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Women in Management in STEM: Which Factors Influence the Achievement of Leadership Positions?

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ABSTRACT

Efforts to inspire women to enter a STEM-related profession continue to increase. However, even though many women are now working in these male-dominated professions, they are not always successful in progressing into leadership positions. This is especially the case in higher management positions, where women are confronted with gender-specific barriers. We discuss here some of the factors that can increase the probability of women's career progression in their profession.

This study examines the individual factors that favour the career development of women in STEM, even though individual factors are socially mediated. Our main research question is: which factors influence the achievement of leadership positions for women in STEM? We developed an online survey addressing several professional associations in three STEM fields to answer this question. Logistic regression factors were used to predict these women's achievement of leadership positions.

Significant effects are noted in the women's work motivation, career orientation and area of expertise. Positive influencing factors include high intrinsic work motivation, orientation towards general management and autonomy. Women who work in architecture (which in Germany is considered a STEM field) are more likely to achieve a leadership position than women in computing or engineering. Our findings show that children are not an obstacle to a woman's career path in the STEM professions and that male role models are a beneficial factor to women who seek to reach leadership positions.

KEYWORDS

leadership position, work motivation, career orientation, gender, STEM, architecture

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INTRODUCTION

The under-representation of women in STEM subjects (science, technology, engineering, mathematics) is a global phenomenon. Compared to other European countries, the number of women in STEM in Germany is particularly low (Eurostat, 2012). In Germany, the gender balance between women's and men's occupations remains persistent. Despite equal qualifications, men and women are still unequally represented in the professions (Dressel & Wanger, 2010). For example, engineering or computer science are perceived as male and only a few women opt for these professions (Ihsen, 2010; Bath, Schelhowe, & Wiesner, 2010). Little has changed in this respect in recent years. In 2008, the proportion of female university engineering graduates in mechanical engineering was only 19.4 % and in 2018 it was 20.6 %. In computer science the proportion of female graduates increased from 15.1 % to 19.8 % during this period (Kompetenzzentrum Technik-Diversity-Chancengleichheit, 2019). Finally, in 2017, only 18.1 % of engineers and 16.3 % of IT specialists on the German labour market were women (Institut für Arbeitsmarktforschung, 2018).

In Germany, STEM also includes the field of architecture which is considered an engineering discipline, and there are comparatively more women in this field than in other engineering disciplines such as mechanical, industrial, civil engineering or computer science. In 2017, 28.3 % of employed architects in Germany were female (Institut für Arbeitsmarktforschung, 2018). There is more or less no research about the situation of female architects so far (Caven, 2004; Caven & Diop, 2012). For this reason, we have explicitly included architects in the sample.

Once they have completed their studies, the number of women in STEM subjects decreases over the course of their careers. Women are less likely to study a STEM-related subject, they are less likely to finish their studies with a degree, and they work less frequently in a STEM-related profession. The ‘leaky pipeline’ phenomenon shows that women in STEM from school onwards often leave the profession due to a large number of obstacles (Jacobs, 2005).

The gender inequality gap is particularly evident in higher management positions. With a 22 % share of female leaders, Germany is one of the worst performers in a European comparison (Holst & Friedrich, 2017). Despite political efforts and a gender quota for supervisory boards, far more men are at the top of companies. The number of female managers in STEM is particularly low. For example, in Germany, the proportion of women in management positions in mechanical engineering in 2018 was 9.3 % (Statista, 2019). Even highly-qualified female engineers are confronted with the ‘glass-ceiling’ phenomenon, which finally leads to diminished career opportunities (Barreto, Ryan, & Schmitt, 2009).

Numerous barriers at the structural and individual levels have been identified as leading to under-representation of women in higher management positions. In particular, women in STEM experience a twofold problem in gaining access to higher positions in working life—both as *women* and as *women in STEM.* This is reflected in the organizational structures and it makes women’s career

advancement more difficult. The literature has discussed the effects of inhospitable workplace climates and male-dominated networks (Sagebiel, 2018), lack of promotion for women (Fouad, Singh, Cappaert, Chang, & Wan, 2015), and the difficulties of balancing work and family roles (Weisgram & Diekman, 2016).

There are also individual factors that restrict women's career development in STEM. Normally, the structural factors are at the centre of the discourse. We focus here on individual factors, but it must be emphasized that these individual factors are always mediated socially. Since childhood, women's beliefs have been biased by the assignment of gender roles and traditional work role expectations (Hackett & Betz, 1981). What women regard as motivating or important for their careers is shaped by society. For example, gender stereotyped assumptions can lead to women having less self-confidence in their technical or leadership competence (Sieverding, 2003; Janneck, Vincent, & Othersen, 2012). The male-dominated work culture often conflicts with women's identity (Faulkner, 2007) or 'female' behavior (Ihsen, 2010). As the culture does not fit with women's expectations, they are often less motivated to pursue a career. The poor compatibility of family and career also plays an important role here. Women tend to place more value on family and are therefore willing to put their careers on the backburner (Abele, 2002).

Most studies deal with the obstacles women face in their career advancement. Conversely, there must be factors that favour the career of women in STEM. The literature has identified several factors that increase the probability of women becoming successful in their profession. For example, female engineers who remain in the profession are described as highly motivated by the challenges of the profession (Buse, Bilimoria, & Perelli, 2013; Vanantwerp & Wilson, 2015) and they strongly self-identified as engineers (Ayre, Mills, & Gill, 2013; Cech, Rubineau, Silbey, & Seron, 2011). This attitude strengthens these women's positions in the male-dominated profession. Support of others and role models are also highlighted as beneficial factors (Dulini, Cohen, & Duberley, 2018). Moreover, successful women were less likely to be married and they had fewer children (Buse et al., 2013).

In this paper, we will investigate the influence of women's work motivation, career orientation, children and role models on the achievement of leadership positions. Our main research question is: which factors influence the achievement of leadership positions for women in STEM? As research has shown that the persistence of women in STEM is related to their personal characteristics, we will mainly focus on the individual factors that lead to success. This study focuses on the objective career success of women and we will examine their achievement of leadership positions (Ng, Eby, Sorensen, & Feldman, 2005). Although career success can also be measured by subjective factors (such as individual satisfaction with the job), it is precisely the differences between objective factors (such as income and status) that are decisive for gender inequality.

Here we define leadership as positions with personnel responsibility. This refers to positions such as department heads, employees with senior management tasks, including directors, managing directors and also those who run their own company.

THEORETICAL UNDERPINNING

Work Motivation: Self-Determination Theory

Several studies have examined the expression of extrinsic and intrinsic work motivation among professionals. Abele (2002) has concluded that the career motivation of women, especially their intrinsic motivation, decreases with age. The difficulties anticipated by women in reconciling work and family life are seen as one possible explanation of this problem. The lack of motivation to progress a career can also lead women to take their jobs less seriously, which results in reduced career opportunities. Society's expectations of women's career related behaviors can have an influence on women's real career motivation (Buse et al., 2013). For example, the idea of a prototype leader is more likely to be conveyed with male attributes, while women are more likely to be associated with friendliness and caretaking and thus with a lack of leadership qualities (Ely, Ibarra & Kolb, 2011). Moreover, women are taught early in life that they are more concerned with family responsibilities, than with career development, which can have an impact on their subsequent motivation to reach a leadership position (Pflugradt & Janneck, 2012).

Research that investigates career motivation in the STEM subjects finds that there is almost no difference between men and women (Shinohara & Fujimoto, 2016). This result is corroborated in a qualitative study by Vanantwerp & Wilson (2015), who use Self-Determination Theory (SDT) to examine engineers at the beginning of their careers. Consequently, it is suspected that women who decide to enter a STEM profession are already very highly motivated ('genderfilter', Blickenstaff, 2005).

