findings among the different levels of female academics. Yet, it might be possible that female academics in the earlier stage of their career have different opinions than women who have a higher position. It could be the case that women in their thirties have a different level of ambition than women in their forties due to differences in the family life. Ideally, we would have preferred to examine data that would consider women from all academic career levels and all independent variables, but such rich datasets are not available at this moment. Therefore, we recommend to collect and share more extensive data, especially data that include female associate professors and assistant professors.

Third, in our analysis we made a distinction between Alpha, Beta and Gamma areas. The Gamma area consists of two different subfields: Behaviour & Society and Economics. Between these two subfields there are large differences in the share of female full professors. One could say that Behaviour & Society is more related to Alpha, with 21.39% female academics in 2011 (VSNU, 2012). On the other hand, Economics shows a much lower share of female full professors, namely 8.49% (VSNU, 2012), which resembles the Beta area. Due to small sample sizes we were not able to separate Gamma into two different subfields. Future research can focus on this. Also, even though we only compared among the three different research areas, in some case the sample sizes remained rather small. It is therefore difficult to conclude whether the factors that were found to be insignificant, are indeed the same for all research areas.

We would argue that the current research is a starting point for future research concerning the differences between research areas in the share of female full professors. Only one other research so far has examined these differences, albeit only from the organisational side (Van den Brink, 2010). We found that Alpha women are at some points more ambitious than other female academics. The composition of the research area also plays a role in explaining the differences between research areas, albeit smaller than ambition does. We will need more research on the differences between the Beta and Gamma area. Based on our data we can only conclude that the Alpha area stands out when it comes to ambition, this explains why in the Alpha area the share of female full professors is the highest compared to the other research areas.

Furthermore, we need more information on the influence of the work environment on the level of ambition of female academics. We found that female academics from the Alpha area work part-time more often, whereas female academics from the Beta and Gamma area work full-time more often. There could be a relation between this norm of working fulltime and a lower level of ambition, but this relation should be examined empirically. Also, our argument that female academics from the Beta and Gamma area might be less ambitious because they do not want to be perceived as tokens needs further study.

Lastly, more research is needed on the role of social capital as a restricting factor for female academics. We were not able to include data on access to networks. We have tried to gather data on the membership of female networks that belong to universities, but most of the universities could not provide us with detailed information about the members of these networks. It is important to gain more insight into network membership. This is because as ambitious as a female academic can be, as long as she cannot make her ambition clear to, for example, (male) scouts, there will remain a gap between potential women and the share of female full professors. More research is needed into the role of social capital: to which

formal and, even more important, informal networks do women belong? We do know that women are often part of female networks, while men are part of male networks (Van Balen & Van Vianen, 2002). One might expect that Beta and Gamma women would more often be part of male networks than Alpha women, as Beta and Gamma women are more surrounded by men, and thus have more opportunities to engage in contacts with their male counterparts. On the other hand, having networks around you, does not imply being able to enter these networks. For Beta and Gamma women it might be hard to enter networks that are mainly composed of men as men often adhere to stereotypes when they are in a male-dominated environment (Schein, 1985), and women that are part of a male-dominated networks might act as queen bees (Ellemers et al., 2004; Staines, Tavris, & Jayaratne, 1974). We would encourage other researchers to further examine the issue of social capital as an explaining individual factor for the differences between research areas in the share of female full professors.

## **5.2. Implications**

In our research we found evidence for differences between research areas concerning the preferences of women. At some points Alpha women tend to be more ambitious than women from the other areas and this explains to some extent the differences between research areas in the share of female full professors. Then, how to stimulate female academics to become more ambitious? In order to answer this question we have to look into the reason why Beta and Gamma women tend to be less ambitious than Alpha women. We proposed that there is a relation between the restrictions women experience from their work environment and their level of ambition. We therefore recommend research areas with a relatively low share of female full professors to create a work environment that supports female academics. Perhaps the biggest challenge women face these days is the combination of having children and realising a career. In the Netherlands, women are the ones that take care of children most often and therefore work part-time more often than men do (CBS, 2013), which is also expected from women by society (Cloïn & Bierings, 2012). The norm of working full-time restricts female academics from being ambitious. We suggest this issue can be solved by universities in two ways.

First, we recommend universities to change the norm of working full-time in the Beta and Gamma area. If female academics are given the opportunity to work part-time and still attain a high position, this can enhance their level of ambition. Universities can for example offer female academics the possibility to work on research projects in teams instead of individually. In this way, female academics will be able to combine their career with their family life, as research projects are not completely dependent on one individual working full-time.

Second, if changing the norm is difficult to realise, universities should provide female academics with work conditions so women can meet the requirement of working full-time. Suitable terms of employment are offering child care and the possibility of working flexible hours and working from home (Pouwels & Henderikse, 2013). In this way, female academics can work full-time and still take care of their family. This gives women the opportunity to realise their ambition.

Although the Beta and Gamma area have a lower share of potential women, we think this issue may solve itself, as more and more women choose Gamma and Beta oriented studies. Between 2007 and 2012, the

number of female Beta students increased by 43.99 per cent, whereas the number of male students only grew by 18.19 per cent. For Gamma studies the amount of female students increased by 14.38 per cent, still higher than the increase of male students by 13.39 per cent (VSNU, 2013). Moreover, Dutch girls are more and more stimulated by the government to not stick to stereotypical images of study and career too much, but to follow their ambitions instead (Rijksoverheid, n.d.). We expect that in a few years the share of potential female Beta and Gamma academics has grown, and with the help of policy measures aimed at creating a more suitable work environment that enhances female academics' ambition, the share of female full professors in the Beta and Gamma area will increase.

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## APPENDIX

Table 38

*Assignment of faculties to research areas dataset Need et al. (2001)*

Research area	Faculty (Dutch)	Faculty (English)
Alpha	Geesteswetenschappen	Humanities
Beta	Biologie	Biology
	Scheikunde	Chemistry
	WINS: Wiskunde, informatica & natuurkunde	Mathematics, informatics & physics
Gamma	Maatschappij- & gedragwetenschappen	Social & behavioural sciences
	Economische wetenschappen & econometrie	Economics & econometrics

Table 39

*Assignment of faculties to research areas datasets VSNU (2000-2012)*

Research area	Domain (Dutch)	Domain (English)
Alpha	Taal & cultuur	Language & culture
Beta	Landbouw	Agriculture
	Natuur	Nature
	Techniek	Technology
Gamma	Economie	Economics
	Gedrag & maatschappij	Behaviour & society

