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The Differential Effect of Anticipated Work-Family Conflict on the STEM Major Embeddedness of Men and Women

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THE DIFFERENTIAL EFFECT OF ANTICIPATED WORK-FAMILY CONFLICT ON THE STEM MAJOR EMBEDDEDNESS OF MEN AND WOMEN

by

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ABSTRACT

THE DIFFERENTIAL EFFECT OF ANTICIPATED WORK-FAMILY CONFLICT ON THE STEM MAJOR EMBEDDEDNESS OF MEN AND WOMEN

Dante P. Myers
Old Dominion University, 2015
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It is nationally concerning that many students who begin as Science, Technology, Engineering and Mathematics (STEM) majors do not complete their degrees. Of additional concern is that among the STEM students who do persist to degree completion, women are severely underrepresented. The present research investigates the extent to which anticipated conflicts between work and family life (AWFC) are negatively related to students' embeddedness in their STEM majors, especially the STEM embeddedness of women. The hypothesized model was tested using structural equation modeling in Mplus-7 with a sample of 218 STEM students from an archival database. As hypothesized, work-family decision making self-efficacy had a negative relationship with both anticipated work interference with family (AWIF) and anticipated family interference with work (AFIW). Notably, only AFIW was negatively related to major embeddedness and only the indirect effect of WFSE on major embeddedness through AFIW was positive and significant, partially supporting each corresponding hypothesis. Additionally, the relationships among study variables did not significantly differ by gender. However, the relationship between AFIW and major embeddedness approached significance for women. Implications of this research, future directions, and study limitations are discussed.

This thesis is dedicated to my Lord and Savior, Jesus Christ.

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CHAPTER I

INTRODUCTION

It is of national concern that many men and women who begin college as Science, Technology, Engineering, and Mathematics (STEM) majors do not persist through to degree completion (Chen, 2013; NSB, 2007). In 2012, the President's Council of Advisors on Science and Technology (PCAST) reported that among students enrolled in STEM fields in 2004, only 35% attained a degree in STEM as of 2009 (PCAST, 2012). Because of this pervasive issue of students leaving STEM majors, the STEM pipeline is often described as "leaking." Moreover, this phenomenon occurs more frequently among women than men. In 2009, women earned fewer than 40 percent of all undergraduate degrees awarded in STEM (APS, 2011). Research efforts have identified numerous factors that contribute to gender disparities in STEM retention, including unwelcoming "chilly" climates (Cheryan, Plaut, Davies, & Steele, 2009), gender-typed attitudes (DiDonato & Strough, 2013), lower self-efficacy among women (Heilbronner, 2013; MacPhee, Farro, & Canetto, 2013), perceived misalignment between STEM and women's values (e.g., communal goals; Diekman, Brown, Johnston, & Clark, 2010), and negative stereotypes regarding STEM (Hill, Corbett, & St. Rose, 2010).

An understudied contributor to why women are disproportionately less likely than men to stay in STEM majors is the influence of the *anticipation* of future conflict between work and family life. Workforce evidence suggests that men and women's careers are differentially impacted by their family circumstances, such that the effects of having a family are more negatively impactful for women than for men (Mason, Wolfinger, & Goulden, 2013). This finding also applies to STEM careers; women's careers are affected more severely than men's careers by the presence of or the desire to have a family (Etzkowitz, Kemelgor, & Uzzi, 2000; Frome, Alfeld, Eccles, & Barber, 2008). Indeed, women who have left STEM careers report that incompatibilities between work and home life were a driving factor (Heilbronner, 2013). Although research evidence suggests that discordancy between the family and work domains is a significant barrier for women once in STEM careers (Etzkowitz et al., 2000; Heilbronner, 2013), minimal research has examined the degree to which work and family interdependencies impact career-related decisions in STEM *prior* to entering the workforce. This research investigates the extent to which anticipated conflicts between work and family life are negatively related to students' embeddedness in their STEM majors, in particular the STEM embeddedness of women.

Embeddedness theory describes individuals' degree of enmeshment within their work environment as a function of factors—namely, fit, links, and sacrifice—that influence their decisions to stay (Feldman & Ng, 2007; Lee, Burch, & Mitchell, 2014; Mitchell, Holtom, Lee, Sablynski, & Erez, 2001). The present research applies embeddedness theory to the pre-entry phase of career development, specifically for those majoring in STEM. In a college context, *major embeddedness* offers a comprehensive explanation of those factors that anchor students to their field of study and future career path. Indeed, research has shown that embeddedness is an accurate description of how students conceptualize "staying in" their major (Morganson, Major, Streets, Litano, & Myers, in press). Extant research has focused on addressing the issue of STEM underrepresentation from the viewpoint of "why students leave" (Seymour & Hewitt, 1997). However, applying embeddedness theory within a college context reorients the focus to "why students stay" in their majors. In order to link the work-family interface to a college environment, the current study is interested in students' self-efficacy for making work-family management decisions and their perceptions of *anticipated* work-family conflict and how those factors are related to STEM embeddedness. The model driving this research is shown in Figure 1. It is described and elaborated in the sections that follow.

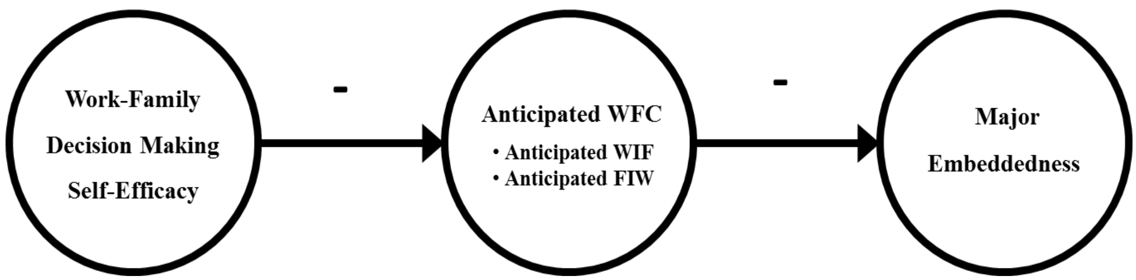

Figure 1. The proposed model depicting the mediation effect of anticipated work-family conflict on the relationship between work-family decision making self-efficacy and major embeddedness.

Anticipated Work-Family Conflict

Work-family conflict (WFC), the foundational construct of *anticipated work-family conflict* (AWFC), is defined as "a form of interrole conflict in which the role pressures from the work and family domains are mutually incompatible in some respect. That is, participation in the work (family) role is made more difficult by virtue of participation in the family (work) role" (Greenhaus & Beutell, 1985, p. 77). Adapted from the definition of WFC in the workforce, AWFC is defined by Westring and Ryan

(2011) as "the belief that participation in one's future work-role will interfere with participation in one's future family-role (and vice versa)." Applied in this study to STEM college students, AWFC taps beliefs about the extent to which WFC will occur after college as participants in the workforce. Although WFC has garnered a great deal of research attention, AWFC is relatively understudied. Both constructs, however, have received inadequate research attention in STEM. Since there is a paucity of AWFC research, the following paragraphs of this section include a chronological review of the AWFC literature. Additionally, discussion regarding the study of AWFC in a STEM context is included.

Research in the 1970's and 1980's laid the foundation for what would ultimately become AWFC. Farley (1970) examined an early version of AWFC and found that graduate student women with high career aspirations were more likely than graduate student women with low career aspirations to anticipate conflict between marriage and career. This early research finding suggested that the degree to which women desire a career over not having a career impacts the amount of work and life conflict they expect. Years later, Baber and Monaghan (1988) examined the career and family related expectations of 250 college women. The results demonstrated that although women increasingly desired to pursue male-dominated and innovative careers, their future family aspirations were adversely impacted. Specifically, these women were less child-oriented and proposed strategies for managing conflicts between work and life demands such as delaying childbearing. Taken together, these studies provided early evidence of anticipated incompatibilities between work and family life for women that have high career aspirations. These research studies set the stage for more developed AWFC research to be conducted in the 1990's and the early millennium.

During the early and mid-90's, several studies showed that college women consistently reported lower AWFC than college men (Burley, 1994; Livingston & Burley, 1991; Livingston, Burley, & Springer, 1996). Possible explanations for these findings are that women incorporated methods of coping such as modifying roles and standards more than men (Burley, 1994), men more often sacrificed family activities for work duties than women (Livingston & Burley, 1991), and that women had lower commitment to work and higher femininity (which was related to lower AWFC; Livingston et al., 1996). Although these results suggest that AWFC is more of a concern for men than women, this research is limited in terms of the measurement of AWFC. These studies did not use a validated measure of AWFC and were narrow in scope (i.e., multiple directions of AWFC were not assessed). Appositely, Livingston et al. (1996) asserted that the construct of AWFC needed clarification and additional research attention.

Research conducted since the turn of the new millennium addressed some of the prior AWFC research shortcomings by improving its measurement and adding to the empirical knowledge of the construct. Barnett, Gareis, James, and Steele (2003) examined college seniors' perceptions of future career-marriage conflict from a global viewpoint. Results suggested that students that had a working mother during their childhood years and students that planned to delay marriage and childbearing anticipated the least conflict between work and home domains. Moreover, no gender differences were found. While WFC has been conceptualized as a bi-directional construct (i.e., work can interfere with family and family can interfere with work), the authors maintained that multiple directions of AWFC may be hard for college students to differentiate. Cinamon (2006) extended research beyond simply studying AWFC from a global perspective by establishing AWFC as a bi-directional construct. Results demonstrated that AWFC has the same bi-directional composition that is commonly found in WFC. This finding accentuates the importance of assessing the future work and family conflict of college students from a bi-directional perspective, as they indeed can distinguish between dimensions. (This study is described in more detail later in the context of STEM.)