SDT has previously been used to analyze many aspects of work motivation (Ryan & Deci, 2000). The special aspect of SDT is that motivation is not seen in isolation as an individual characteristic, but in correlation to environmental perception. In particular, SDT differentiates two kinds of motivation: intrinsic motivation and extrinsic motivation. The main assumption of SDT is that there is a relationship between the perceived working environment and the individual's motivation. If the organizational structure is perceived as non-self-determined, then the motivation can be either an amotivation or an extrinsic motivation. Amotivation is defined as any behavior that is not valued or any compulsory task that is performed by actors who feel absolutely incompetent. The different forms of extrinsic motivation are determined by the different phases of socialization and internalization. External regulation corresponds to a still high degree of non-self-determination and actions are carried out only on the basis of reward or punishment, as is usual in work organization. The employee only performs the action for which she is paid or for which there is a selective incentive. All other options for action are not executed.

Introjected regulation represents an internalization of these reward and punishment incentives, and the actor rewards or punishes themselves. This represents a first stage of internalization and socialization. Even if no direct control by the boss or other control instances is possible, then the action is still carried out because otherwise self-punishment by a guilty conscience begins. Identifying regulation describes a behavior whose values and goals are an integral part of the self-concept. Here, social norms are internalized and followed. This is a regulation of action, as can be found in many organizations, which is controlled by professions and their professional norms. Integrated regulation is the form of action regulation

that is in line with the self-concept. It is defined as an integration of goals and norms with which the individual completely agrees. According to intrinsic motivation, this is the type of regulation that has the highest self-determination. Intrinsic motivation means acting free of external incentives and constraints, which is only carried out because it brings fun, joy or satisfaction (see Fig. 1). Therefore, our first hypothesis states that:

H1: Women whose work motivation is more self-determined are more likely to achieve a leadership position.

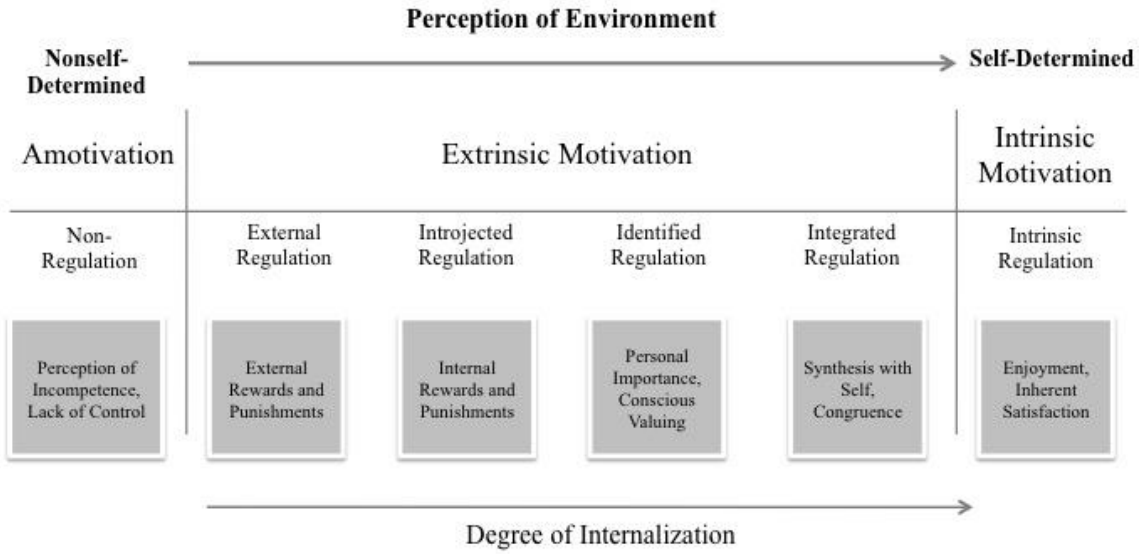

Figure 1: Self-Determination Theory (Ryan & Deci 2000, 72)

Career Orientation: Career Anchors According to Schein

A person's career orientation includes individual career aspirations and the associated motives for pursuing a career, which therefore influence the probability of achieving a leadership position.

Schein (1975) developed a concept for career orientation on the basis of a longitudinal study that focuses on the professional development of an individual. Accordingly, each individual has a career anchor, upon which his or her professional goals and interests depend. By definition, a career anchor is that set of personality constructs that would not be given up if a choice had to be made. At best, a person achieves congruence between their career anchor and the work environment to reach stable career development and positive career outcomes. Schein identifies the following career anchor profiles: general management competence, technical-functional competence, security and stability, autonomy and independence, entrepreneurial and creativity, service and dedication to a cause, pure challenge, and lifestyle. To identify career needs, Schein developed the Career Orientation Inventory, which is a Likert scale assessment with 40 questions (Schein, 1990). In our qualitative preliminary study (there is more information in the section on the research method), we found that the female interviewees particularly mentioned

four anchors in the interviews. Consequently, we decided to only query these four anchors in the quantitative study, as follows:

1. *General management competence*: persons with this career anchor desire to lead and advance quickly in an organization, they place importance on high income and influencing the organization.
2. *Technical-functional competence*: persons with this career anchor want to stay in a specific area of expertise and they want to get better at what they do, they are not interested in being promoted out of their functional responsibilities.
3. *Autonomy and independence*: persons with this career anchor want to work flexibly and autonomously.
4. *Lifestyle*: persons with this career anchor want to combine their career with family and leisure activities, they limit their career to maintain life balance. It is noticeable that this career anchor occurs mainly among women.

Various studies have taken up, widened or criticized the career anchor model. The extent to which career anchors are represented in different occupational groups has been studied, for example: RD&E professionals (Bigliardi & Dormio, 2009), the self-employed (Feldmann & Bolino, 2000), IT professionals (Chang, Jiang, Klein, & Chen, 2012) and engineers (Wils, Wils, & Tremblay, 2010). Ellison and Schreuder (2000) examined the relationship between career anchor and career satisfaction among midcareer employees, and found that the fit between career anchor and employment goes hand in hand with high intrinsic career satisfaction.

It has also been shown that demographic characteristics such as gender, age or nationality can influence career anchors (Kniveton, 2004). For example, Chia, Koh, and Pragasam (2008) state that female and male accounting students differ in their career orientation, and they add that women tend to focus on meaningful and secure jobs. Further studies focus exclusively on women and their career orientations (Erwee, 1990; Riordan & Louw-Potgieter, 2011).

In summary, although some anchors can promote a leadership career in an organization, others can hinder it. In this study, we expect that general management competence and autonomy are career promoting, while technical-functional competence and lifestyle lead to slower or no leadership career at all for women. Therefore, our second hypothesis states that:

H2a: Women whose career orientation prefers general management competence are more likely to achieve a leadership position.

H2b: Women whose career orientation prefers a high degree of autonomy are more likely to achieve a leadership position.

Children

For women, having children can have a significant effect on their professional development, which is also found in the STEM professions (Jean, Thompson, & Payne, 2015). Recent studies have concluded that children are a critical factor in women's career progress and have mostly negative effects on women's careers (Fouarge, Manzoni, Muffels, & Luijkx, 2011; Waldfogel, 2007).
There are, of course, some women who voluntarily put their professional goals on the back burner, reduce working time and focus instead on childcare (Hakim,

2006). Due to the pressure of social norms, women are more likely to give up their careers because of children. In particular, in Germany many working women are still confronted with the 'raven mother ideology'[1] (Wolffram, 2015).

