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Moderation in the Actor-Partner Interdependence Model

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**Abstract**

Potential moderators of effects in the Actor Partner Interdependence Model (APIM) include variables that vary within dyads, between dyads, or both between and within dyads (i.e., mixed moderators). Another factor that determines the complexity of APIMoMs is whether dyads are indistinguishable (e.g., same sex friendship pairs) or distinguishable (e.g., heterosexual couples). For each possibility, we discuss what are the potential moderator effects (up to eight), how they might be estimated and tested, as well as their interpretation. We also present submodels, based on patterns of moderation of the actor and partner effects, which are statistically simpler, more conceptually meaningful, and more powerful tests of moderator effects. Example analyses illustrate the recommended steps involved in an APIM moderation analysis.

### Moderation in the Actor-Partner Interdependence Model

The Actor-Partner Interdependence Model or APIM has become a widely used vehicle for analyzing dyadic data. In the basic APIM, each dyad member's score on the same variable,  $X$ , is used to predict both members' scores on the outcome variable,  $Y$ . The effect of a person's own  $X$  on his or her own  $Y$  is referred to as the *actor effect* and the effect of the partner's  $X$  on the other person's  $Y$  is referred to as the *partner effect*. Dyads can be categorized as either indistinguishable or distinguishable. For example, monozygotic twins and gay and lesbian couples are said to be indistinguishable in that there is no meaningful difference between the two members. Other dyad members are said to be distinguishable—for example, parent-child dyads and heterosexual couples—in that the two members can be differentiated in the same way for all dyads. To estimate the actor and partner effects for either type of dyads, either multilevel modeling (MLM) or structural equation modeling (SEM) can be used (Kenny, Kashy, & Cook, 2006).

Many APIM studies examine how the actor and partner effects might change depending on characteristics of the dyad members and of their relationship. The current paper reviews the methodologies available to achieve this goal by focusing on how an additional variable interacts with actor and partner variables—the moderation of actor and partner effects. For example, a researcher might want to know if the effect of the partner's  $X$  on the person's  $Y$  is stronger or weaker depending on whether the person is the husband or the wife, or how long the dyad members have known each other. These are questions of moderation of the partner effect. Although most APIM studies have investigated the moderation of actor and partner effects, to date there has not been a systematic description of the possible moderating effects in different

situations, how these effects can be estimated and tested, and importantly, how these effects can be statistically and theoretically simplified to make them more theoretically meaningful.

The first goal of this paper is to present a typology of the most common types of APIM moderation, a typology that largely depends on the type of dyadic variable that the moderator is (i.e., within, between, or mixed—a distinction which is discussed fully below). We shall also explain how these moderator effects can be estimated, interpreted, and tested using both SEM and MLM. The data illustrations are completed in SEM, and MLM versions of these analyses are available in the web appendix ([davidakenny.net/papers/APIMoM/tech.pdf](http://davidakenny.net/papers/APIMoM/tech.pdf)). We shall see that often researchers have difficulty measuring and testing moderation, and we hope our explanations might aid in future analyses. Finally, we outline different patterns of moderating effects. Finding patterns can simplify the model, increase statistical power, and most importantly aid researchers in understanding the theoretical meaning of these moderation effects.

We adopt here the standard starting assumption that the moderation is linear—the change in actor or partner effects is constant across levels of the moderator variable. This type of moderation can be tested through the use of product terms, e.g., actor variable times the moderator. Whenever product terms are included in the model, it is presumed that the “main effects” of the terms used to form the product variable (and all lower-order terms) are also included in the model. To aid in the interpretation of interaction effects and to reduce collinearity, it is helpful to center the moderator and other predictors (i.e., subtract the mean from all scores before computing the product), or have zero be a plausible and interpretable value for the moderator and predictors.

### Typology of APIM Moderation

Our typology of moderator effects is based on the different types of dyadic moderator variables. The moderator variable can be a within-dyads variable, a between-dyads variable, or a mixed variable. A within-dyads variable varies only within dyads (i.e., every dyad has the same average score). For example, percent talking time is a within-dyads variable, as well as percentage of housework completed by each member. A prototypical within-dyads variable is gender in heterosexual couples or role in mother-child dyads. In fact, if there is a distinguishing variable, it is necessarily a dichotomous within-dyads variable. For example, Millings and Walsh (2009) studied how for heterosexual couples gender moderated actor and partner effects of attachment style on the quality of social support provided. Many APIM studies focus on the interaction of a distinguishing variable with actor and partner effects—referred to simply as a distinguishable dyads model. Although not typically thought of this way, an APIM with distinguishable dyads is an APIM moderation model (APIMoM) where the moderator is within-dyads. For example, Jackson and Beauchamp's (2010) studied how the role of coach versus athlete moderated actor and partner effects of self-efficacy on satisfaction with the coach-athlete relationship. In their study, role (coach vs. athlete) is a within-dyads moderator variable, and it is also a distinguishing variable because it is dichotomous.