During the same year, Weer, Greenhaus, Colakoglu, and Foley (2006) had notable findings regarding students' expectations of WFC, gender, and role-altering strategies while assessing AWFC as a bi-directional construct. The sample consisted of 259 undergraduate business college students from a private university. The results indicated that women anticipated more WFC than men. Additionally, students with high expectations of work and family conflicts anticipated utilizing *family*-altering strategies (e.g., delaying marriage, limiting the number of children, etc.) but not *career*-altering strategies (e.g., reducing high-level career aspirations and reducing perceived importance of status; Weer et al., 2006). These findings suggest that the work domain may take precedence over the family domain in the minds of young adults whose focus may instead be on their career development (Weer et al., 2006).

All of the previously mentioned studies assessed AWFC in a college environment, however, only three studies to date have examined AWFC in a STEM context. Cinamon (2006) and Cinamon (2010) had minority percentages (40% in each study) of their samples contain students from the "Faculty of Sciences" and Westring and Ryan (2011) had a complete STEM student sample (medical students). In addition to investigating the bi-directional factor structure of AWFC as mentioned earlier, Cinamon (2006) examined the contribution of gender to the variance in AWFC. The findings demonstrated gender differences amid her sample; college women reported greater anticipated work interference with family (AWIF) and greater anticipated family interference with work (AFIW) than men. These findings (along with the findings from Weer et al., 2006) are noteworthy given that they contradict the early AWFC research suggesting that college men anticipate more conflict between work and family than college women (i.e., Burley, 1994; Livingston & Burley, 1991; Livingston et al., 1996).

Cinamon (2010) examined the contribution of students' role salience to the variance in their AWFC. Cluster analysis distinguished four participant profiles: work-oriented, family-oriented, dual-oriented, and no orientation. One of the study's goals was to investigate gender effects and AWFC within the four groups. Chi-square analysis revealed significant gender differences within groups. The greatest proportion difference was in the family-oriented profile; women significantly outnumbered men. In addition, MANOVA analysis demonstrated significant differences in AWFC for the work-oriented and family-oriented profiles, such that work-oriented participants anticipated the most conflict and family-oriented participants anticipated the least (Cinamon, 2010).

While research conducted by Cinamon consisted of partial STEM samples, Westring and Ryan (2011) is the only study to have examined AWFC with a complete STEM student sample. Specifically, the participants included 437 medical students from a large Midwestern university. The authors integrated the work-family and career development literatures in order to investigate a nomological network of AWFC (Westring & Ryan, 2011). The nomological net included self-perceptions (e.g., self-efficacy), role perceptions (e.g., work role demands), and expected outcomes (e.g., certainty regarding family plans). Although the results regarding a nomological net for AWFC were inconclusive, the findings underscored the importance of self-efficacy as a significant antecedent to AWFC (Westring & Ryan, 2011).

Work-Family Decision Making Self-Efficacy

Self-efficacy is defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391). With regard to the present research, self-efficacy specific to managing work-family problems or *work-family decision making self-efficacy* (WFSE) is germane. WFSE refers to "self-efficacy specifically focused on one's capacity to make effective decisions about work and family roles" (Westring & Ryan, 2011). Indeed, research has demonstrated that high WFSE is not only related to reports of lower WFC in the workforce (Hennessy & Lent, 2008), but is also related to lower *anticipated* WFC in the pre-entry phase of career development (Cinamon, 2006, 2010; Westring & Ryan, 2011).

Cinamon (2006) examined the contribution of gender and WFSE to the variance in AWFC. The participants in this study included 358 unmarried students from two universities in Israel. The results demonstrated that WFSE had a significant negative association with AWFC. Additionally, women anticipated more WFC and had lower WFSE than men. Cinamon (2010) also examined self-efficacy to the variance of AWFC. The sample included 387 college students that were neither married nor had children. A majority of the students held a job and on average these students worked approximately 22 hours per week. Findings revealed that WFSE was significantly negatively related to

AWFC. MANOVA revealed differences in WFSE among the four participant profiles (i.e., work-oriented, family-oriented, dual-oriented, and no orientation) identified by Cinamon. Participants who were family-oriented reported less AWFC and demonstrated higher WFSE. Conversely, work-oriented participants anticipated more WFC and demonstrated less WFSE (Cinamon, 2010). Westring and Ryan (2011) found that WFSE was the most robust predictor of AWFC, over all role perceptions and other self-perceptions. Furthermore, WFSE was the only variable significantly related to certainty regarding career plans. Therefore, it is expected that WFSE will be inversely related to AWFC.

Hypothesis 1a: Work-family decision making self-efficacy will be negatively related to anticipated work interference with family.

Hypothesis 1b: Work-family decision making self-efficacy will be negatively related to anticipated family interference with work.

Self-efficacy (as a subdimension of psychological capital) has been shown to have a positive relationship with embeddedness in the workplace (Sun, Zhao, Yang, & Fan, 2012). For the present study, a similar relationship is expected within a college environment. However, given that the type of self-efficacy to be assessed is specific (i.e., WFSE) rather than general, this relationship is expected to be modest. Moreover, it is expected that the presence of AWFC in the model will further reduce the relationship between WFSE and major embeddedness. In other words, AWFC will at least partially mediate the relationship between WFSE and major embeddedness. (The nature of the relationship between AWFC and major embeddedness is elaborated in the succeeding section.) Thus, it is hypothesized that:

Hypothesis 2a: Work-family decision making self-efficacy will have an indirect effect on major embeddedness through anticipated work interference with family.

Hypothesis 2b: Work-family decision making self-efficacy will have an indirect effect on major embeddedness through anticipated family interference with work.

STEM Major Embeddedness as an Outcome of Anticipated Work-Family Conflict

Embeddedness theory provides a comprehensive explanation of the factors—fit, links, and sacrifice—that influence individuals' decisions to stay in their jobs and careers (Feldman & Ng, 2007; Lee et al., 2014; Mitchell et al., 2001). This theory originated in the organizational behavior literature and was formulated as a response to criticisms of voluntary turnover (i.e., an employee's self-willed decision to leave an organization) research. Criticisms of this research focus on variables in traditional models of turnover (e.g., job satisfaction, organizational commitment, and job search behavior) only predicting a modest amount of variance in turnover (Mitchell et al., 2001). Embeddedness theory contributes to the study of turnover beyond how it has been traditionally studied as meta-analytic evidence shows it accounts for incremental variance in turnover above and beyond job attitudes and job alternatives (Jiang, Liu, McKay, Lee, & Mitchell, 2012). With regard to the factors of job embeddedness, *fit* refers to "an employee's perceived compatibility or comfort with an organization and with his or her environment," *links* refers to "formal or informal connections between a person and institutions or other people," and *sacrifice* refers to "the perceived cost of material or psychological benefits that may be forfeited by leaving a job" (Mitchell et al., 2001). Inherent in the definitions of the facets of job embeddedness is the dual context of the conceptualization of this construct. Put simply, one can be embedded or anchored to their specific organization as well as be embedded or anchored to their community at large. In addition to the types of embeddedness mentioned, Feldman and Ng extended the theory to include occupations (occupational embeddedness) and careers (Feldman & Ng, 2007). Applied to the pre-entry phase of career development, major embeddedness offers a comprehensive explanation of those factors that anchor students to their field of study and future career path.

Morganson and colleagues conducted the only published study that has explored embeddedness within a college context (Morganson et al., in press). Specifically, the researchers conducted focus groups with men and women majoring in STEM in order to contextualize embeddedness to the university environment. Indeed, results indicated that embeddedness theory is applicable in this context, as students' conceptualization of major embeddedness aligned with embeddedness theory's theoretical underpinnings. Stated differently, embeddedness in a college environment has the same factor structure (i.e., fit, links, and sacrifice) as embeddedness in a work environment. Morganson et al. (in press) examined major embeddedness from a qualitative perspective, laying the foundation for the study of embeddedness among college students. The present study expands on their research by quantitatively examining major embeddedness, specifically as an outcome to AWFC.

At present, embeddedness theory has mainly been examined in the context of the workforce. Thus, the workforce literature is explored in order to draw parallels between the relationship between WFC and retention-related outcomes and the relationship between AWFC and major embeddedness. Feldman and Ng (2007) reviewed numerous factors that have been found to encourage and discourage employees' career mobility (i.e., changing of jobs, organizations, and/or occupations). Of the perspectives reviewed, one is particularly relevant to this present research, that is, the personal life perspective. The personal life perspective on job mobility suggests that individuals' mobility is partly determined by their personal lives rather than their professional lives. One component of this perspective investigated in embeddedness related research is support in resolving work-life conflicts (e.g., Casper & Buffardi, 2004). The authors asserted that in order to reduce WFC, individuals are likely to either switch organizations or withdraw from the labor force entirely (Feldman & Ng, 2007). A similar association is expected within a college context; that is, the more AWFC students perceive, the less embedded in their major they will be. Additionally, past research has empirically examined the link between WFC and retention-related outcomes in employed samples. Meta-analytic evidence suggests that WFC adversely affects work-related outcomes such as job satisfaction, turnover intentions, absenteeism, and organizational commitment (Amstad, Meier, Fasel, Elfering, & Semmer, 2011), some of which are similar to occupational embeddedness. Specific to STEM careers, work and family incompatibilities are equally detrimental (Etzkowitz et al., 2000; Frome et al., 2008). The study of major embeddedness as an outcome of AWFC is justified as workforce research demonstrates the deleterious relationships between WFC and retention-related outcomes and suggests links between work and family incompatibilities, job mobility, and embeddedness. Moreover, recent evidence signifies the relevance of embeddedness theory in a college context (Morganson et al., in press). Therefore, it is expected that AWFC has an inverse association with STEM major embeddedness. Thus, it is hypothesized that:

Hypothesis 3a: Anticipated work interference with family will be negatively related to major embeddedness.