Temporary part-time work and career breaks limit these women's careers for the rest of their lives because they have fewer development skills (Gash, 2009). This is especially pertinent for women in highly competitive career contexts (Cross & Linehan, 2006). Research has shown that these discontinuous career patterns are the main reason for women's lower career success (Abele & Spurk, 2011).

Moreover, normative beliefs about motherhood can lead to the stigmatization of mothers, who are seen as less professionally competent than men and women without children (McIntosh, McQuaid, Munro, & Dabir-Alai, 2012). For women, parenthood seems to be a penalty that has a negative influence on their objective career success (Waldfogel, 2007). In the literature, this is described as the 'motherhood penalty' and 'fatherhood bonus'. Indeed, there is evidence that, in contrast to women, men are rewarded for being fathers (Budig & Hodges, 2010).

For women in a male-dominated culture, such as the STEM professions, motherhood is a key turning point in their professional life. Motherhood tends to be especially incompatible with normative engineering careers (Herman, Lewis, & Humbert, 2013). Ranson (2005) finds that successful women are often suddenly seen as 'no longer one of the boys.' Many women also have to choose between a career in engineering and a husband or children (Banerjee, Schenke, Lam, & Eccles, 2018). Consequently, many women decide not to study an engineering subject or to leave the engineering profession because they consider their family plans to be incompatible with a career in engineering (Weisgram & Diekman, 2016). For example, Cech et al. (2011) find no negative effects of motherhood during studying for an engineering qualification. However, women's family plans may already have filtered them out before studying (Blickenstaff 2005).

In contrast, Herman and Lewis (2012) show that the partner's support and encouragement from management are important factors in a woman's development. In this context, supportive partners can be seen as a beneficial factor for women's careers (Juraqulova, Byington, & Kmec, 2015). We summarize these findings in our third hypothesis:

H3: Women without children are more likely to achieve a leadership position.

Additionally, we control for the employment of the partner because, as mentioned earlier, the partner's support is an important influence factor.

Female Role Models

Gender stereotypes are widespread in the male-dominated STEM occupations. These suggest, for example, that women are less technically competent. Previous research has shown that women have negative attitudes due to these stereotypes and are less likely to choose a STEM-related occupation (Nosek, Banaji, & Greenwald, 2002).

Female role models are seen as important in overcoming the gender stereotypical expectations that exist in the STEM professions (Marx & Roman, 2002). Several studies have confirmed that role models can have an impact on gender disparities

(Stout, Dasgupta, Hunsinger, & McManus, 2011; Young, Rudman, Buettner, & McLean, 2013). Female role models are also able to influence women's expectations and career decisions because they show that they can overcome gender-related challenges (Quimby & DeSantis, 2006). In particular, women who are able to reconcile their career and family are seen as important role models (Dulini et al., 2018).

Stout et al. (2011) show that female engineering students who identified with the biographies of female engineers are more likely to pursue engineering careers. This is also evident in relationship to leadership aspirations (Rios, Stewart, & Winter, 2010). Therefore, strong female role models can alleviate gender stereotypes and improve a woman's self-image (Marx & Roman, 2002).

Whether women can identify with the role model is also relevant. Studies have shown that individuals are more likely to identify with a role model if they share similarities (such as gender), if they personally identify with them, and if success appears achievable (Mariani, Marshall, & Mathews-Schultz, 2015). However, in principle, men can also serve as role models for women. Cheryan, Siy, Vichayapai, Drury, and Kim (2011) state that the role model's gender makes less of a difference as long as it does not represent stereotypes that are incompatible with the female role.

Although personal contact with a role model is important, people without personal contact can also act as role models. For example, Lockwood and Kunda (1997) have shown that superstar role models can be inspiring. More importantly, mothers also serve as role models for their daughters (Ikonen, Leinonen, Asikainen, & Hirvonen, 2017).

However, role models can have negative effects, such as when individuals view future success for themselves as unattainable (Lockwood & Kunda, 1997). Therefore, our final hypothesis states that:

H4: Women with female role models are more likely to achieve a leadership position.

Control Variables

To test our hypotheses, we have to control some further variables that can also have an influence on career probability, as follows:

1. Engineers who hold a PhD more often reach leadership positions than engineers without a PhD (Falk & Küpper, 2013).
2. If a parent has an academic background, then the chance of obtaining a leadership position is much higher (Falk & Küpper, 2013).
3. Working abroad is generally regarded as important for a career (Bonache, 2005), although previous research on the correlation between working abroad and career success are contradictory and unclear (Bolino, 2007).
4. Although the STEM subjects are very similar due to their technical and mathematical orientation, there are also many striking differences between them. While mechanical engineering, for example, is very technical, in architecture artistic aspects are also important (Franck, 2009). Accordingly,

these subjects could address different groups of people. Therefore, we control for the areas of expertise.
5. Organisational research has shown that the size of a company is an important influencing factor—a faster career is possible in a smaller company (Burke, 2000).
6. Finally, we control for age.

EMPIRICAL EVIDENCE

Survey Design and Methods

In our qualitative preliminary study, we conducted 20 semi-structured expert interviews with men and women who hold a leading position in an engineering profession. In the interviews the participants reflected on their career path. The aim of this study was to identify beneficial and impeding factors for the achievement of a leadership position. The results indicate that the women's motivation, career orientation, family life and support of others are relevant for their careers. Based on the results of our interviews, we developed a quantitative online survey. Between September 2018 and January 2019, we asked several professional associations in the STEM field to forward an email with a link for the quantitative online survey to their members. Seven professional associations supported the survey. In total, 389 persons filled out the questionnaire, with 318 women and 71 men. Because of the low numbers of male respondents, we deleted the 71 men from our data and used only the female cases. Therefore, we have only empirical evidence for women and their careers. The reason for the low response rate among men may be related to the fact that the title of the research project expressly mentions women in management positions.

The seven professional associations are listed in Table 1, which includes more detail about their membership structure. The associations sent the questionnaires to selected departments or to selected persons. The response rates vary from a low rate in one case up to 62.3 %. We included the data of the German Academy of Science and Engineering, although the number of participants is very low. As the members are appointed on the basis of their outstanding performance, we consider their participation in the study to be fruitful.

Additionally, we asked the survey respondents which area of expertise they felt they belonged to. The details are given in Table 2.

Our basic assumption during the qualitative interviews in these disciplines was that we suspected possible differences in women's career paths. We have especially investigated the field of architecture (which in Germany is considered a STEM field), because the proportion of women is higher in comparison to the other engineering fields.