For a between-dyads moderator variable—sometimes called a *level-two variable* in MLM—both members have the same score. For example, Cillessen, Jiang, West and Lazkowski (2005) found for same-sex friends that the effect of positive social behavior on friendship security changed depending on the gender of the friendship pair. Gender, in this example, is a between-dyads moderator. Other common between-dyads moderators include length of the relationship and number of children in the household.

Mixed variables vary both between *and* within dyads. When a mixed variable is used in an APIMoM, there are really two moderator variables, one for each of the dyad members. For example, Vinkers, Finkenauer, and Hawk (2011) studied how trust, a mixed dyadic variable, moderated the effects of disclosure on snooping behavior in newlywed couples. Note that in this example there are potentially two moderators, how much the person trusts their spouse (actor moderator) and how much the person's spouse trusts them (partner moderator).

In the remaining sections, we consider moderators that are within-dyads, between-dyads, and mixed. For each of the cases below, we describe the model that is estimated and what terms in that model capture moderation effects. We explain how each model can be estimated by using MLM and SEM. Extended details about the models and both SEM and MLM syntax are presented in a web appendix ([davidakenny.net/papers/APIMoM/tech.pdf](http://davidakenny.net/papers/APIMoM/tech.pdf)).

### **Dichotomous Within-Dyads Moderator (Distinguishable Dyads)**

The simplest form of moderation in the APIM is when dyad members are distinguishable. For example, in heterosexual married couples, one member is always a man and the other member is always a woman. There are now two actor and two partner effects: one actor and one partner effect for each of the two members. Said another way, the actor and partner effects may be moderated by the distinguishing variable—a within-dyads variable. For the heterosexual married couples example, the husband and wife would each have an actor effect and there is one partner effect from the husband to the wife and another from the wife to the husband. There are a total of four effects. In this paper, we adopt the convention that the partner effect refers to the *Y* variable. So the husband to wife partner effect is called the *wife partner effect* and wife to husband partner effect is called the *husband partner effect*.

The distinguishable dyads model can be estimated by either MLM or SEM. For MLM, a pairwise dataset (see Kenny et al., 2006 for a description of this structure) is created and a single equation is estimated for both dyad members with own  $X$  and partner's  $X$  as predictors.

Nonindependence is modeled either as a random intercept at the level of the dyad or by the correlation of errors. When using MLM, the interaction of the distinguishing variable with the actor and partner effects tests moderating effects. The model for person  $i$  in dyad  $j$  with gender as the distinguishing variable, denoted as  $G$ , which acts as a moderator is

$$Y_{ij} = b_0 + b_1X_{ij} + b_2X'_{ij} + b_3G_{ij} + b_4X_{ij}G_{ij} + b_5X'_{ij}G_{ij} + e_{ij}, \quad (1)$$

where  $X$  is the actor variable,  $X'$  is the partner variable,  $b_0$  is the intercept,  $b_1$  is the coefficient of  $X_{ij}$  on  $Y_{ij}$  (actor effect),  $b_2$  is the coefficient of  $X'_{ij}$  on  $Y_{ij}$  (partner effect),  $b_3$  is the coefficient of  $G_{ij}$  on  $Y_{ij}$ ,  $b_4$  is the actor interaction with gender,  $b_5$  is the partner interaction with gender, and  $e_{ij}$  represents the residual term. If the interaction between gender and the actor variable is statistically significant,  $b_4$ , then the actor effect for husbands is statistically different from the actor effect for wives. That is, gender moderates the actor effect. Likewise, the interaction of gender and the partner variable,  $b_5$ , indicates the difference in the two partner effects. For instance, by testing the interaction of actor's attachment avoidance and gender on compulsion to give care, Millings and Walsh (2009) found that the negative actor effect of avoidance on caregiving was stronger for husbands than for wives.