Hypothesis 3b: Anticipated family interference with work will be negatively related to major embeddedness.

Role of Gender in the Model

Research in sociology and social psychology has examined the experiences of gender role socialization on work-family expectations (Bolzendahl & Myers, 2004; Davis & Pearce, 2007; Medved, Brogan, McClanahan, Morris, & Shepherd, 2006; Rhea & Otto, 2001). Women are socialized from an early age to prepare for family life and family duties (Medved et al., 2006). There is evidence that suggests the current generation of girls and boys is being socialized to have similar expectations for educational attainment (Rhea & Otto, 2001); however, girls and women hold more egalitarian work-family gender ideologies than boys and men (Bolzendahl & Myers, 2004). Davis and Pearce (2007) found that those who have more egalitarian attitudes for work-family balance have higher educational expectations; this relationship was stronger for girls than for boys. This finding suggests that this relationship is stronger because the gender socialization spectrum is wider for women than for men (Davis & Pearce, 2007).

Medved et al. (2006) also explored the differential work-family gender socialization experiences of men and women. The sample consisted of 312 students from a midsized university with a mean age of 20 years old. Furthermore, the participants were predominantly Caucasian (92.6%) and women (64%). The results showed that men and women participants were encouraged similarly to find enjoyable and meaningful work, but that women were also urged to choose their career based on family reasons, stop working once they have children, and plan ahead for life choices by taking possible future family obligations into account. In other words, the importance of considering family when anticipating work and family conflicts was constructed through advice provided to young women but not to young men (Medved et al., 2006). Research findings therefore suggest that women are socialized differently and hold different gender ideologies for work and family than do men.

As women are socialized to a greater extent than men to prepare for potential work-family discord, it is expected that women's socialization experiences may coincide with their unfavorable experiences in STEM. As a result, a stronger negative relationship between AWFC and STEM major embeddedness is expected for women than for men. Although the research evidence for gender differences in AWFC is inconsistent (e.g., Cinamon, 2006; Livingston et al., 1996), workforce evidence indicates that incompatibilities between work and family not only impact women's STEM careers more than men's (Etzkowitz et al., 2000; Frome et al., 2008), but are also a driving factor influencing women's decisions to leave these careers (Heilbronner, 2013). Moreover, given the numerous contributors to women's underrepresentation in STEM, the STEM environment may exacerbate women's perceptions of future work and family conflict prior to career entry.

The above evidence suggests that gender will likely impact the relationships in the proposed model. For example, student gender may affect the relationship between AWFC and STEM major embeddedness, such that the effect of high levels of AWFC on embeddedness may be more pronounced for women than for men. Additionally, the effect of student gender on study variables may be present earlier in the model. That is, the effect of high levels of WFSE on AWFC may be more prominent for men than for women, leading to reduced levels of AWFC and increased major embeddedness. While there is an expectation for the impact gender has on the relationship between AWFC and major embeddedness, the potential impact of gender in the full context of the model remains to be seen. With limited research on these constructs in the present context, predicting specific relationships regarding gender influences is not tenable. Thus, the following research questions are posed:

Research Question 1a: To what extent are the relationships between work-family decision making self-efficacy, anticipated work interference with family, and major embeddedness different for STEM major men and women?

Research Question 1b: To what extent are the relationships between work-family decision making self-efficacy, anticipated family interference with work, and major embeddedness different for STEM major men and women?

In summary, the aim of this present research is to explore the contribution of AWFC and WFSE to the STEM major embeddedness of men and women. With the continuously leaking STEM pipeline, investigating factors that keep STEM men and women anchored to their majors is imperative. Toward that end, embeddedness theory is educed from the workforce literature and applied to a college context by assessing major embeddedness. Specifically, WFSE is assessed as an antecedent to AWFC (consistent with past research; e.g., Westring & Ryan, 2011) and the understudied construct AWFC is assessed as a potential contributor to STEM embeddedness. Moreover, AWFC is examined as a potential mediator of the relationship between WFSE and major embeddedness. Finally, as research suggests that women are more likely to leave STEM majors and careers than men (APS, 2011) and that work and family incompatibilities are a driving factor of women’s decisions to leave STEM careers (Heilbronner, 2013), the relationships between WFSE, AWFC, and STEM major embeddedness are compared among men and women.

CHAPTER II

METHOD

Participants

An archival database was used to test the hypothesized model. The separate larger study from which these data originated examined the experiences of students majoring in STEM. The participants included undergraduate STEM students from a large public university in the southeastern U.S. The researchers used university records to produce a random sample of 1,235 declared STEM major juniors and seniors. Because women are underrepresented in STEM majors, special recruitment efforts were employed in order to increase women's participation. Having a higher number of women participate in the study was important for the purpose of investigating gender effects. Randomly selected students were emailed a link to the web-based survey. The sampling method generated 227 completed surveys. Of these participants, 218 provided sufficient data for the purpose of this current research. Excluded participants failed to respond to items for constructs (e.g., skipping entire scales) that are central to this present study (i.e., WFSE, AWFC, gender, and major embeddedness). Students were compensated $15 for their participation. The sample was mainly Caucasian (61.5 percent) and male (53.7 percent). The participants were predominately single (69.3 percent) and had no children (73.3 percent). The participants had a mean age of approximately 26 years (SD = 7.38). Full demographic information is presented in Table 1.

Table 1.

Frequency Table of Demographics

Variable	*N*	%
Gender		
Male	117	53.7
Female	101	46.3
Race		
Caucasian	134	61.5
African-American	38	17.4
Asian	13	6.0
Hispanic	3	1.4
Multiple Race	22	10.1
Other	8	3.7
Marital Status		
Single	151	69.3
Married/Living with a Partner	67	30.7
Number of Children Living at Home		
0	159	73.3
1	28	12.9
2	21	9.7
3	7	3.2
4 or more	2	0.9

Note: Number of children was not reported by one participant.

Measures

Anticipated work-family conflict. Anticipated work-family conflict was assessed using the 18-item work-family conflict scale created by Carlson, Kacmar, and Williams (2000) and adapted by Westring and Ryan (2011) to reflect the measurement of anticipated conflict (i.e., with future tense applied). Participants responded on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

In order to reduce model complexity, it was proposed that parcels would be used to assess AWIF and AFIW based on AWFC's three subdimensions. However, because of receiving a positive indefinite error message when attempting to analyze the full measurement model including AWFC as proposed, an alternative method for measuring this construct was employed. Specifically, items were selected for the identification of AWIF and AFIW based on Matthews, Kath, and Barnes-Farrell (2010)'s validated short-form version of Carlson et al. (2000)'s WFC measure (from which Westring and Ryan [2011] made adaptations to assess AWFC). This measure reduced Carlson et al. (2000) 18-item measure to a six item measure with the same factor structure. In other words, both directions of WFC and all three subdimensions were represented with this abbreviated measure.

An example item of anticipated work interference with family is, "I will have to miss family activities due to the amount of time I will have to spend on work responsibilities." A sample item of anticipated family interference with work is, "I will have to miss work activities due to the amount of time I will have to spend on family responsibilities." Cronbach's alphas from Westring and Ryan (2011) for AWIF and AFIW (initial sample and cross-validation sample) ranged from .73 - .83 and .73 - .92, respectively. For the current study, the reliability estimates for the three item AWIF scale and the three item AFIW scale are .62 and .76, respectively. The reliability for the six item AWFC measure was .79. While the reliability estimates of AFIW and the full AWFC scale demonstrated traditionally acceptable reliability levels ($\alpha \geq .70$), AWIF did not. Matthews et al. (2010) reported a similarly low reliability estimate (i.e., .60) for the abbreviated measure of WIF in their study 1. Following their rationale, with three items tapping into theoretically different components of AWIF, it is not surprising that AWIF's reliability estimate is lower than the estimates from Westring and Ryan (2011). Appendix A includes a full item listing for this measure.

Work-family decision making self-efficacy. Following Westring and Ryan (2011), work-family decision making self-efficacy was assessed using the 10-item knowledge/certainty subscale of the Attitudes Towards Multiple Role Planning Scale (Weitzman & Fitzgerald, 1996). One item was modified in order to clarify the referent. Specifically, "career person" was changed to "professional in my field." Participants responded using a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). An example item of WFSE is, "Figuring out how to balance my career and my family confuses me because I don't feel I know enough about myself or about the stresses involved in balancing these roles."

In the present study, two positively worded items were excluded from this measure due to weak correlations with other WFSE items and relatively poor item-total correlations. Cronbach's alpha from Weitzman and Fitzgerald (1996) was .83. The reliability estimate for the eight item WFSE measure in this study was .92. A full item listing for this measure is presented in Appendix B.

Major Embeddedness. Major embeddedness was measured using a 7-item scale adapted from the global measure of embeddedness from Crossley, Bennett, Jex, and Burnfield (2007). The development and use of a global measure of embeddedness compared to a composite measure of embeddedness (i.e., inclusion of the separate fit, links, and sacrifice subscales) is warranted as global embeddedness predicts unique variance in intentions to search, intentions to quit, and voluntary turnover, even after accounting for empirical overlap with a composite measure of embeddedness (Crossley et al., 2007). With regard to the present study, the measure was adapted by changing the referent from "this organization" to "my major." Participant responses were rated on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A sample item for major embeddedness is, "I am tightly connected to my major." The Cronbach's alpha from Crossley et al. (2007) was .88. For the current study, the reliability of the seven item major embeddedness scale was 88. Please see Appendix C for the full major embeddedness measure.

Gender. Participant gender was measured using a single item, "What is your gender?" Responses were coded 1 (*male*) or 2 (*female*).

Control variables. There are two demographic variables that were controlled for in this present study: number of children and marital status. Number of children was measured by using a single item, "How many children or dependents under the age of 18 are living at home with you?" Responses were coded 1 (*none*) to 7 (*six or more*). Marital status was measured by using a single item, "What is you marital status?" Responses were coded 1 (*single*) or 2 (*married/living with a partner*).