Table 1: Basic population and description of the seven professional associations

Professional association	*Description of members*	*Number of female members contacted*	*Number in the sample (response rate for each organization)*
Association of Electrical Engineering, Electronics and Information Technology (VDE Verband der Elektrotechnik, Elektronik und Informationstechnik)	Personal members and companies from electrical engineering or computer science	850 members of the Section Women Engineers	120 (14.1%)
Association for Computer Science (GI Gesellschaft für Informatik)	Computer scientists from science, research and teaching IT specialists from administration, business and industry	300 members of the Section Women and Computer Science	75 (25%)
Association of German Architects (BDA Bund Deutscher Architekten)	Architects City planners	77 selected women members	48 (62.3%)
Association of German Machinery and Plant Manufacturers (VDMA, Verband Deutscher Maschinen- und Anlagenbau)	A commercial association with no personal membership Senior managers from these companies completed the questionnaire	800 selected members	46 (5.8%)
Women in science and technology (NuT Frauen in Naturwissenschaft und Technik)	Association for women working in scientific and technical fields	300	15 (5%)
German Association of Women Engineers (DIB Deutscher Ingenieurinnenbund)	Women who work in mechanical engineering, electrical engineering, civil engineering, or process engineering	400	9 (2.3%)
German Academy of Science and Engineering (Acatech Deutsche Akademie der Technikwissenschaften)	German Academy of Sciences for Technology Members are appointed on the basis of their scientific achievements and reputation	70 women members	5 (7.1%)

Table 2: Area of expertise

Area of expertise	*Percentages*	*N (in total 316 respondents who answered this question)*
Architecture	15.1 %	48
Mechanical, industrial or civil engineering	27.9 %	89
Computer science	22.0 %	70
Others (including natural science)	34.0 %	109

We found in our interviews that the architects achieve high satisfaction from the creative aspects of their work. The creative, artistic aspect is probably female connoted:

> I am very interested in building good houses and if that serves as a testimony to my career, then I have made a career. (Female Architect)

This can also lead to a conflict between creative and management aspects (Cohen, Wilkinson, Arnold, & Finn, 2005). In Germany, architects work in small companies. In contrast, engineers mainly work in large companies, as shown in Table 3. Therefore, we control for size of company and for area of expertise in our regression analysis.

Table 3: Area of expertise and size of companies

Company size	*Architecture*	*Mechanical, industrial or civil engineering*	*Computer science*
1 – 10 employees	66.0 %	3.4 %	5.7 %
11 – 1999 employees	27.7 %	48.3 %	50.0 %
More than 2000 employees	6.3 %	48.3 %	44.3 %

MEASUREMENT

Depending Variable

We have defined leadership as a position with personnel responsibility. So we operationalize the dependent variable so that '1' in the dummy variable covers all positions where personnel management is necessary, such as departmental management or employees with senior management tasks, including directors, managing directors and also equivalent public service senior positions and those who run their own company (N = 192). In all other cases, the variable is '0' (N = 126).

Independent Variables

To measure the SDT and Hypothesis 1, we make use of items from a questionnaire developed by Gagné, Forest, Gilbert, Aubé, Morin, and Malorni (2010) for the intrinsic, identified, introjected, and extrinsic regulatory style. The integrated dimension and amotivation are adopted from Tremblay, Blanchard, Taylor, Pelletier, and Villeneuve (2009). Additionally, an earlier study used survey questionnaires to measure SDT (Wilkesmann & Lauer, 2018). Intrinsic motivation is measured with items such as: "Because I enjoy my job." Identified work motivation is measured with items such as: "Because this profession has become a fundamental part of me." Introjected work motivation is measured with items such as: "Because I have to be the best in my profession, I have to be a winner." Extrinsic work motivation is measured with items such as: "Because this profession allows me to earn a lot of money." Finally, amotivation is measured with items such as: "I don't know, I don't seem to be able to handle the important tasks of my work." All of the items were measured on a five-point Likert scale (1= strongly disagree; 5= strongly agree).

Figure 2 shows the results from the confirmatory factor analysis (CFA), where we tested if the model with five latent variables and the respective items fits the data well. The analyses were performed in R using the *lavaan* package. The resulting model fit is: GFI = 0.963, AFGI = 0.950, SRMR = 0.079 (Hu & Bentler, 1999). Because we could not confirm the exact theoretical dimensionality of the SDT model, we deleted the integrated regulation from the overall scale. The Cronbach's' Alpha for the five latent variables shows good reliabilities: intrinsic work motivation: .78; identified work motivation: .79; introjected work motivation: .65; extrinsic work motivation: .70; amotivation: .64.

To measure career orientation and Hypotheses 2a and 2b regarding Schein's career anchors we used the following items from the Career Orientation Inventory (1990): 'general management competence', 'autonomy – independence', 'lifestyle' and 'technical-functional competence.'

A principal component analysis with varimax rotation (KMO .678; explained variance 57,6 %) resulted in the following factors:

1. The latent variable 'general management competence' (α .67) with the following items: "I am most fulfilled in my work when I have been able to integrate and manage the efforts of others," "I dream of being in charge of a complex organization and making decisions that affect many people" and "I will feel successful in my career only if I become a general manager in some organization."
2. The factor 'autonomy' (α .55) has a very low Cronbach's' Alpha value; therefore, we only used the item "I am most fulfilled in my work when I am completely free to define my own tasks, schedules, and procedures" instead of the index.
3. The factor 'lifestyle' (α .71) encompasses the following items: "I feel successful in my life only if I have been able to balance my personal, family, and career requirements," "Balancing the demands of personal and professional life is more important to me than achieving a high level managerial position," and "I have always sought out work opportunities that minimize interference with personal or family concerns".