For SEM, a dyad dataset (see Kenny et al., 2006) is created and members are denoted as person 1 and 2 (e.g., person 1 is the coach and person 2 is the athlete). The APIM is defined by two structural equations, one for  $Y_1$  and one for  $Y_2$ . Both  $X_1$  and  $X_2$  predict  $Y_1$  and  $Y_2$ , the paths from  $X_1$  to  $Y_1$  and from  $X_2$  to  $Y_2$  being actor effects and the paths from  $X_2$  to  $Y_1$  and from  $X_1$  to  $Y_2$  being partner effects. Nonindependence in the  $Y$ 's is commonly estimated by a correlation

between the disturbances of  $Y_1$  and  $Y_2$ . Note that in SEM the two variables are member 1's and member 2's  $X$  whereas in MLM the predictor variables are actor and partner variables. The equation for member 1 is

$$Y_1 = b_0 + a_1X_1 + p_1X_2 + e_1 \quad (2)$$

and for member 2 it is

$$Y_2 = b_1 + p_2X_1 + a_2X_2 + e_2. \quad (3)$$

This model is saturated and so has zero degrees of freedom. Note that  $a_1$  and  $a_2$  are the actor effects and  $p_1$  and  $p_2$  are the partner effects. To test statistically whether paths are equal across levels of the distinguishing variable, the two actor or two partner paths are set equal to each other and that equality constraint is evaluated by the change in fit of the model. For instance, Lawrence and colleagues (2008) used SEM to study the effects social support solicited on relationship satisfaction in heterosexual couples. To test if the actor and partner effects of support solicitation were different across husbands and wives, they constrained the two actor paths and the two partner paths to be equal and tested whether there was a significant decrease in model fit.

Regardless whether MLM or SEM is used, it is essential to statistically evaluate whether actor and partner effects are different for the two members, something which is quite often overlooked. All too often researchers just present the two actor and two partner effects and interpret that difference as meaningful without ever presenting any statistical evidence that they are different. Also problematic is when only a single actor and a single partner effect is reported without ever explicitly reporting whether they are in fact statistically the same for the two types of dyad members.

There are several reasons why it is important to test for the equality of actor and partner effects. First, it is this test that permits the researcher to claim moderation. That is, if a



researcher wants to claim that the effects are different across levels of the distinguishing variable, a statistical test is required to show that they are different. Showing that only one actor effect (or partner effect) is statistically significant and the other is not does not demonstrate that the actor (or partner) effects are statistically different from each other. Second, if the effects are not different, then it makes sense to compute a single actor or partner effect because the test of that single effect has more power than the test of the two effects separately.

A within-dyads moderator need not be a dichotomy, but could be a continuous variable, such as the percent time speaking. However, every within-dyads moderator variable that we found in the literature was a dichotomy. Should one have a continuous within-dyads moderator, one can use the analysis strategy for a between-dyads moderator that we discuss next.

### **Between-Dyads Moderator**

**Indistinguishable Dyads.** The second type of potential moderator of the APIM is a variable that only varies between dyads—a between-dyads moderator. Examples of this type of moderator include the gender of same-gender friendship pairs (Cillessen et al., 2005) and the reciprocity of friendship in pairs of children (Adams, Bukowski, & Bagwell, 2005). As when the moderator is within dyads, when a between-dyads moderator is included in an analysis of indistinguishable dyads, there are two potential moderating effects: moderation of the actor effect and moderation of the partner effect. That is, the magnitude of the effect of the actor's *X* on the actor's *Y* may depend on the level of the between-dyads variable, and the effect of the partner's *X* on the actor's *Y* may depend on the between-dyad moderator. For example, Cillessen and colleagues (2005) found that the effect of self-rated prosocial behavior on friendship security was larger when the friends were female than when they were male, an example of an actor effect being moderated by a between-dyads variable. The partner effect can also be moderated by

a between-dyads variable. For example, Adams et al. (2005) tested whether the reciprocity of the friendship moderated the influence of prior aggression on partner's aggression measured six months later.

When there is a between-dyads moderator, again, either MLM or SEM can be used to estimate this model. When using MLM two interaction terms are included in the model—the interaction of the moderator and the actor variable,  $XM$ , and the interaction of the moderator and the partner variable,  $X'M$ . The significance tests of these interactions indicate whether or not the actor and partner effects change depending on values of the between-dyads moderator.

When using SEM to estimate a model with a continuous between-dyads moderator, two interaction terms need to be added to the model: the interaction of the moderator with  $X_1$  or  $X_1M$  and the interaction of the moderator with  $X_2$  or  $X_2M$ . As shown in Figure 1, there are then four moderation effects: the effect of  $X_1M$  on  $Y_1$  or  $am1$ , the effect of  $X_2M$  on  $Y_2$  or  $am2$ , the effect of  $X_2M$  on  $Y_1$  or  $pm1$ , and the effect of  $X_1M$  on  $Y_2$  or  $pm2$ . Note the first two are actor moderation effects and the second two are partner moderation effects. Because the dyad members are indistinguishable, the equality constraints of  $am1 = am2$  and  $pm1 = pm2$  need to be imposed (as well as all the other equality constraints on the means, variances, and intercepts that for members 1 and 2, Olsen & Kenny, 2006).