CHAPTER III

RESULTS

Power Analysis

There are numerous techniques for identifying an adequate sample size when conducting research using structural equation modeling, including, for example: a minimum sample size of 200, conducting power analyses, or equating the required sample size to the number of estimated parameters (N:q; e.g., Jackson, 2003; MacCallum, Browne, & Sugawara, 1996). For studies using archival data, these techniques are conducted in order to ensure that there is sufficient power to move forward with subsequent analyses. A power analysis was conducted to calculate 80% power for three fit statistics: global chi square, CFI, and RMSEA. Three SPSS power analysis syntaxes were used based on conventions for acceptable fit for each fit index (Hu & Bentler, 1999), resulting in suggested samples sizes of 289, 266, and 99 for global chi square, CFI, and RMSEA, respectively. The sample size for the present study did not meet suggestions for two of the three fit statistics. However, since the maximum likelihood (ML) estimation method was used and the distributions for study variables are normal, having at least the minimum standard sample size for SEM (i.e., 200 cases) is sufficient to run the proposed analyses (Kline, 2011).

Data Analytic Strategy

The initial process before conducting any analyses included cleaning the data and checking for outliers. Missing data were handled using expectation maximization (EM) imputation in Mplus-7. EM imputation uses maximum likelihood parameter estimation to find the expected value of a participant's missing response by using their previous responses (Cohen, Cohen, West, & Aiken, 2003). This approach overcomes issues (e.g., biased estimates and underestimated standard errors) of other methods used to manage missing data (Cohen et al., 2003). As a next step, regression assumptions were tested. No study variable violated the assumption of normality. Descriptive statistics, reliability estimates, and intercorrelations were calculated for all study variables and are presented in Table 2.

Table 2

Means, Standard Deviations, and Intercorrelations of Variables

Variable	*M*	*SD*	1	2	3	4	5	6
1. WFSE	3.40	.88	(.92)					
2. AWIF	2.51	.69	-.43**	(.62)				
3. AFIW	2.23	.64	-.47**	.61**	(.76)			
4. M-Embed	4.12	.70	.17*	-.18*	-.27**	(.88)		
5. Gender	.47	.50	.01	-.01	-.05	.01		
6. #Child	.45	.85	.18**	.10	-.07	-.10	-.01	
7. Marital	.31	.46	.28**	-.06	-.09	-.12	.08	.33**

Note: N = 215. Values in parentheses represent coefficient alphas. WFSE = Work-Family Decision Making Self-Efficacy; AWIF = Anticipated Work Interference with Family; AFIW = Anticipated Family Interference with Work; M-Embed = Major Embeddedness; Gender = Student gender (0 = male, 1 = female); #Child = Number of children; Marital = Marital status (0 = single, 1 = married/living with a partner). *p < .05. **p < .01.

Structural Equation Modeling

The hypothesized model was tested using structural equation modeling (SEM) with maximum likelihood estimation and bootstrapping at 5,000 iterations in Mplus-7. SEM, also known as covariance structure analysis, refers to a family of data analytic techniques that represents an extension of general linear modeling procedures (e.g., ANOVA and multiple regression). SEM affords researchers the ability to examine the relationships among observed and latent variables. Specifically, SEM analyzes the relationships among variables typically in a confirmatory manor (i.e., effects are specified a priori). Bootstrapping is resampling technique where cases are randomly selected with replacement in order to generate additional data sets. This method estimates standard errors and confidence intervals for the empirical sampling distribution. The objective of SEM is to determine if a proposed model is supported by the data collected, which is assessed with model fit. In basic terms, SEM first evaluates a measurement model and then evaluates a structural model (Kline, 2011; Lei & Wu, 2007).

In order to assess model fit for the entire structural equation model, fit statistics were used. There are two categories of fit statistics in SEM: model test statistics and approximate fit indexes (Kline, 2011). First, one of the most used model test statistics was used: the model chi-square. The model chi-square tests the exact-fit hypothesis (i.e., the population covariances match predicted covariances; Kline, 2011). For this test, it is expected that the chi-square value equals its degrees of freedom and is not statistically significant at say the .05 level. However, the model chi-square has been demonstrated to be overly sensitive to large sample sizes with regard to statistical significance (Kline, 2011). This reality and the fact that single fit statistics do not present an adequate depiction of model fit warranted the use of additional fit statistics.

Next, a series of approximate fit indexes were used. The first approximate fit index used was the root mean square error of approximation (RMSEA; Steiger, 1990). The RMSEA refers to a badness-of-fit index where “best fit” would be concluded from a value of zero. Additionally, the RMSEA tests the close-fit hypothesis where failure to reject the null hypothesis at the .05 level typically indicates “good fit” and tests the poor-fit hypothesis where the upper bound of the 90% confidence interval is exceeded (Kline, 2011). Good model fit is indicated when RMSEA is less than or equal to .06 and the upper bound of the 90% confidence interval does not exceed .1 (Hu & Bentler, 1999). Acceptable model fit is indicated when RMSEA is less than or equal to .08 (Schumacker & Lomax, 2004). The next approximate fit index used was the Bentler Comparative Fit Index (CFI; Bentler, 1990). The CFI is an incremental fit index that assesses the fit of a hypothesized model compared to a baseline model. The threshold for concluding good model fit for CFI identified by Hu and Bentler (1999) is CFI greater than or equal to .95. The final approximate fit index used was the standardized root mean square residual (SRMR). Hu and Bentler (1999) suggested that the CFI be used together with the SRMR which measures the difference between observed and predicted correlations. The threshold for concluding acceptable model fit for SRMR identified by Hu and Bentler (1999) is SRMR less than or equal to .08.

Measurement Equivalence

Prior to testing the measurement and structural models, measurement equivalence was analyzed for all study variables (i.e., WFSE, AWIF, AFIW, and major embeddedness). Generally, testing for measurement equivalence determines if scores from the operationalization of a construct mean the same thing across different conditions (e.g., consistency of measurement over populations, time, methods, etc.; Kline, 2011; Meade & Lautenschlager, 2004). To be more precise, however, the measurement equivalence literature maintains that there are different levels of measurement equivalence, two of which were assessed in the current research: configural invariance and metric invariance (Vandenberg & Lance, 2000). Configural invariance tests if the factor pattern specified for measurement components is equivalent across groups and metric invariance builds on configural invariance by testing if the factor loadings of like items are equivalent across groups (Horn & McArdle, 1992; Vandenberg & Lance, 2000). In the context of this present study, both configural and metric measurement equivalence were used to ensure that each study variable had the same factor pattern and responses to items for men and women. This is important because if measurement scales do not measure the same thing across groups then any group differences among variables are potentially artifactual. In order to test this, multi-sample confirmatory factor analyses (CFA) were used. (CFA is defined in the next section.) Student gender was dummy coded where males were the reference group and females were the group of interest in each CFA. Two models were then compared for each study variable: 1) a fully constrained model and 2) a model where all parameters are unconstrained for men and women. A chi-square difference test was then used to determine if the constrained and unconstrained models significantly differed (Schumacker & Lomax, 2004), which would mean that the analyzed construct differs for men and women.

First, the model chi-square fit statistic for the constrained WFSE model was $\chi2(53) = 152.418$ and for the unconstrained WFSE model was $\chi2(45) = 144.317$. The chi-square difference between models of $\chi2(8) = 8.101$ did not exceed the critical value of $\chi 2(8) = 15.507$, indicating that the WFSE scale measured the same thing for men and for women. Second, the model chi-square fit statistic for the constrained AWIF model was $\chi 2(3) = 6.185$ and for the unconstrained AWIF model was $\chi 2(0) = 0.617$. The chi-square difference between models of $\chi 2(3) = 5.568$ did not exceed the critical value of $\chi 2(3) = 7.815$, indicating that the AWIF scale measured the same thing for men and for women. Third, the model chi-square fit statistic for the constrained AFIW model was $\chi 2(3) = 10.321$ and for the unconstrained AFIW model was $\chi 2(0) = 4.086$. The chi-square difference between models of $\chi 2(3) = 6.235$ did not exceed the critical value of $\chi 2(3) = 7.815$, indicating that the AWIF scale measured the same thing for men and for women. Finally, the model chi-square fit statistic for the constrained major embeddedness model was $\chi 2(39) = 116.927$ and for the unconstrained major embeddedness model was $\chi 2(32) = 113.226$. The chi-square difference between models of $\chi 2(7) = 3.701$ did not exceed the critical value of $\chi 2(7) = 14.067$, indicating that the major embeddedness scale measured the same thing for men and for women.

Measurement Model

Before evaluating the structural model in SEM the measurement model was evaluated using confirmatory factor analysis. CFA is a technique that “analyzes a priori measurement models in which both the number of factors and their correspondence with the indicators are explicitly specified” (Kline, 2011). In terms of the present research, the measurement model to be assessed consisted of four latent variables: WFSE, AWIF, AFIW and major embeddedness. Specifically, WFSE was represented by eight indicators and major embeddedness was be represented by seven indicators. Furthermore, AWIF and AFIW each consist of three sub-dimensions within each latent variable. These constructs were represented by three indicators each based on Matthews et al.'s (2010) abbreviated version of Carlson et al.'s (2000) WFC measure (from which Westring and Ryan [2011] made adaptations to assess AWFC).