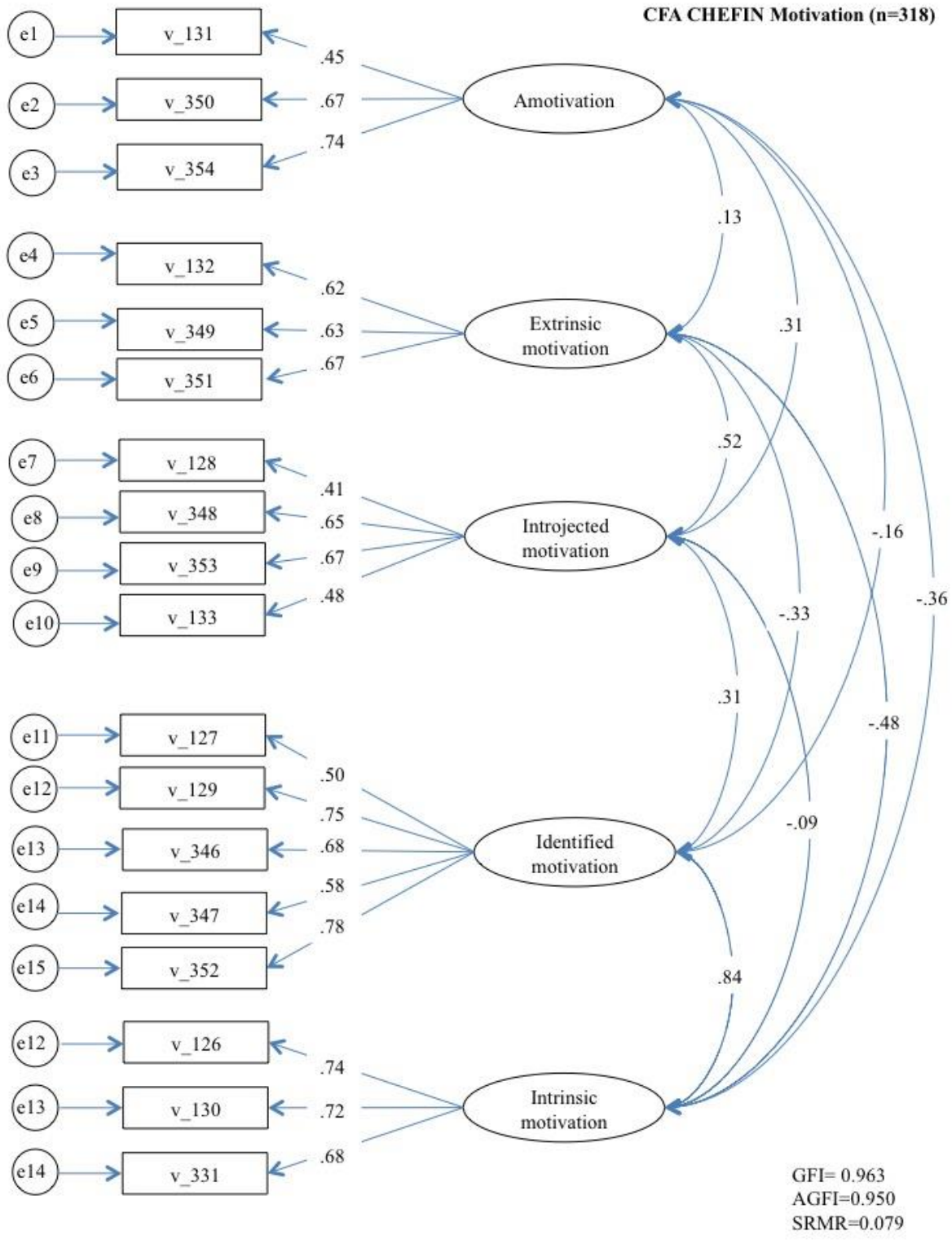

Figure 2: Confirmation factory analysis of work motivation

4. The Cronbach's' Alpha of the latent variable 'technical-functional competence' (α .35) is also very low; therefore, we use only the item "I would rather leave my organization than accept a rotational assignment that would take me out of my area of expertise." All of the items were measured on a five-point Likert scale (1= strongly disagree; 5= strongly agree).

For Hypothesis 3 we asked if the respondents have children (1 = yes 48.4 %; 0 = no 51.6 %). A total of 155 women have one child, 108 have two children, 18 have three children, and two have four children. To test Hypothesis 4, we asked if the respondents have a role model (no = 74.8 %) and if yes, then is it a female (11.5 %) or male (13.7 %) role model.

We controlled for socio-economic status and background by asking about receiving a PhD (29.6 %) and the academic level of the parental home (father or mother have received a university degree, 49.7 %). Additionally, we controlled for support by asking if the partner is working (74.2 %) or not (25.8 %). As mentioned previously, we controlled the size of company (numbers of employees), the area of expertise, and age.

EMPIRICAL RESULTS AND FINDINGS

To test our hypotheses, we estimated a logistic regression analysis and report the average marginal effects (AME) (see Table 4). AMEs can be interpreted as the percentage to achieve a leadership position. Architects, for example, are 39.2 % more likely to achieve a management position than other disciplines. With every increase of the intrinsic motivation by one characteristic on the Likert scale to the right, the probability of reaching a leadership position increases by 9.3 %.

Hypothesis 1 (women whose work motivation is more self-determined are more likely to achieve a leadership position) is confirmed. Every increase of intrinsic motivation increases the probability of achieving a leadership position by about 9.3 %. Hypothesis 2a (women whose career orientation prefers general management competence are more likely to achieve a leadership position) and 2b (women whose career orientation prefers a high degree of autonomy are more likely to achieve a leadership position) are fully confirmed. With every increase of both career orientations by one characteristic on the Likert scale to the right, the probability of reaching a leadership position increases by 8.6 % or 7.1 %. A career orientation that focuses on a good work-life balance (lifestyle) decreases the probability of achieving a leadership position by about 8.4 % and a woman who wants to make a career only and exclusively in her narrow field of expertise will decrease the probability (technical-functional competence) by about 3.9 %. Hypothesis 3 (women without children are more likely to achieve a leadership position) has to be rejected because the opposite is true: women with children are 10.1 % more likely to reach a leadership position.

Table 4: Logistic regression for factors predicting the achievement of leadership position

	Leadership position *AME*
H1Work motivation	
Intrinsic work motivation *α .78*	**.093***
Identified work motivation *α .79*	-.043
Introjected work motivation *α .65*	.003
Extrinsic work motivation *α .70*	.007
H2 Career orientation	
General management competence *α .67*	**.086****
Autonomy	**.071****
Lifestyle *α .71*	**-.084****
Technical-functional competence	**-.039***
H3 Children	
Children (1=yes; 0=no)	**.101***
H4 Female role models	
Role model (1=female role model; 0=male role model)	**-.172***
Control variables	
PhD (1=PhD; 0=no PhD)	**.186****
Academic parental home (1=family of academics; 0=family of non-academics)	-.036
Spouse employed (1=yes; 0=no)	.007
Working abroad (1=yes; 0=no)	.015
Size of company	*-.026'*
Areas of expertise	
Architecture (1=Architecture; 0= all others)	**.392****
Mechanical, industrial, civil engineering (1=engineering; 0=all others)	-.005
Computing (1=computing; 0=all others)	.074
Age	-.00
N	311
Nagelkerke[2] R^2	.432
' < 10%; * < 5%, ** < 1% significance	

Similarly, Hypothesis 4 (women with female role models are more likely to achieve a leadership position) also has to be rejected. Both of these results are unexpected and will be discussed in detail later on. Women with a male role model have a 17.2 % higher probability of achieving a leadership position. If women have a female role model, then 33.3 % of the role models are women from public life and 8.3 % are their own mothers. If women have a male role model, then 28.6 % of them are superiors, 28.6 % are their own fathers, and 11.9 % are male colleagues. Two control variables are very important: first, receiving a PhD increases the probability of reaching a leadership position by about 18.6%; and second, female architects are 39.2 % more likely to achieve a management position than the women in other professions. We will discuss these points in more detail in the next section.

Since the female architects play a special role in our sample, we have recalculated the logistic regression without female architects and removed the disciplines variables as independent variables. The results remain exactly the same, except for the variable of the role models, which is no longer significant. But even without the female architects, the distributions of male and female role models remain exactly the same as described above, namely that women from public life are important in the case of female role models and fathers and superiors in the case of male role models.

DISCUSSION

The most unexpected results are the two rejected hypotheses—children are not barriers to women who seek to reach leadership positions, and male role models have a strong and positive influence. First, given that part-time work and career breaks due to motherhood are a risk factor for career success, one possible explanation could be that these women were supported by their employer—although 23.3 % work part-time and 32.2 % had formerly worked part-time. Another possible explanation could be that women with children are already doing a challenging management job in their family. Even though this is a very time-consuming job, they show characteristics (e.g., being goal-oriented, dealing with scarce time resources, and making decisions quickly) that they also need in leadership positions (Herman & Lewis, 2012). This study's results show that these women have some support from their partners: among the women that have children, 14.3 % of their partners are not working (and conversely 85.7 % have a job). For women who have children and a partner who is working, then 13.6 % of these partners have a part-time job and 86.4 % have a full-time job (see Tables 5 and 6). These findings are consistent with both the literature (Herman & Lewis, 2012; Barth, Dunlap, & Chappetta, 2016) and with the results of our qualitative interviews. Most of the women that we interviewed in leadership positions have children. Although they describe this as a huge challenge, these women are able to combine their careers with a regular family life. They also describe a supportive partner as the most important beneficial factor. Nevertheless, compared to men in leadership positions, this is still an imbalance. While women in leadership positions are more likely to have partners with a comparable professional position, men are more likely to have partners with a lower position (Bischoff, 2010). Therefore, men in leadership positions get much more help from their partners in caring for children and housework, than women in leadership positions receive from their partners (Holst & Friedrich, 2017). Women are more likely than men to be forced to reconcile their career with childcare alone. At the same time, it is harder for men to justify not working and to assume the role of a househusband. The gender role expectations of society play a major role here (Koppetsch & Speck, 2015).