**Distinguishable Dyads.** If dyad members are distinguishable with a between-dyads moderator, then the distinguishable dyads model discussed above expands to include four moderation effects. For example, using gender in heterosexual couples as the distinguishing variable, the between-dyads variable can moderate the actor and partner effect for women and for men thus producing the four moderator effects:

- 1) the woman's actor effect moderated by the between-dyads variable,
- 2) the woman's partner effect moderated by the between-dyads variable,
- 3) the man's actor effect moderated by the between-dyads variable, and
- 4) the man's partner effect moderated by the between-dyads variable.

For example, Stroud, Durbin, Saigal, and Knobloch-Fedders (2010) found that the positive actor and partner effects of a person's negative emotions on marital dissatisfaction were reduced by length of marriage for both husbands and wives.

Typically a key question in distinguishable dyads with a between-dyads moderator analysis is whether the moderation of the actor or partner effects is the same for the two members. When using MLM, the moderating effects of the between-dyads variable are included in the model as two three-way interactions of the moderating variable,  $M$ , the distinguishing variable,  $G$ , and actor variable,  $X$  or partner variable,  $X'$ :  $XGM$  and  $X'GM$ . The test of the two three-way interactions indicates whether the between-dyads moderator differentially moderates the actor and partner effects across the two dyad members.

For SEM, the moderator's interaction with  $X_1$  and  $X_2$  are added to the model, yielding two different moderator effects for each person:  $X_1M$  and  $X_2M$  (see Figure 1). By imposing equality constraints on the distinguishable model, the appropriate tests of differential moderators across dyad members can be obtained. For instance, to test if actor moderation is the same for both members, the path from the  $X_1M$  variable to  $Y_1$  or  $am1$  and the path from the  $X_2M$  variable to  $Y_2$  or  $am2$  are set equal. Such a test is equivalent to the test of the actor by moderator by distinguishing variable interaction,  $XGM$ , by MLM.

### Mixed Moderator

The possible moderation effects in the APIM become much more complicated when a mixed variable is used as a moderator. If the moderator is mixed, then there are two potential moderators of the actor and partner effects. We call one the *actor moderator* which is the person's own score on the moderator (or when the moderator variable and outcome variable are from the same person in SEM models) and the other is called the *partner moderator* which is the person's partner's score on the moderator (or when the moderator variable and outcome variable are from different persons in SEM models). So for instance, in examining the effect of hostile marital behavior on depressive symptoms, a person's own warmth, an actor moderator, might moderate the actor and partner effects of hostile marital behavior on his or her depressive symptoms; the partner's warmth, a partner moderator, might also moderate these effects (Proulx, Beuhler, & Helms, 2009). Note that in SEM the same variable can be either an actor or partner moderator depending on which person's outcome variable it is pointing to (see Figure 2). For example, when  $X_1M_1$  or  $X_2M_1$  affect  $Y_1$ ,  $M_1$  is an actor moderator, and when  $X_1M_1$  or  $X_2M_1$  affect  $Y_2$ ,  $M_1$  is a partner moderator.

Because both the  $X$ , hostile behavior in the example study, and the moderator are mixed variables, the researcher can decide to flip the two. For instance, make hostile marital behavior the moderator and warmth the  $X$  variable: A person's own hostile behavior can alter the actor and partner effects of warmth on change in depressive symptoms, and his or her partner's hostile behavior can alter these effects. These two formulations are statistically equivalent, but often one way makes more sense theoretically or empirically.

**Indistinguishable Dyads.** In the indistinguishable case, two separate moderation variables are included in the model: The actor's moderator variable and the partner's moderator

variable. This inclusion produces four two-way interaction terms (MLM) or paths (SEM) added to the model:

- 1) the moderation of the actor effect by the actor's moderator, ( $X_1M_1 \rightarrow Y_1$  and  $X_2M_2 \rightarrow Y_2$ , in SEM, see Figure 2),
- 2) the moderation of the actor effect by the partner's moderator, ( $X_1M_2 \rightarrow Y_1$  and  $X_2M_1 \rightarrow Y_2$ ),
- 3) the moderation of the partner effect by the actor's moderator, ( $X_2M_1 \rightarrow Y_1$  and  $X_1M_2 \rightarrow Y_2$ ), and
- 4) the moderation of the partner effect by the partner's moderator, ( $X_2M_2 \rightarrow Y_1$  and  $X_1M_1 \rightarrow Y_2$ ).