The measurement model resulted in the following fit statistics: $\chi^2(183) = 353.192$, $p < .001$, CFI = .93, RMSEA = .065 (90% CI [.06, .08]), SRMR = .048. The fit statistics for the measurement model revealed conflicting evaluations of model fit. Model chi-square was significant (which was expected since chi-square is sensitive to sample size) and CFI did not exceed .95, indicating poor model fit. However, RMSEA and SRMR did not exceed .08 and the upper bound of the RMSEA 90% confidence interval did not exceed .1, which suggested that the measurement model fit the data well. Additionally, each indicator significantly loaded onto its specified factor. In accordance with Kline (2011), each factor was properly identified, having at least three indicators load onto each factor. The standardized factor loadings for WFSE, AWIF and AFIW, and major embeddedness are presented in Figures 2, 3, and 4, respectively.

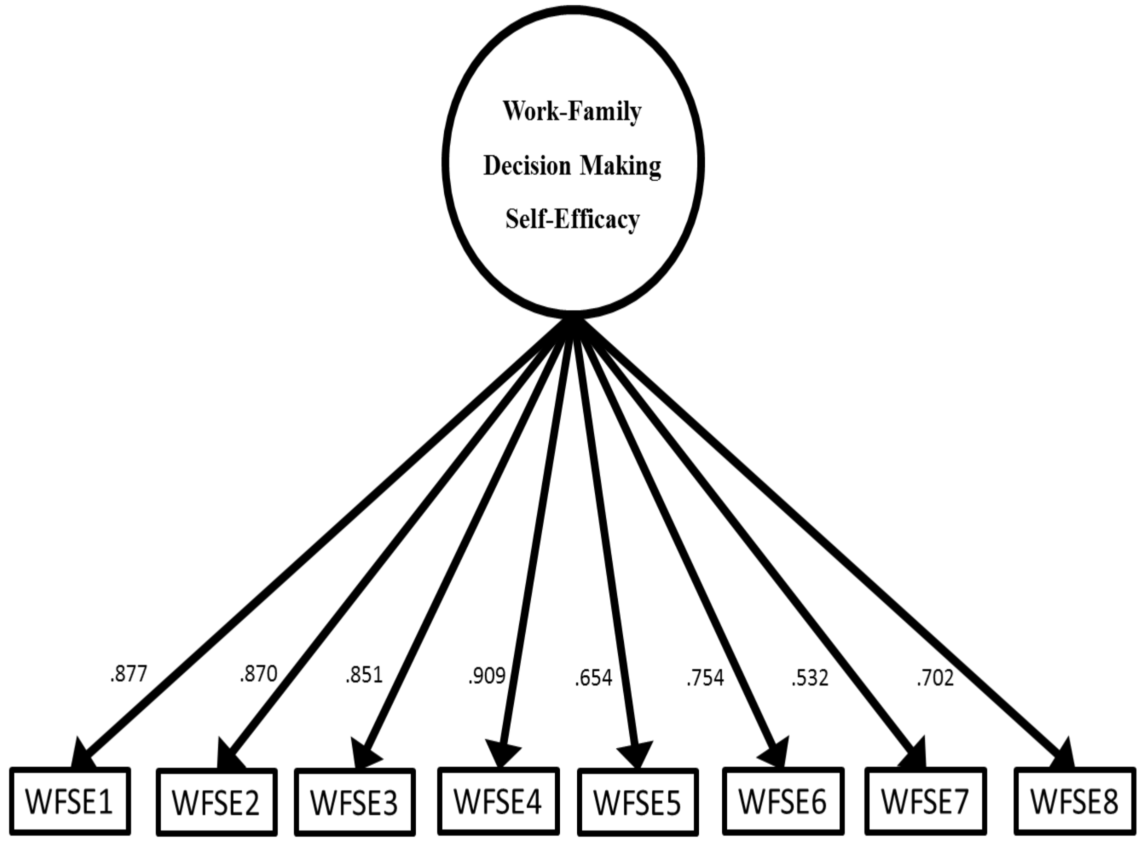

Figure 2. Confirmatory factor analysis for work-family decision making self-efficacy with standardized parameter estimates.

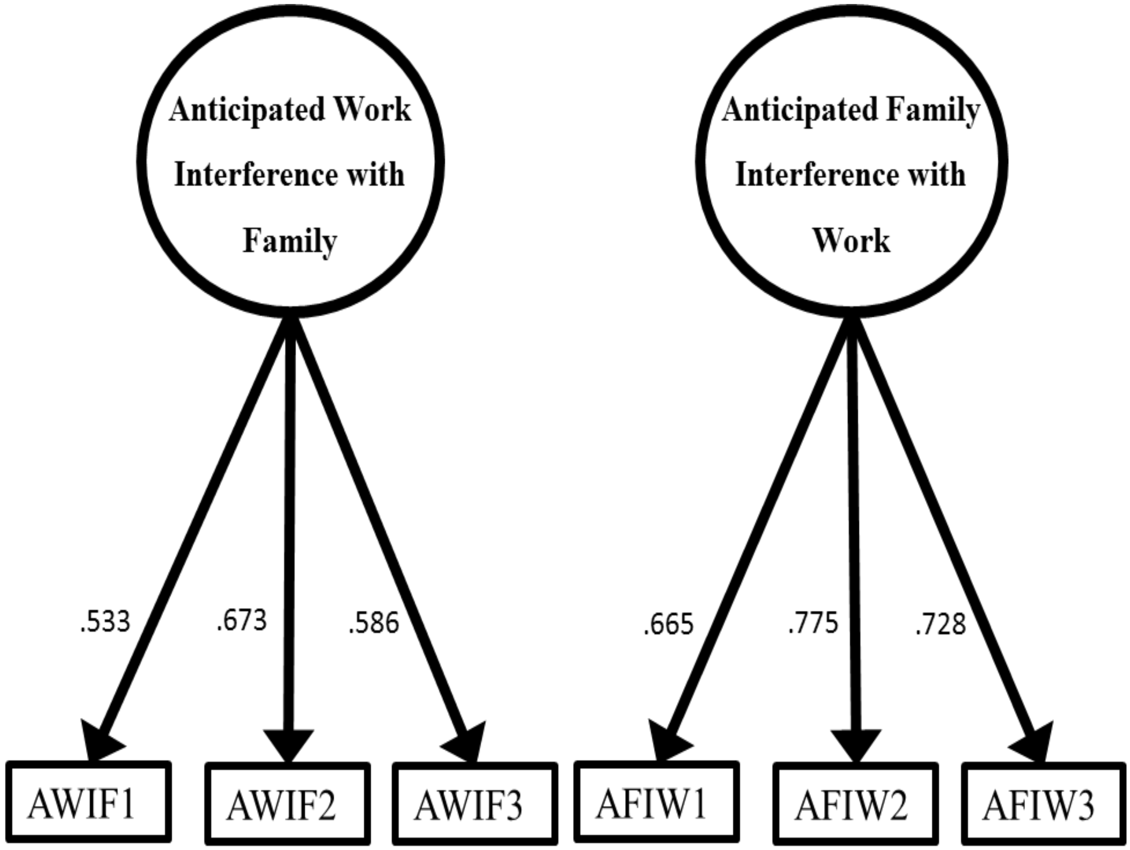

Figure 3. Confirmatory factor analysis for anticipated work interference with family and anticipated family interference with work with standardized parameter estimates.

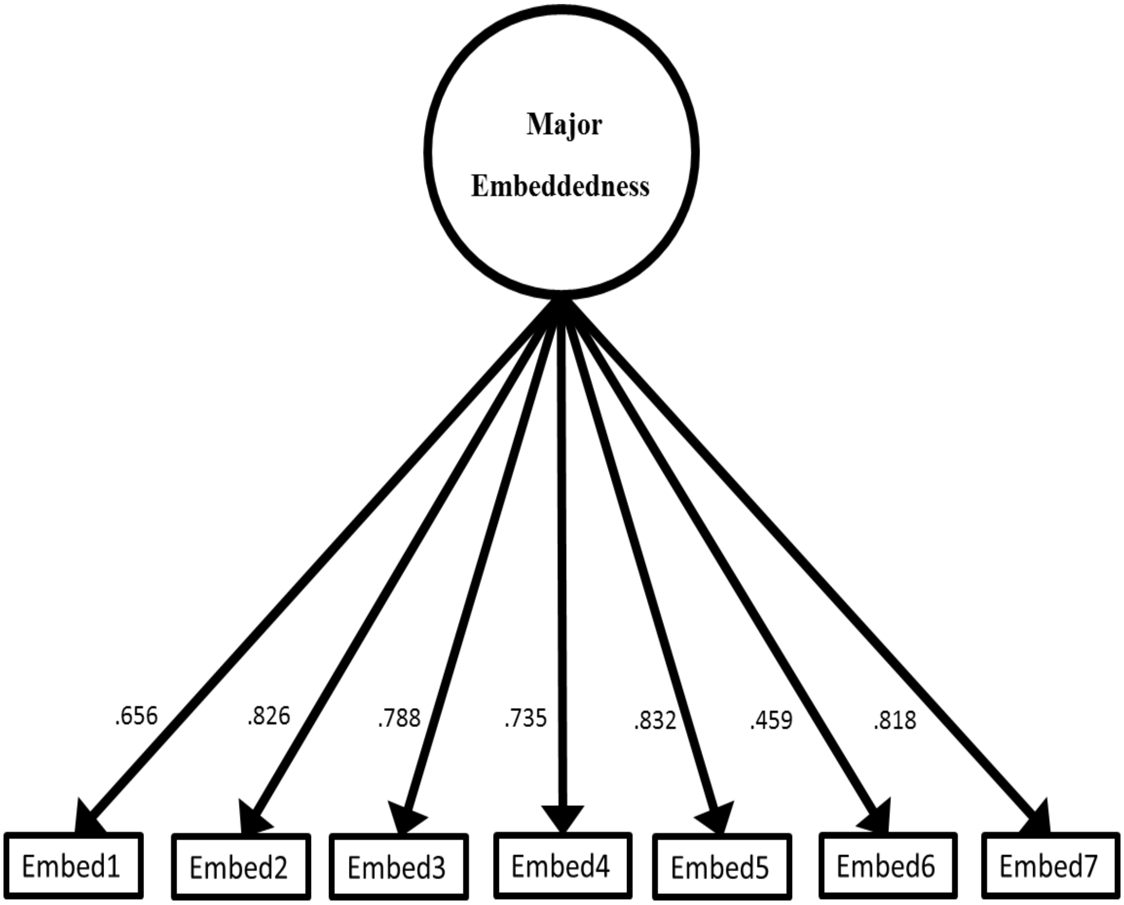

Figure 4. Confirmatory factor analysis for major embeddedness with standardized parameter estimates.