Table 5: Women with/without children and their partner's employee-status

	Partner is not employed	Partner is employed
Women without children	36.6 %	63.4 %
Women with children	14.3 %	85.7 %

Table 6: Women with/without children and their partner's volume of employment

	Partner with a full-time job	Partner with a part-time job
Women without children	94.5 %	5.5 %
Women with children	86.4 %	13.6 %

The second unexpected result is the strong and positive influence of male role models. One explanation for this could be that there are no female role models. Most of the male role models in our study are superiors, fathers or colleagues, while most of the female role models are women from public life. The female role models are therefore not personally available, which can lead to women identifying less with them (Mariani, Marshall, & Mathews-Schultz, 2015). It can be expected that the male role models are more present for the women and can also actively support them in their careers. As the study of Haas, Koeszegi and Zedlacher (2016) has shown, fathers have a great influence on motivating women to pursue a career in STEM and male colleagues help women integrate into social networks in the STEM fields. Another explanation could be that successful women imitate the behavior of successful men and, therefore, achieve a leadership position. It is also possible that women have to accept masculinist leadership models in order to succeed (Burkinshaw, 2015). To better integrate into the male-dominated organizational culture, women tend to suppress feminine characteristics and adapt to male norms (Buse et al., 2013).

Consequently, male role models can also have positive effects on the career success of women (Cheryan et al., 2011). Given that these women show a high intrinsic work motivation, it is possible that they will not be easily intimidated by gender stereotypes. According to Herman and Lewis (2012), these women may compare themselves with men, expect a similar career and thus having children is no obstacle for them. However, further research is necessary here.

The particular situation of female architects needs further explanation. As previously mentioned, architects tend to work in very small companies. Often they are running their own business and set up their own company. During the qualitative interviews, the female architects (the sample included four female architects) chose this as the best career path, for example:

> My goal was to become self-employed as soon as possible, even though I really didn't have that much professional experience, but this self-employment was totally important to me, that independence. (Female Architect)

Running their own company is chosen by female (and also male) architects to avoid low pay, long working hours, job insecurity and the glass ceiling (Caven, 2004). Moreover becoming one's own boss can allow for a better reconciliation between the competing demands of family and work (Wellington, 2006). This is the best way to combine creativity and autonomy, which are main aspects of the architectural profession (Sang, Dainty, & Ison, 2008). This does not have to be a conscious decision but can also result according to the circumstances, for example:

> I became self-employed and I believe the good thing about our profession is that in the end quality also prevails. (Female Architect)

Given that success in architecture also depends on winning anonymous competitions, women are more likely to have the opportunity to prove their ability, regardless of gender.

Our findings show, according to Schein's career anchor theory, that the balance between work environment and personal motives has a positive impact on female architect's intrinsic career motivations and thus on their careers (Ellison & Schreuder, 2000).

Our results regarding work motivation and career orientation are in agreement with the theoretical assumptions—personal attitudes also have an important influence on women's careers, in addition to the known organizational and structural influences. To meet the challenges of following a career in the STEM professions, a high intrinsic work motivation (Buse et al., 2013; Vanantwerp & Wilson, 2015) and career advancement orientation are important for women who wish to reach leadership positions. As these factors are also influenced by the gendered society, women need to have a much stronger effort if they want to overcome these expectations and want to achieve leadership positions.

The women in our sample may be highly motivated and less influenced by gender stereotypes because they have already been 'filtered out' by socialization in the STEM professions (Blickenstaff, 2005). However, further investigations are required to prove the influence of the factors that we have discussed on reaching a leadership position. First, our sample is biased because it is probable that only women interested in the topic completed the questionnaire; and men seemed to feel hardly addressed by the survey. Second, it was difficult for us to check whether the recipients of the email were really random. Finally, to test causal influences on the career, longitudinal data should be available. Therefore, we suggest that further research should integrate longitudinal data.

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ENDNOTES

[1] 'Rabenmutter' (raven mother) is a German insult for women who do not take good care of their children.
[2] (Nagelkerke, 1991)

REFERENCES

Abele, A. (2002). Geschlechterdifferenz in der beruflichen Karriereentwicklung. Warum sind Frauen weniger erfolgreich als Männer? [Gender difference in career development. Why are women less successful than men?]. In B. Keller & Mischau, A. (ed.), *Frauen machen Karriere in Wissenschaft, Wirtschaft und Politik. Chancen nutzen – Barrieren überwinden* (pp. 49–63). Baden-Baden: Nomos.

Abele, A., & Spurk, D. (2011). The dual impact of gender and the influence of timing of parenthood on men's and women's career development: Longitudinal findings. *International Journal of Behavioral Development, 35*(3), 225–232. doi: 10.1177/0165025411398181

Ayre, M., Mills, J. E., & Gill, J. (2013). 'Yes, I do belong': the women who stay in engineering. *Engineering Studies, 5*(3), 216–232.

Banerjee, M., Schenke, K., Lam, A., & Eccles, J. S. (2018). The roles of teachers, classroom experiences, and finding balance: A qualitative perspective on the experiences and expectations of females within STEM and non-STEM careers. *International Journal of Gender, Science and Technology, 10*(2), 288–307.

Barreto, M., Ryan, M. K., & Schmitt, M. T. (2009). *The glass ceiling in the 21st century: Understanding barriers to gender equality*. Washington, D. C.: American Psychological Association.

Barth, J. M., Dunlap, S., & Chappetta, K. (2016). The influence of romantic partners on women in STEM Majors. *Sex Roles, 75,* 110–125. doi:10.1007/s11199-016-0596-z

Bath, C., Schelhowe, H., & Wiesner, H. (2010). Informatik: Geschlechteraspekte einer technischen Disziplin. [Computer Science: Gender Aspects of a Technical Discipline]. In R. Becker, B. Kortendiek & B. Budrich (eds.), Handbuch Frauen- und Geschlechterforschung: Theorie, Methoden, Empirie, 3., erw. und durchges. Auflage (pp. 829–841). Wiesbaden: Verlag für Sozialwissenschaften.

Bigliardi, B., & Dormio, A. I. (2009). R&D personnel career routes: An exploratory study. *Journal of Technology Management & Innovation, 4*(1), 8–21.

Bischoff, S. (2010). *Wer führt in (die) Zukunft? Männer und Frauen in Führungspositionen in der Wirtschaft in Deutschland [Who leads into (the) future? Men and women in leading positions in the economy in Germany]*. Bielefeld: wbv.

Blickenstaff, J. C. (2005). Women and science careers: Leaky pipeline or gender filter? *Gender and Education, 17*(4), 369–386.

Bonache, J. (2005). Job satisfaction among expatriates, repatriates and domestic employees: The perceived impact of international assignments on work-related variables. *Personnel Review, 34*(1), 110–124.

Bolino, M. C. (2007). Expatriate assignments and intra-organizational career success: Implications for individuals and organizations. *Journal of International Business Studies, 38*(5), 819–835.

Budig, M., & Hodges, M. (2010). Differences in disadvantage: variation in the motherhood penalty across white women's earnings distribution. *American Sociological Review, 75*(5), 705–728. doi: 10.1177/0891243210386729

Burke, R. J. (2000). Company size, board size and numbers of women corporate directors. In R. J. Burke & Mattis, M. C. (ed.), Women on corporate boards of directors*: Issues in business ethics (*pp. 157–167, Vol 14). Dordrecht: Springer.

Burkinshaw, P. (2015). *Higher Education, Leadership and Women Vice Chancellors: Fitting in to Communities of Practice of Masculinities*. UK: Palgrave Macmillan.