Note that these four interaction terms are in addition to the main effects that also need to be in the model.

Although with a mixed moderator there are two moderators, either for theoretical or methodological reasons an investigator might choose to examine just one of the two. For example, Barelds and Dijkstra (2009) examined in their study of romantic couples the effect of age, the moderator, on the effect of positive illusions on relationship quality. For theoretical reasons, they used only the actor's age as moderator and did not include partner's age.

For MLM, four two-way interaction terms are added to the model—the interaction of the actor moderator with both the actor and partner variables or  $MX$  and  $MX'$  and the interaction of the partner moderator with both the actor and partner variables or  $M'X$  and  $M'X'$ . The tests of the four interaction terms determine whether the actor or partner moderators significantly change the direction and/or magnitude of the actor and partner effects.

For SEM, four two-way interactions of  $X_1M_1$ ,  $X_2M_1$ ,  $X_1M_2$ , and  $X_2M_2$  are added as predictors in each of the two equations. As can be seen in Figure 2, the four interactions each have two paths—one to  $Y_1$  and the other to  $Y_2$ —and appropriate equality constraints must be made to take into account indistinguishability (see web appendix). Tests of the paths from the interaction terms evaluate the four different moderator effects.

**Distinguishable Dyads.** The most complex APIMoM involves distinguishable dyads and mixed moderators. In the distinguishable case, there are two actor effects and two partner effects. If the moderating variable is mixed then one may have the actor's score on that variable as well as the partner's score on that variable moderating each of the four base distinguishable dyads effects for a total of eight interaction terms added to the model. Using gender as the distinguishable variable, the eight interaction effects are as follows:

- 1) the woman's actor effect moderated by the woman's moderator variable,
- 2) the woman's partner effect moderated by the woman's moderator variable,
- 3) the woman's actor effect moderated by the man's moderator variable,
- 4) the woman's partner effect moderated by the man's moderator variable,
- 5) the man's actor effect moderated by the man's moderator variable,
- 6) the man's partner effect moderated by the man's moderator variable,
- 7) the man's actor effect moderated by the woman's moderator variable, and
- 8) the man's partner effect moderated by the woman's moderator variable.

As was the case with mixed moderators and indistinguishable dyads, using only the actor's score on the mixed moderator variable is more common in past research than using only the partner's score on the moderator, or both the actor's and the partner's scores. For example, Caughlin and Afifi (2004) examined whether for dating couples the negative effect of trying to avoid certain

discussion topics—such as sex, relationship issues, and past negative events—on relationship satisfaction (actor effect) was reduced by the actor's motivations to protect the relationship (actor moderator variable).

For estimation using MLM, to estimate these eight moderating effects a model that includes four three-way interaction terms needs to be estimated. These four interaction terms are:  $XGM$ ,  $X'GM$ ,  $XGM'$ , and  $X'GM'$ . The significance test for  $XGM$  indicates whether the moderation of the actor effect by the actor moderator is different across dyad member while the test for  $X'GM$  indicates if the moderation of the partner effect by the actor moderator is different across dyad member. The significance tests for  $XGM'$  and  $X'GM'$  indicate if the moderation of the actor and partner effects by the partner's moderator is different across dyad members.

For SEM, the four interactions of the two moderators with actor and partner effects are added as predictors:  $X_1M_1$ ,  $X_2M_1$ ,  $X_1M_2$ , and  $X_2M_2$  (see Figure 2). Because dyad members are treated as distinguishable, their effects on  $Y_1$  and  $Y_2$  are allowed to differ, which results in a total of eight interaction effects. To test if the moderation is significantly different across dyad members, the parameters for the two relevant interaction effects can be set equal across members and a chi-square test can be used. For example in a model with actor variable–actor moderator interaction terms, Bodenmann, Ledermann, and Bradbury (2007) examined whether marital satisfaction moderated the effect of daily stress on sexual activity differentially for husbands and wives.

With such large and complex models, finding patterns among these moderation effects can be crucial for making theoretical sense of the results and simplifying the model. We now focus on detailing and estimating such patterns.

### **Simplifying Moderation Effects: Finding Submodels**

As we have seen, especially when the moderator variable is mixed, these models can become quite large, which has two negative side effects. First, large samples are required to detect substantial effects. Second, the discussion of the results can be overwhelming. Finding patterns among the moderation effects can help to reduce this complexity and aid in the theoretical understanding of the results. In addition, the individual tests of moderation have lower statistical power than simplified models implying specific patterns.