Structural Model

The next model that was analyzed was the structural model in SEM with maximum likelihood estimation and bootstrapping at 5000 iterations. The structural model was controlled for number of children and marital status. Testing the structural model yielded the following fit statistics: $\chi^2(220) = 489.624$, $p < .001$, CFI = .90, RMSEA = .075 (90% CI [.07, .08]), SRMR = .081. Comparable to the fit statistics for the measurement model, these fit statistics revealed conflicting evaluations of model fit.

Model chi-square was significant, which again was expected since chi-square is sensitive to sample size, and CFI did not exceed .95, indicating poor model fit. On the other hand, after rounding, RMSEA and SRMR did not exceed .08 and the upper bound of the RMSEA 90% confidence interval did not exceed .1, which suggested that the structural model fit the data well. R^2 refers to the proportion of variance explained in a variable by a set of predictors (Kline, 2011). R^2 values for the structural model were: AWIF = .38, AFIW = .37, and major embeddedness = .16.

After model fit was determined for the structural model, subsequent analyses were conducted. First, each individual path in the model was assessed to determine statistical significance at the .05 level and path magnitude and direction were also assessed (Schumacker & Lomax, 2004). WFSE exhibited a significant negative relationships with AWIF, β = -.601, p < .001, and AFIW, β = -.607, p < .001, respectively, supporting hypotheses 1a and 1b. AFIW exhibited a significant negative relationship with major embeddedness, β = -.316, p = .042, supporting hypothesis 3b. Hypothesis 3a, however, was not supported as AWIF was not significantly related to major embeddedness, β = .029, p = .827. The AWFC results suggest that anticipated family to work conflict, rather than anticipated work to family conflict, is related to the major embeddedness of STEM students. Next, in order to test hypothesis 2b, the indirect effect from WFSE to major embeddedness through AFIW was examined. The model indirect effect revealed that AFIW mediated the relationship between WFSE and major embeddedness, providing support for hypothesis 2b. Specifically, the relationship between WFSE and major embeddedness through AFIW was significant and positive, β = .192, p = .026. Hypothesis 2a was not supported given that AWIF was not related to major embeddedness. These results again highlight the importance of anticipated family to work conflict, rather than anticipated work to family conflict, for STEM major embeddedness. The structural equation model depicting the standardized parameter estimates is presented in Figure 5.

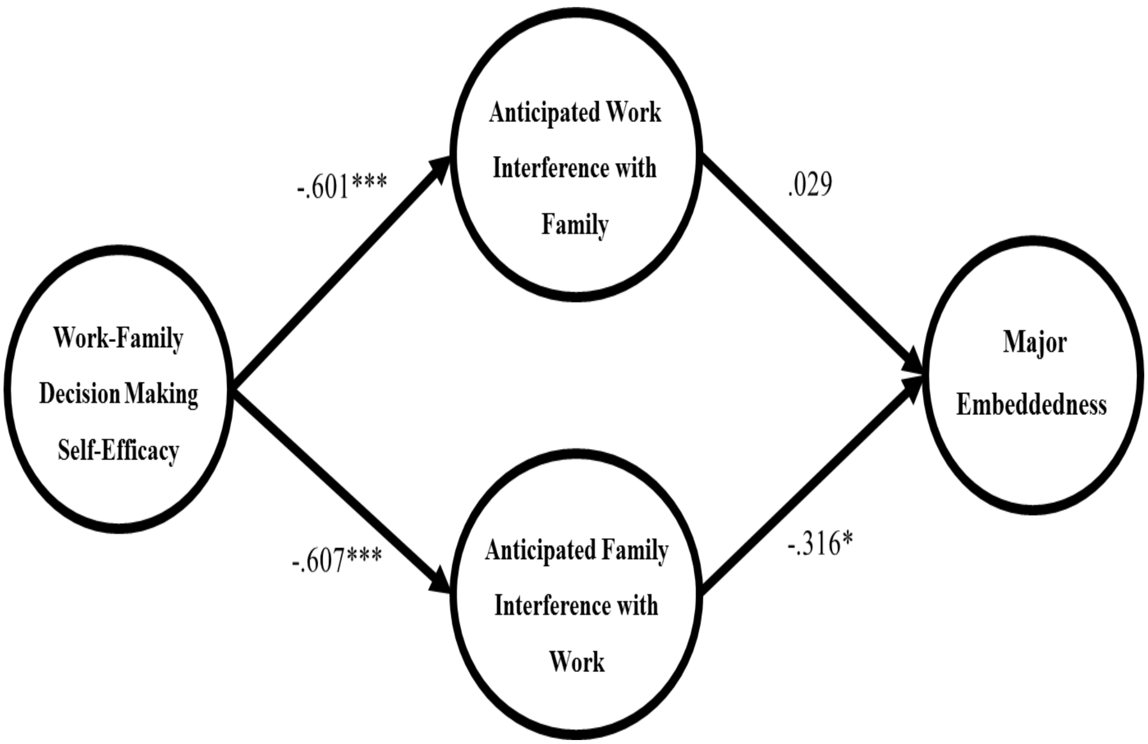

Figure 5. Structural equation model with standardized parameter estimates. * $p < .05$, *** $p < .001$.

Multi-group Analyses

A multi-group analysis was conducted in order to ascertain any significant path differences for men and women STEM students. Student gender was dummy coded where males were the reference group and females were the group of interest.

Additionally, each model was controlled for number of children and marital status. First, two models were compared: 1) a fully constrained model and 2) a model where all parameters are unconstrained for men and women. A chi-square difference test was then used to determine if the constrained and unconstrained models significantly differed (Schumacker & Lomax, 2004). If the constrained and unconstrained models are significantly different (i.e., the difference in model chi-square statistics exceeds the critical value of χ^2[11] = 19.675), it can be concluded that the hypothesized model differs for men and women. The model chi-square fit statistic for the constrained model was $\chi^2(485) = 901.487$ and for the unconstrained model was $\chi^2(474) = 885.355$. The chi-square difference between models of $\chi^2(11) = 16.132$ did not exceed the critical value of $\chi^2(11) = 19.675$, indicating the relationships among study variables did not differ between men and women. Despite this finding, it is notable that after investigating the statistical significance, magnitude, and direction of each path in the unconstrained men and women models, both the relationship between AFIW and major embeddedness ($\beta = -.382$, $p = .080$) and the indirect effect from WFSE to major embeddedness through AFIW ($\beta = .206$, $p = .070$) approached significance for women but not for men.

Next, after the difference between the above models was assessed, relationships among study variables were explored further. Namely, each path in the proposed model was examined for a gender difference. Although the model chi-square difference was not significant for the initial multi-group analysis, it may be the case that there is one path that is accounting for the reported chi-square difference (i.e., χ^2[11] = 16.132) that is statistically significant when compared using the critical value based on one degree of freedom for one unconstrained path (i.e., χ^2[1] = 3.841). In these instances, the chi-square difference between a fully constrained model and a model where only one path was unconstrained for men and women was tested. Similar to the findings for the initial chi-square difference test for the fully constrained and fully unconstrained models, none of the additional chi-square difference tests yielded significant results, indicating that there was no gender difference among each individual relationship for study variables.

CHAPTER IV

DISCUSSION

This project contributes to underrepresentation in STEM research by examining the relationships between WFSE, AWFC, and major embeddedness. This study is one of only two studies that examines AWFC with an exclusively STEM sample and identifies this construct as a potential contributor to why students decide to stay in STEM. Additionally, this study adds to the limited research that has applied embeddedness theory to the college environment and builds on qualitative research by quantitatively examine the theory in this context. The results demonstrated that WFSE had a negative relationship with AWFC, only AFIW was negatively related to major embeddedness, and only the indirect effect of WFSE on major embeddedness through AFIW was positive and significant. Moreover, the relationships among study variables did not significantly differ by gender. However, the relationship between AFIW and major embeddedness and the indirect effect of WFSE on major embeddedness through AFIW approached significance for women. These findings will be discussed in detail below.

Hypothesized Model Interpretations

The finding that WFSE was negatively related to both AWIF and AFIW is consistent with previous research (i.e., Cinamon, 2006, 2010; Westring & Ryan, 2011), and provides additional evidence for these relationships in a STEM context. This finding suggests that STEM students that are more confident that they can make effective decisions regarding future work and family roles anticipate less conflict between future work and family. Notably, WFSE explained large portions of variance in both AWIF (R^2

= .38) and AFIW (R^2 = .37), highlighting the importance of WFSE to the reduction of AWFC. These findings are important because they can inform initiatives aimed at increasing STEM students' WFSE, which can ultimately reduce concerns that their future work and family lives will be incompatible. (Additional discussion on this is included in the implications section.) Since this study is one of only two (cf., Westring & Ryan, 2011) that has examined the relationship between WFSE and AWFC with a complete STEM sample, future research is encouraged to continue to examine the associations among these constructs.