Buse, K., Bilimoria, D., & Perelli, S. (2013). Why they stay: Women persisting in US engineering careers. *Career Development International, 18*(2), 139–154. doi:10.1108/CDI-11-2012-0108

Caven, V. (2004). Constructing a career: women architects at work, *Career Development International, 9*(5), 518–531. doi:10.1108/13620430410550763

Caven, V. & Diop, M. (2012). Architecture: a 'rewarding' career? An Anglo-French comparative study of intrinsic rewards in the architecture profession. *Construction Management and Economics, 30*(7), 513–523, doi:10.1080/01446193.2011.627356

Chang, C. L., Jiang, J. J., Klein, G., & Chen, H. (2012). Career anchors and disturbances in job turnover decisions: A case study of IT professionals in Taiwan. *Information and Management, 49*(6), 309–319. doi:10.1016/j.im.2012.08.002

Cech, E., Rubineau, B., Silbey, S., & Seron, C. (2011). Professional Role Confidence and Gendered Persistence in Engineering. *American Sociological Review, 76*(5), 641–666. doi:10.1177/0003122411420815

Cheryan, S., Siy, J. O., Vichayapai, M., Drury, B. J., & Kim, S. (2011). Do female and male role models who embody STEM stereotypes hinder women's anticipated success in STEM? *Social Psychological and Personality Science, 2*(6), 657–664. doi:10.1177/1948550611405218

Chia, Y. M., Koh, H. C., & Pragasam, J. (2008). An international study of career drivers of accounting students in Singapore, Australia and Hong Kong. *Journal of Education and Work, 21*(1), 41–60. doi:10.1080/13639080801957014

Cohen, L., Wilkinson, A., Arnold, J., & Finn, R. (2005). 'Remember I'm the bloody architect!' Architects, organizations and discourses of profession. *Work, Employment and Society, 19*(4), 775–796. doi:10.1177/0950017005058065]

Cross, C., & Linehan, M. (2006). Barriers to advancing female careers in the high-tech sector: Empirical evidence from Ireland. *Women in Management Review, 21*(1), 28–39. doi:10.1108/09649420610643394

Dressel, K. & Wanger, S. (2010). Erwerbsarbeit: Zur Situation von Frauen auf dem Arbeitsmarkt. [Employment: The situation of women in the labour market]. In R. Becker, B. Kortendiek & B. Budrich (eds.), Handbuch Frauen- und Geschlechterforschung: Theorie, Methoden, Empirie, 3., erw. und durchges. Auflage (pp. 489–498). Wiesbaden: Verlag für Sozialwissenschaften.

Dulini, F., Cohen, L., & Duberley, J. (2018). What helps? Women engineers' accounts of staying on. *Human Resource Management Journal, 28*(3), 479–495.

Ellison, J. A., & Schreuder, A. M. G. (2000). The relation between career anchors, occupational types and job satisfaction of midcareer employees. *SA Journal of Industrial Psychology, 26*(2), 1–6.

Ely, R. J., Ibarra, H. & Kolb, D. (2011). Taking gender into account: theory and design for women's leadership development programs. Faculty & Research Working Paper.

Erwee, R. (1990). Career anchor profiles of a sample of business and professional women. *Journal of Individual Psychology, 16*(1), 5–12.

Falk, S., & Küpper, H.-U., (2013). Verbessert der Doktortitel die Karrierechancen von Hochschulabsolventen? [Does the doctorate improve the career opportunities of university graduates?]. *Beiträge zur Hochschulforschung, 35*(1), 58–77.

Faulkner, W. (2007). Nuts and bolts and people: Gender-troubled engineering identities. *Social Studies of Science, 37*(3), 331–356. doi:10.1177/0306312706072175

Feldman, D. C., & Bolino, M. C. (2000). Career patterns of the self-employed: Career motivations and career outcomes. *Journal of Small Business Management, 38*(3), 53–67.

Fouad, N., Sing, R., Cappaert, K. J., & Chang, W. (2015). Comparison of women engineers who persist in or depart from engineering. *Journal of Vocational Behavior, 92,* 79–93. doi:10.1177/1069072716658324

Fouarge, D., Manzoni, A., Muffels, R., & Luijkx, R. (2011). Childbirth and cohort effects on mothers' labour supply: a comparative study using life history data for Germany, The Netherlands and Great Britain. *Work, Employment & Society, 24*(3), 487–507.

Franck, G. (2009). Die Architektur: Eine Wissenschaft? [Architetcture: a science?]. *Der Architekt*. Retrieved from www.iemar.tuwien.ac.at/publications/Franck%202009c.pdf

Gagné, M., Forest, J., Gilbert, M., Aubé, C., Morin, E., & Malorni, A. (2010). The motivation at work scale: Validation evidence in two languages. *Educational and Psychological Measurement*, *70*(4), 628–646. doi:10.1177/0013164409355698

Gash, V. (2009). Sacrificing their Careers for their Families? An Analysis of the Family Pay Penalty in Europe. *Social Indicators Research, 93*(3), 569–586. doi:10.1007/s11205-008-9429-y

Haas, M., Koeszegi, S. T., & Zedlacher, E. (2016). Breaking patterns? How female scientists negotiate their token role in their life stories. *Gender, Work and Organization*, 23(4), 397–413. https://doi.org/10.1111/gwao.12124

Hackett, G. & Betz, N.E. (1981). A self-efficacy approach to the career development of women. *Journal of Vocational Behavior*, 18, 326–339.

Hakim, C. (2006). Women, careers, and work-life preferences. *British Journal of Guidance and Counselling, 34*(3), 45–61. doi:10.1080/03069880600769118

Herman, C., & Lewis, S. (2012). Entitled to a Sustainable Career? Motherhood in Science, Engineering, and Technology. *Journal of Social Issues, 68*(4), 767–789.

Herman, C., Lewis, S., & Humbert, A. L. (2013). Women Scientists and Engineers in European Companies: Putting Motherhood under the Microscope. *Gender, Work and Organization, 20*(5), 467–478. doi:10.1111/j.1468-0432.2012.00596.x

Holst, E. & Friedrich, M. (2017): Führungskräfte-Monitor 2017. Update 1995-2015. [Leadership-Monitor]. Berlin: DIW.

Hu, L., &. Bentler, P. M. (1999) Cutoff criteria for fit indexes in covariancestructure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. doi:10.1080/10705519909540118

Ihsen, S. (2010). Ingenieurinnen: Frauen in einer Männerdomäne. [Female engineers: women in a male domain]. In R. Becker, B. Kortendiek & B. Budrich (eds.), *Handbuch Frauen- und Geschlechterforschung: Theorie, Methoden, Empirie*, 3., erw. Und durchges. Auflage (pp. 799–805). Wiesbaden: Verlag für Sozialwissenschaften.

Ikonen, K., Leinonen, R., Asikainen, M. A., & Hirvonen, P. E. (2017). The influence of parents, teachers, and friends on ninth graders' educational and career choices. *International Journal of Gender, Science and Technology, 9*(3), 221–241.

Institut für Arbeitsmarktforschung (2018): Beschäftigten- und Arbeitslosenstatistik [Employment and unemployment statistics]. Retrieved from http://bisds.iab.de/Default.aspx?beruf=BHG31&region=1&qualifikation=0

Jacobs, J. E. (2005). Twenty-five years of research on gender and ethnic differences in math and science career choices: What have we learned? *New Directions for Child and Adolescent Development,* (110), 85–94. doi:10.1002/cd.151

Janneck, M., Vincent-Höper, S., & Othersen, I. (2012). Entwicklung und Validierung eines Fragebogens zum Technikbezogenen Selbstkonzept (TSK): Eine gendersensitive Studie. [Development and validation of a questionnaire on the technology-related self-concept: a gender-sensitive study]. *Gruppendynamik und Organisationsberatung, 43*(3), 289–310. doi:10.1007/s11612-012-0184-9

Jean, V., Thompson, R., & Payne, S. C. (2015). Women in STEM: Family related challenges and initiatives. In M. Mills (ed.), *Gender and the work-family experience: An intersection of two domains* (pp. 291–311). New York: Springer.