The strategy that we discourage is the trimming of nonsignificant moderator effects without first considering the pattern among the effects; that is, only statistically significant interactions are retained and non-significant ones are dropped. One problem with trimming is that tests of moderation are typically low power (McClelland & Judd, 1993), and thus it may be unlikely that any one moderation effect is significant. Consider the case of a mixed moderator with distinguishable dyads for which there are eight moderator effects. It might be the case that all of these eight effects equal approximately the same value. Given likely low power, a few might be significant and most not. However, the test that the eight effects equal the same value would have more power, be simpler and more parsimonious, and would likely be more conceptually meaningful. Another problem is that trimming capitalizes on chance. For instance, in a situation in which there are four independent tests and all parameter estimates equal the same value, each with a power of .5, the probability that all four would be significant is only .0625, which is the same probability that none of them are significant. However, the test of the null hypothesis that they all equal the same value has a power of approximately .975. Well-informed hypotheses about a pattern are much more likely to yield meaningful results than



piecemeal tests of multiple moderator effects. The patterns described in this section can guide these hypotheses.

One of the goals of this section is to provide researcher with an alternative strategy to trimming. That strategy emphasizes the use of theoretically-relevant patterns. In Tables 1-5, the patterns are found in each column and the rows contain the effect estimates for the interaction term in the row header. Within each column identical letters signify that those two interaction effects are assumed to be of equal magnitude, and the signs of the letters indicate if the effect estimates have the same or opposing directions. For example, in Table 1, the  $a$ 's and  $b$ 's represent the estimate of the interaction effect in the corresponding row header. When two  $a$ 's or two  $b$ 's are in the same column, then they are the same sign and magnitude, except where indicated by a negative sign. Note that a couple pattern implies equal actor and partner moderator effects whereas a contrast pattern implies equal but opposite signs (Kenny & Cook, 1999; Kenny & Ledermann, 2010). Kenny and Ledermann (2010) discussed in detail the patterns among actor and partner effects in the basic distinguishable dyads model (see Table 1). Each dyad member can have either an actor-only model, a partner-only model, a couple-level model, or a contrast model. The actor-only model appears when only the actor's  $X$  variable influences one's own outcome but not the partner's outcome, whereas the partner-only model indicates that only the partner's  $X$  variable influences the person's outcome. The couple model is where both actor and partner effects are present, are of equal magnitude and in the same direction. The contrast model is when the partner effect is of equal but opposite sign to the actor effect. This pattern implies either the actor's variable has a positive effect on some outcome whereas the partner's variable has a reducing effect on that outcome or the actor effect is negative and the partner effect is positive and relatively equal magnitude.<sup>2</sup>

First we discuss patterns among moderation effects in models with a between-dyads moderator.

### **Between-Dyads Moderator**

**Indistinguishable Dyads.** If there is a between-dyads moderator with indistinguishable dyads, there are two potential moderator effects—moderation of the actor effect and moderation of the partner effect. Table 2 presents the different patterns of moderation results. We might find that only the actor effect is moderated by the between-dyads variable (the actor-only moderation model), only the partner effect is moderated (the partner-only moderation model), both the actor and partner effects are moderated, and these interaction effects are of similar sign and magnitude (the couple moderation model), or both the actor and partner effects can be moderated by the between-dyads variable and these effects are of opposite sign but similar magnitude (the contrast moderation model). It is important to note that these four models refer to patterns between the two interaction effects, and not the main effects as in the distinguishable dyads case. The main effects may have a completely different pattern from the moderation effects. Cillessen and colleagues (2005) found the actor-only moderation pattern—only the actor effect of prosocial behavior on security was moderated by gender — whereas Adams and colleagues (2005) found that the partner-only pattern.

These submodels can again be tested with either MLM or SEM. Testing with SEM is cumbersome because setting up the indistinguishable dyads model involves many equality constraints, but once set up the various patterns can be tested in this framework. In MLM the actor-only moderation model and the partner-only moderation model are tested simply by either including these interaction terms or not, but the couple moderation and contrast moderation models are tested using the interaction of sum and difference terms with the moderator. The

interaction of the between-dyads moderator and the sum of the actor and partner variables tests the couple moderation model and the interaction of the between-dyads moderator and the difference between the actor and partner variables tests the contrast moderation model.

**Distinguishable Dyads.** If a between-dyads moderator is added to the distinguishable case, the same patterns can arise among the interaction terms as discussed for indistinguishable dyads. Those models again are the actor-only moderation model, the partner-only moderation model, the couple, and the contrast moderation models (see Table 3). As was the convention earlier, if both the actor and partner effects are moderated similarly (same sign and magnitude) this is called the *couple moderation model*, and when the actor and partner effects are moderated to a similar magnitude but in an opposite direction by the between-dyads moderator this is called the *contrast moderation model*.