With workforce research demonstrating negative relationships between WFC and retention-related outcomes (Amstad et al., 2011) and suggesting links between work and family incompatibilities, job mobility, and embeddedness (Feldman & Ng, 2007), it was expected that AWFC would be negatively related to major embeddedness. The current research demonstrated that AFIW, but not AWIF, was negatively related to major embeddedness, which underlines the importance of anticipated family interference with work influencing students' degree of connectedness with their STEM majors. Moreover, the indirect effect results suggest that STEM students with more confidence in their ability to make effective work-family decisions were more embedded in their majors through reduced levels of AFIW. There are a couple potential explanations for the lack of significant relationship between AWIF and major embeddedness. First, poor measurement could have masked the true relationship that exists between AWIF and major embeddedness. It is commonly known that low reliability of measures can lead to Type II errors. In this study, AWIF had a reliability estimate of .62, which did not exceed the traditionally acceptable level of .70. By comparison, AFIW had a reliability estimate of .76, which did exceed the traditionally acceptable level of .70. Second, it may be the case that there is no true relationship between AWIF and major embeddedness. Perhaps the nature of work in STEM engenders concerns among prospective STEM professionals about family duties impeding work responsibilities rather than the opposite. Weer et al. (2006) reported that students were more likely to anticipate using family altering strategies rather than reduce high-level career aspirations in addressing AWFC. As a STEM career can be characterized as a high-level career aspiration, it is possible that STEM students are more focused on their career development and see future family-to-work conflicts, rather than future work-to-family conflicts, as detrimental to their career development.

Despite the lack of significant results involving AWIF, the findings that AFIW is negatively related to major embeddedness and that WFSE has an indirect effect on major embeddedness through AFIW still have their importance. These findings mirror demonstrated workforce relationships with similar variables in the college environment and provide quantitative evidence for embeddedness as an outcome of AWFC in this context. Additionally, this research suggests that anticipated work and family conflicts can be targeted and reduced to influence STEM students' decisions regarding staying in their major.

Exploration of Gender Differences

Research questions were posed with the intent of exploring how relationships among study variables differed for men and women. Given different work-family gender socialization experiences and numerous contributors to women's underrepresentation in STEM, the relationship between AWFC and major embeddedness could reasonably be expected to be more pronounced for women than for men. Yet, no gender differences were detected in this study. This is likely due to underpowered analyses. SEM is a large sample data analytic technique that usually requires a sample size greater than 200 (Kline, 2011). Although the sample size in this study exceeded 200, the approach used to investigate gender differences essentially split the data in half by analyzing separate women's and men's models. The women's model was tested with a sample size of 101 whereas the men's model was tested with a sample size of 117, each of which may not have been large enough to execute separate stable structural equation models. Future research should examine these relationships with at least twice as many men and women to increase power and the likelihood of detecting gender differences.

Notwithstanding the lack of significant gender differences found in this study, it is notable that both the relationship between AFIW and major embeddedness ($\beta = -.382$, $p = .080$) and the indirect effect from WFSE to major embeddedness through AFIW ($\beta = .206$, $p = .070$) approached significance in the women's model. As is the case in extant AWFC research, women may be more concerned that family and home life will impact their work life. With different work-family socialization experiences than men in childhood, these concerns may continue to persist throughout women's life progression, including the phases before and after career entry. Given the unfavorable experiences in STEM for women (e.g., unwelcoming climates, perceived misalignment between STEM and women's values, etc.; Cheryan et al., 2009; Diekman et al., 2010), perhaps pursuing this kind of career magnifies concerns about family life impacting work life more so for women than for men. The current study was not able to provide conclusive evidence regarding these interpretations. Again, future research should seek to address adequate power concerns by examining these relationships with more participants, especially more women.

Limitations

As is present in all research, this study includes potential limitations. First, the use of archival data constrained the choice of measures in this study. For instance, the original researchers measured AWFC with a multi-dimensional scale. The focus of this present research was only on the bi-directional nature of AWFC. A measure only assessing the bi-directionality of AWFC would have likely been used barring this constraint. Unlike WFC in the workplace, it is possible that college students have trouble distinguishing between facets of AWFC (i.e., time, strain, and behavior) since they are not actually experiencing the conflict. Trouble in distinguishing dimensions of AWFC would introduce error into measurement, which would ultimately affect the detection of true relationships among study variables.

Second, the data used in this study were cross-sectional, which may suggest that common method bias is an issue. Spector (2006) asserted that cross-sectional self-report data are critiqued so automatically and broadly that the common method variance concern has become an “urban legend” (i.e., the concern is based on truth but has been distorted and exaggerated over time). In his review of the common method variance issue, Spector (2006) highlighted that common method variance is not a universal inflator of correlations and that multimethod correlations are not always larger than monomethod correlations. Spector does not discount common method bias as a research issue; rather, he maintains that our thinking about the issue should change. Along the lines of Spector (2006), future research assessing the variables in this study should address common method bias by thinking about likely sources of variance (e.g., item characteristics, item context, measurement context, etc.) that might impact each measured variable, possibly employing recommendations from Podsakoff, MacKenzie, Lee, and Podsakoff (2003) such as incorporating temporal, proximal, psychological, or methodological separation of measurement (see discussion on this in the future research section) or using statistical remedies.

Third, and as already mentioned, power to detect significant effects may have been an issue. This study's sample size of 218 did not meet recommended sample sizes for two of the three fit statistics (i.e., 289 and 266) used in the power analysis for this study. Although SEM is a large sample data analytic technique where $N \geq 200$ is usually sufficient to run proposed analyses, the complexity of the models analyzed in this study may have warranted a larger sample size, as indicated by power analysis conducted for this research.

Fourth, and also as already mentioned, low reliability for the AWIF measure could lead to falsely concluding that this construct has no relationship with major embeddedness. With nearly 40% of this construct's measurement being attributed to measurement error, the lack of relationships detected with this construct should be interpreted with caution.

Finally, the generalizability of these results may be in question. The mean age of participants in this study was approximately 26 years with an *SD* of 7.38. Seventy-two participants were over age 26, which is not uncommon for the university from which these data originated as it has a large non-traditional student population. Although the generalizability of these results to traditional students is questionable, the importance of conducting retention-related research generalizable to non-traditional students cannot be emphasized enough (ACSFA, 2012).

Theoretical and Research Implications

Regarding theoretical implications, this study's contributions are highlighted in the application of embeddedness theory to the college environment. Traditional research on STEM underrepresentation has investigated this issue from the viewpoint of "why students leave" STEM (Seymour & Hewitt, 1997), however, applying embeddedness theory to the college environment changes the focus to "why students stay" in STEM. Qualitative research demonstrated that embeddedness in the college environment has the same factor structure as embeddedness in the workforce (Morganson et al., in press). Now with quantitative evidence of embeddedness' utility in a college environment, there is more support for the extension of embeddedness theory to this context.

Theoretical discussion of major embeddedness can be strengthened by discussing the model in more depth and the research implications of this study. First, this study expanded on past AWFC research with STEM samples (e.g., Westring & Ryan, 2011) by assessing AWFC with a sample that was more representative of STEM students (i.e., included 13 majors from the college of engineering and the college of sciences). Furthermore, this research applied AWFC to as specific research issue, that is, underrepresentation in STEM with major embeddedness as the outcome, rather than just investigating gender mean differences or a nomological network for AWFC (e.g., Westring & Ryan, 2011; Cinamon, 2006). Second, the predictors in this study accounted for 16% of the variance in embeddedness. While this percentage may be categorized as modest, WFSE and AWFC are work-family specific variables and represent only one of the potential aspects of what embeds students to STEM majors. This is practically significant as it can lead to the retention of STEM students and any amount of STEM students retained contributes to answering national calls to address retention issues regarding this demographic. By demonstrating the novelty and utility of examining work-family related constructs as one aspect STEM students' major embeddedness, embeddedness theory in a college context is effectively identified as a lens through which the issue of STEM underrepresentation can be studied.

Practical Implications

In terms of practical implications of this research, there are potential influential roles that both universities and organizations can play in patching the STEM "leaky pipeline." First, the finding that WFSE is significantly negatively related to AWFC suggests that initiatives can be implemented to enhance students' WFSE early in their STEM experience, which may help keep men and women anchored in their majors. University initiatives can include seminars, workshops, courses, programs, or mentoring (e.g., Cinamon & Rich, 2004) specifically tailored to providing students with skills to help prevent WFC, create greater integration between work and family, and help identify ways to experience work-family enrichment (i.e., "the extent to which experiences in one role improve quality of life in the other role"; Greenhaus & Powell, 2006). Enhancing students' WFSE prior to career entry only partially addresses the larger issue of students not staying in STEM; a more holistic (i.e., "whole life") approach needs to be employed (Litano & Major, 2015). That is, initiatives need to consider all life roles for men and women in addressing this issue, not solely focusing on their STEM education experiences. Which leads to the second practical implication, efforts made to increase students' WFSE should be matched with initiatives that make involvement in STEM more compatible with their lives outside of work. For instance, STEM professionals should have increased access to family friendly policies such as flextime, teleworking, paid parental leave, and condensed work weeks (e.g., Lewis, 1997; Perry-Smith & Blum, 2000). Indeed, research evidence suggests that organizations that employ a whole-life approach report less turnover and increased retention (e.g., Ngo, Foley, & Loi, 2009; Sands & Harper, 2007). In implementing initiatives to increase students' WFSE early in their STEM experience and make participation in STEM more compatible with their personal lives, universities and organizations can make invaluable contributions in anchoring and keeping men and women in STEM.

Future Research

Given the limitations of the current study, future research can make improvements in construct measurement, sample size, research design, and expand the proposed model. Emphasizing these areas of improvement will afford researchers the opportunity to better elucidate true relationships among study variables, increase the likelihood of detecting existing significant effects, increase thoroughness and rigor, and extend the application of theory.