Juraqulova, Z., Byington, T., & Kmec, J. A. (2015). The impacts of marriage on perceived academic career success: Differences by gender and discipline. *International Journal of Gender, Science and Technology, 7*(3), 369–392.

Kniveton, B. H. (2004). Managerial career anchors in a changing business environment. *Journal of European Industrial Training, 28*(7), 564–573. doi:10.1108/03090590410549984

Kompetenzzentrum Technik-Diversity-Chancengleichheit (2019). Retrieved from www.komm-mach-mint.de/Service/Daten-Fakten.

Lockwood, P., & Kunda, Z. (1997). Superstars and me: Predicting the impact of role models on the self. *Journal of Personality and Social Psychology, 73*(1), 91–103.

Lockwood, P. (2006). "Someone like me can be successful": Do college students need same-gender role models? *Psychology of Women Quarterly, 30*, 36–47.

Mariani, M., Marshall, B. W., & Mathews-Schultz, L. A. (2015). See Hillary Clinton, Nancy Pelosi, and Sarah Palin run? Party, ideology, and the influence of female role models on young women*. Political Research Quartely, 68*(4), 716–731. doi:10.1177/1065912915605904

Marx, D. M., & Roman, J. S. (2002). Female role models: Protecting women's math test performance. *Personality and Social Psychology Bulletin, 28*(9), 1183–1193.

McIntosh, B., McQuaid, R., Munro, A., & Dabir-Alai, P. (2012). Motherhood and its impact on career progression. *Gender in Management: An International Journal, 27*(5), 346–364. doi:10.1108/17542411211252651

Nagelkerke, N. J. D. (1991). A note on a general definition of the coefficient of determination. *Biometrika, 78*(3), 69–692.Ng, T. W. H., Eby, L. T., Sorensen, K. L., & Feldman, D. C. (2005). Predictors of objective and subjective career success. A meta-analysis. *Personnel Psychology, 58*(2), 367–408.

Nosek, B. A., Banaji, M. R., & Greenwald, A. G. (2002). Math = male, me = female, therefore math ≠ me. *Journal of Personality and Social Psychology, 83*(1), 44–59. doi: 10.1037//0022-3514.83.1.44

Pflugradt, J. & Janneck, M. (2012). „Ein bisschen wie ein Außerirdischer". Subjektive imperative und mentale Blockaden von Frauen in technisch-naturwissenschaftlichen Berufsfeldern [„A bit like an alien." Subjective imperative and mental blockades of women in technical-scientific occupational fields]. *Gruppendynamik & Organisationsberatung* 43(3), 269–287. DOI: 10.1007/s11612-012-0183-x

Quimby, J. L., & DeSantis, A. M. (2006). The influence of role models on women's career choices. *The Career Development Quarterly, 54*(4), 297–306.

Ranson, G. (2005). No longer 'One of the boys': negotiations with motherhood, as prospect or reality, among women in engineering. *Canadian Review of Sociology & Anthropology, 42*(2), 145–166.

Riordan, S., & Louw-Potgieter, J. (2011). Career success of women academics in South Africa. *South African Journal of Psychology, 41*(2), 157–172. doi:10.1177/008124631104100205

Rios, D., Stewart, A., & Winter, D. (2010). 'Thinking she could be the next president': Why identifying with the curriculum matters. *Psychology of Women Quarterly, 34*(3), 328–338.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development and well-being. *American Psychologist, 55*(1), 68–78.

Sagebiel, F. (2018). Gender and network awareness in/for successful leadership in academic science and engineering. *International Journal of Gender, Science and Technology, 10*(3), 25–51.

Sang, K. J.C., Dainty, A. R. J., & Ison, S. G. (2008). The impact of self-employment on architects' job satisfaction. In A. Dainty (ed.), *Procs 24th Annual ARCOM Conference* (pp.13–22.), Cardiff: Association of Researchers in Construction Management.

Schein, E. H. (1975). How career anchors hold executives to their career paths. *Personnel, 52*(3), 11–24.

Schein, E. H. (1990). *Career anchors: Discovering your real values.* San Diego, CA: Pfeiffer.

Shinohara, S. K., & Fujimoto, T. (2016). Gender differences in career persistence among research and development (R&D) engineers in Japan. *International Journal of Gender, Science and Technology, 8*(3), 320–337.

Sieverding, M. (2003). Frauen unterschätzen sich: Selbstbeurteilungs-Biases in einer simulierten Bewerbungssituation. *Zeitschrift für Sozialpsychologie, 34*(3), 147–160. doi: 10.1024//0044-3514.34.3.147

Koppetsch, C. & Speck, S. (2015). *Wenn der Mann kein Ernährer mehr ist. Geschlechterkonflikte in Krisenzeiten* [When the man is no longer a breadwinner. Gender conflicts in times of crisis] Berlin: Suhrkamp.

Statista (2019). *Frauenanteil in Führungspositionen in Deutschland nach Branchen im Jahr 2018* (Stand: 30. Oktober). [Proportion of women in management positions in Germany by sector in 2018]. Retrieved from de.statista.com/statistik/daten/studie/575509/umfrage/frauenanteil-in-fuehrungspositionen-in-deutschland-nach-branchen/

Stout, J. G., Dasgupta, N., Hunsinger, M., & McManus, M. A. (2011). STEMing the tide: Using ingroup experts to inoculate women's self-concept in science, technology, engineering, and mathematics (STEM). *Journal of Personality and Social Psychology, 100*(2), 255–270. doi:10.1037/a0021385

Tremblay M. A., Blanchard, C. M., Taylor, S., Pelletier, L. G., & Villeneuve, M. (2009). Work extrinsic and intrinsic motivation scale: Its value for organizational psychology research. *Canadian Journal of Behavioural Science, 41*(4), 213–226. doi:0.1037/a0015167

Vanantwerp, J., & Wilson, D. (2015). Differences between engineering men and women: How and why they choose what they do during early career. Conference Paper. *122nd ASEE Annual Conference & Exposition*.

Waldfogel, J. (2007). Parental work arrangements and child development. *Canadian Public Policy/Analyse de Politiques, 33*(2), 251–271. Retrieved from www.jstor.org/stable/30032528

Weisgram, E. S., & Diekman, A. (2016). Family-friendly STEM: Perspectives on recruiting and retaining women in STEM fields. *International Journal of Gender, Science and Technology, 8*(1), 38–45.

Wellington, A. J. (2006). Self-employment: the new solution for balancing family and career? *Labour Economics, 13*(3), 357–386. doi:10.1016/j.labeco.2004.10.005

Wilkesmann, U., & Lauer, S. (2018). The influence of teaching motivation and New Public Management on academic teaching*. Studies in Higher Education*, 44, 1–18. doi:10.1080/03075079.2018.1539960

Wils, L., Wils, T., & Tremblay, M. (2010). Toward a career anchor structure: An empirical investigation of engineers. *Relations Industrielles, 65*(2), 236–256. doi:10.7202/044301ar

Wolffram, A. (2015). Karrierewege und Lebensgestaltung promovierter Ingenieur- und Naturwissenschaftlerinnen aus Osteuropa an deutschen Universitäten. [Career paths and life planning of doctorate engineers and natural scientists from Eastern Europe at German universities]. *Beiträge zur Hochschulforschung, 37*(3), 100–117.

Young, G. M., Rudman, L. A., Buettner, H. M., & McLean, M. C. (2013). The influence of female role models on women's implicit science cognitions. *Psychology of Women Quarterly, 37*(3), 283–292. doi:10.1177/0361684313482109