When dyads are distinguishable, each member of the dyad can have a different pattern of results. For example, it may be the case that there is only moderation of the actor effect for one member of the dyad. For example, the actor effect for wives is moderated by years married, but the husband's actor effect is not, or that the moderator amplifies the actor effect of one member and reduces the actor effect for the other member. Alternatively both members' partner effects could be moderated in a similar way, there could be moderation for only one member, or the two members' partner effects could be moderated in opposite directions. Stroud and colleagues (2010) found couple moderation models for both members of married couples—husbands' and wives' own and their partners' negative emotions had less of an impact on their marital dissatisfaction as the length of the marriage increased.

### **Mixed Moderator**

The presence of a mixed moderator greatly complicates the analysis, yielding four moderator effects with indistinguishable dyads and eight with distinguishable. When the moderator is mixed, there are really two variables being added—the actor’s moderator variable and the partner’s moderator variable.

**Indistinguishable dyads.** Here, there are four moderation effects. With a mixed moderator the four patterns—actor-only, partner-only, couple, and contrast—can occur for both the actor and partner *X variables* and the actor and partner *moderators*. Table 4 contains the patterns for the indistinguishable, mixed moderator case. In the actor moderator model (Actor *M* Only) both the actor and partner effects change across levels of the actor’s moderator variable, but the partner’s moderator variable does not moderate either effect. Alternatively, in the actor-only moderation model (Actor *X* Only), the actor effect is moderated by both the actor’s and partner’s moderator variables but the partner effect is not moderated by either variable. In sum, in the Actor *M* Only Model, actor and partner effects change across levels of the actor moderator, while in the Actor *X* Only Model the actor effect changes across levels of both the actor and partner moderator. In the partner moderator model (Partner *M* Only), only the partner’s moderator variable moderates both the actor and partner effects and in the partner only model (Partner *X* Only), the partner effect is moderated by both the actor’s and partner’s moderator variables but the actor effect is not moderated by either variable. Additionally there are two couple models and two contrast models for the mixed moderator indistinguishable dyads case. In the couple moderator model (Couple *M*) the actor and partner effects are both moderated to a similar degree by the actor’s moderator variable, and the actor and partner effects are both moderated to a similar degree by the partner’s moderator variable, but these last two moderation effects may be different from the first two moderation effects. In the couple moderation model

(Couple  $X$ ) the actor effect is moderated to a similar magnitude and in the same direction by both the actor and partner moderator variables, and the partner effect is moderated to a similar magnitude and in the same direction by both the actor and partner moderators. In the contrast moderator model (Contrast  $M$ ) the partner effect is moderated by each of the two moderators to a similar magnitude but in the opposite direction as the actor effect, whereas in the contrast moderation model (Contrast  $X$ ) the moderation of the actor effect by the actor and partner moderating variables is equal magnitude but in the opposite direction. The partner effect is also moderated by the actor and partner moderating variables in a contrast pattern, but it can be a different strength ( $a \neq b$ ) or direction ( $b$  can equal  $-a$ ).

The pattern for  $X$  can also be combined with the pattern for  $M$ . The final model needs to be described in terms of  $X$  and  $M$ . So for instance, the study might result in an actor-only moderator model—only the actor's moderator is used—with a contrast model for  $X$ —the actor and partner effects are moderated to the same extent but in the opposite direction by the actor moderator. A table with all of the possible combinations of  $X$  and  $M$  models can be found in the web appendix.

Many of these patterns can be found in the extant literature. For example, Vinkers, Finkenauer and Hawk (2011) found that newlyweds' perceptions of their partners' low disclosure increased their snooping to the extent that they distrusted their partners. In this study, only the actor effect was moderated by the actor's moderator variable corresponding to either the actor moderator only model, or the actor-only model where  $b = 0$ . So both  $X$  and  $M$  had actor-only patterns.

**Distinguishable dyads.** Here each member of the dyad can have a separate moderation model (see Table 5). For example, the first dyad member can have the partner-only model

whereas the second member has the actor-only model, such as in Caughlin and Huston (2002) where they found that the effect of the husband's demand/withdrawal pattern on both spouses' marital satisfaction was moderated by the wife's expression of affection but the effect of the wife's demand/withdrawal pattern was not. This is an actor *X* only-partner *M* only pattern for husbands and a partner *X* only-actor *M* only pattern for wives.