Measurement. With regard to improving measurement, future research should focus on the focal constructs from the current study. Specifically, AWFC and major embeddedness can be examined with different measurement instruments. In the present research, AWFC was examined using six items from Westring and Ryan's (2011) measure of AWFC based on Matthews et al.'s (2011) abbreviated WFC scale (both of which were based on Carlson et al.'s [2000] original WFC scale). There was a less than adequate reliability estimate for AWIF, which was not surprising as the three items represented conceptually distinct facets of AWIF. Researchers should use alternative measures of AWIF and AFIW (e.g., Cinamon, 2010; Weer et al., 2006) with reliability estimates that exceed acceptable levels, adapt existing validated measures of WFC to assess AWFC (e.g., Netemeyer, Boles, & McMurrian, 1996), or use Westring and Ryan's (2011) measure only if the time, strain, and behavior components of AWFC are explicitly of interest.

Alternate ways of measuring embeddedness may also be appropriate. In this study, embeddedness was assessed by adapting Crossley et al.'s (2007) overall assessment of organizational embeddedness to STEM college majors. Recall that qualitative research (i.e., Morganson et al., in press) demonstrated that STEM majors recognized the same dimensions of embeddedness that have been validated in workforce samples (i.e., fit, links, and sacrifice). Researchers are in the process of developing and validating a multidimensional measure of major embeddedness (Litano et al., 2015), which will enable future investigators to examine the extent to which anticipated work-family conflicts are more important in predicting students' major related fit, links, or sacrifice. For instance, might it be the case that high levels of AWFC significantly reduces students' degree of attachment to their major (i.e., major fit) but is unrelated to their interpersonal relationships in their major (i.e., major links)? Further, gender effects may become more apparent when relationships are examined at this level.

Sample size and research design. Using alternative measures of AWFC and a validated measure of major embeddedness, that assesses its subdimensions, would require additional indicators and would make models examining the relationships between these latent constructs more complex. Given this reality, future research should pair advances in construct measurement with improvements in sample size and research design. As stated earlier, there may have been insufficient power to detect significant effects in the current study because of the size of the sample. The current project was constrained in this regard as the data used were archival, however, sample sizes in future research should exceed the suggested sample sizes from the power analysis conducted for this study. In terms of research design, the relationships among study variables should be examined with temporal separation between constructs. In examining these variables with temporal separation, future research can circumvent internal validity issues and common method bias concerns (Mitchell, 1985; Podsakoff et al., 2003) leading to more defensible conclusions regarding causal inferences.

Expanding on the idea of adding temporal separation between constructs, adding multiple measurements of constructs over time presents the opportunity to examine relationships among study variables in more depth. Specifically, future research can assess change in these constructs over time. It would be interesting to see if/how relationships among these constructs change as students move from freshmen to seniors and how this potential change may differ for men and women. One research question that future research could address is: to what extent do the relationships between WFSE, AWFC, and major embeddedness differ in STEM students' freshman, sophomore, junior, and senior years? It might be the case that WFSE and AWFC have weaker relationships with STEM major embeddedness in students' freshman year vs. other years as concerns regarding work-family incompatibilities have not likely developed and these students have not achieved adequate tenure to develop a "root" in their major. WFSE and AWFC may have stronger relationships with STEM major embeddedness during students' sophomore and juniors years as potential work and family discordancy becomes increasingly more present. The relationships between WFSE, AWFC, and major embeddedness during students' senior year are a bit more challenging to predict. While concerns regarding future WFC could potentially reach their peak during this year, so to can the level of students' major embeddedness. A component of major embeddedness, major sacrifice (i.e., the cost associated with leaving one's major), is likely to be high for senior students as they are nearing graduation. Because of this, WFSE and AWFC may have little impact on the STEM major embeddedness of seniors.

Another research question that future research can address is: to what extent do the relationships between WFSE, AWFC, and major embeddedness differ for men and women majoring in STEM across their freshman, sophomore, junior, and senior years? It might be the case that the relationships between WFSE, AWFC, and major embeddedness are consistently more pronounced for women than for men during their freshman, sophomore, junior, and senior years. These are just a couple examples of research questions that future research could investigate that take this study's variables, time (e.g., freshman to senior progression), and gender into account. Certainly, the inclusion of a time element would not only strengthen future research design but extends future research opportunities and possibilities in theoretically valuable ways.

Model expansion. In addition to examining the relationships in this study with time sequencing, the model from this study should be expanded to include additional antecedents and additional outcomes. The work-family literature underscores the importance of personality variables' influence on WFC (Eby, Casper, Lockwood, Bordeaux, & Brinley, 2005), however, more research on these relationships is needed in the pre-entry phase of career development. For instance, a personality variable such as proactive personality (i.e., people's proclivity to take action to change their environments; Bateman & Crant, 1993) could be assessed as an antecedent to AWFC. Proactive individuals may be better prepared to deal with work and family conflicts by acting in advance to deal with expected difficulties, thus leading to less AWFC and ultimately higher levels of STEM major embeddedness. Moreover, a more distal outcome such as persistence/retention could be included. Future research should examine the extent to which predictors impact STEM major embeddedness, which in turn predicts student persistence (which could be operationalized as degree completion within a specified time frame).

Future research should also extend the current research by examining similar relationships in multiple contexts, namely, bridging the college environment more explicitly with the workforce. One potential way of doing this is by examining how perceptions of AWFC in the college environment relate to actual experienced WFC and embeddedness in the workforce. It would be interesting to investigate how the degree of match (or mismatch) between expectations of WFC and experienced WFC affect job, organizational, and occupational embeddedness. For example, what would be the effect on embeddedness for participants that anticipated high levels of conflict between work and family but experienced relatively low levels of WFC? Furthermore, what would be the effect on embeddedness for participants that anticipated low levels of WFC but experienced high levels of WFC? Finally, what would be the effect on embeddedness for participants that anticipated and experienced similar levels of WFC?

Conclusions

In summary, the present research makes important contributions to the STEM literature. Findings demonstrated that WFSE was negatively related to AWFC, which is consistent with prior research. Additionally, AFIW was negatively related to STEM major embeddedness and the indirect effect of WFSE on STEM major embeddedness through AFIW was positive. Although gender differences in the context of the model were hypothesized, no significant gender differences were found. Nonetheless, the findings from this study as a whole are noteworthy. The embeddedness concept quantitatively held up in the STEM environment and work-family considerations were identified as an influence on STEM students' connectedness with their major. Future research should expand the hypothesized model to include additional antecedents and outcome variables and examine these relationships with a larger sample. Also, future research should extend the hypothesized model by bridging it with workforce constructs.

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APPENDIX A

ANTICIPATED WORK-FAMILY CONFLICT

1. My work will keep me from my family activities more than I would like.
2. The time I will devote to my job will keep me from participating equally in household responsibilities and activities.
3. I will have to miss family activities due to the amount of time I will have to spend on work responsibilities.[a]
4. I think that when I get home from work I will often be too frazzled to participate in family activities/responsibilities.
5. I will often be so emotionally drained when I get home from work that it will prevent me from contributing to my family.[a]
6. Due to all the pressures I will have at work, sometimes when I get home I will be too stressed to do the things I enjoy.
7. The problem-solving behaviors I will use in my job will not be effective in resolving problems at home.
8. Behavior that is effective and necessary for me at work will be counterproductive at home.
9. The behaviors that I will perform that will make me effective at work will not help me to be a better parent and spouse/partner.[a]
10. The time I will spend on family responsibilities will often interfere with my work responsibilities.
11. The time I will spend with my family will often cause me not to spend time in activities at work that could be helpful to my career.
12. I will have to miss work activities due to the amount of time I will have to spend on family responsibilities.[b]
13. Due to stress at home, I will often be too preoccupied with family matters at work.
14. Because I will often be stressed from my family responsibilities, I will have a hard time concentrating on my work.[b]
15. Tension and anxiety from my family life will often weaken my ability to do my job.
16. The behaviors that will work for me at home will not be effective at work.
17. Behavior that is effective and necessary for me at home will be counterproductive at work.[b]
18. The problem-solving behavior that will work for me at home will not be as useful at work.

Note. From Westring & Ryan (2011). Response scale anchors are 1 (*strongly disagree*) to 5 (*strongly agree*). [a] These items were used to represent anticipated work interference with family based on Matthews et al. (2010). [b] These items were used to represent anticipated family interference with work based on Matthews et al. (2010).

APPENDIX B

WORK-FAMILY DECISION MAKING SELF-EFFICACY

1. I don’t know how to plan for combining my career and my family.
2. Figuring out how to balance my career and my family confuses me because I don’t feel I know enough about myself or about the stresses involved in balancing these roles.
3. I can’t understand how some people can be so certain about how to successfully manage career and family responsibilities.
4. When it comes to combining my career with my family, I can’t seem to make up my mind how to do it successfully.
5. It’s easy to be certain how to manage my future career and family obligations in ways that are realistic for me.[a]
6. I have little or no idea of what being both a professional in my field and a parent will be like.
7. I don’t know whether my plans for combining my career and my family will allow me to be the kind of person I want to be.
8. I’m very clear on how to plan for combining my career and family responsibilities.
9. I don’t know whether my plans for combining my career with my family are realistic.
10. I know a lot of strategies for combining a family with a career in a way that minimizes the stress involved.[a]

Note. From Weitzman & Fitzgerald (1996). Response scale anchors are 1 (*strongly disagree*) to 5 (*strongly agree*). All items were reverse coded except items 5, 8, and 10. [a]These items were excluded because they shared weak correlations with other work-family decision making self-efficacy items and had relatively poor item-total correlations..

APPENDIX C

MAJOR EMBEDDEDNESS

1. I feel attached to my major.
2. It would be difficult for me to leave my major.
3. I'm too caught up in my major to leave.
4. I feel tied to my major.
5. I simply could not leave my major.
6. It would be easy for me to leave my major.
7. I am tightly connected to my major.

Note. From Crossley et al. (2007). Response scale anchors are 1 (*strongly disagree*) to 5 (*strongly agree*).

VITA

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