### **Basic Strategy for Testing Patterns in Moderation Models**

We propose the following general three-step strategy for testing moderation. The first step is to determine if dyads are distinguishable in terms of moderation. We need to show that distinguishability matters among the moderation effects. We do this by testing if the moderation effects vary across levels of the distinguishing variable either with an individual test for each interaction term or with an omnibus test. If the results of these tests do not indicate differences in moderation across levels of the distinguishing variable, then we can test for moderation patterns as if the dyad members are indistinguishable in the moderation effects. Note that even if the moderation effects are found to be indistinguishable, the actor and partner effects themselves might still be distinguishable.

Step two, assuming we do find distinguishability on any of the moderation effects, is to find the best pattern for both members of the dyad. There are two ways to accomplish this, first, we might test to see if there is the same pattern for the two members but that pattern varies in strength. For instance, we might have a couple *M* pattern for both members but it is stronger for wives than for husbands—the four models in Table 3 or the eight models in Table 5 would be estimated, and the best fitting (see criteria below) model would be selected. Second, we might want to allow for there to be a different pattern for each of the two members. For instance, there is a couple pattern for wives and a contrast pattern for husbands. To accomplish this efficiently,

we might find the best pattern for one member while assuming an unrestricted model for the other member, then reverse the process for the other member—thus, finding the best fitting pattern for each member separately. The choice between these two options should be clear from the unrestricted estimates obtained from the models estimated in the first step; however, one needs to be careful to avoid capitalizing on chance especially when different models are chosen for the two members. If different patterns are chosen, there should be a theoretical rationale for this choice.

Finally, step three is to choose the best fitting model. When testing for a pattern, ideally four things should happen if it is the best pattern: First, the candidate pattern model should fit as well as the model in which there are no restrictions on the coefficients (i.e., all moderator effects free), a model we call the *unrestricted model*. Second, the model fit of the candidate pattern model should be better than the fit of a model that assumes no moderation at all (i.e., all moderator effects set to zero). Third, the coefficient(s) for the pattern should be robust which is ordinarily determined by a test of statistical significance. Fourth, the fit of the candidate pattern model should be the best relative to the fit of the other plausible pattern models. We refer to these as the *Four Criteria* of a good fitting pattern model.

For a fit index, we suggest using the sampling error adjusted Bayesian information criterion or SABIC where  $N$  refers to the number of dyads, not the number of persons. We use the SABIC because it can be used for saturated models, something which is not possible for other fit indices (e.g., the RMSEA). Not all programs calculate SABIC, but it can be calculated given the  $\chi^2$  statistic as  $\chi^2 + \ln[(N + 2)/24][p]$ , where  $\ln$  is the natural logarithm,  $N$  is the number of dyads, and  $p$  is the number of free parameters in the model. If MLM is used,  $\chi^2$  is replaced by the deviance, i.e.  $-2 \times \text{Log Likelihood}$  (sometimes labeled as  $-2LL$ ).

To estimate the couple and contrast models, two different strategies are available. First, some MLM programs (e.g., HLM and SAS) and all SEM programs allow the user to place contrasts or equality constraints on the coefficients. Second, one can have the distinguishing variable interact with the sum of the actor and partner variables for the couple model or the difference between the actor and partner variables for the contrast model. For instance, for the couple model the sum, or  $X_1 + X_2$ , is computed and this term interacts with the distinguishing variable. For the contrast model the difference score,  $X_1 - X_2$ , interacts with the moderator. If these interaction terms are statistically significant, then there is a different couple or contrast model for the two dyad members. If it is not statistically significant but the main effect of the sum or contrast is, then the two dyad members have the same model. With SEM, estimation of three of the four patterns—actor-only, partner-only and couple—is straight-forward: one fixes the relevant path to zero or to be equal to another path in the model. However, some SEM programs (e.g., Amos) do not allow the constraint required by the contrast model and a phantom variable is needed to force that constraint. A phantom variable is a latent variable without a disturbance that is added to a model force some sort constraint, but it has no theoretical interpretation. For more details, on how phantom variables can be used to estimate the contrast model, see the web appendix.

### **Illustrations**

We illustrate the application of the APIMoM first with a between-dyads variable moderator and second with a mixed variable moderator. We use data from The 500 Family Study (1998-2000: United States; Schneider & Waite, 2008), which investigated middle class, dual-career families living in the United States.



### Between-Dyads Moderator

For the model with a between-dyads moderator, we used happy with role responsibility as the outcome variable, depressive symptoms as the predictor, and time living together as the moderator. The variable happy with role responsibility, measured by the item “I am very happy with how we handle role responsibilities in our relationship,” could range from 1 (strongly disagree) to 5 (strongly agree). The depressive symptoms were assessed by the CES-D (Radloff, 1977) which has a theoretical range of 0 to 60 with higher scores indicating more depressive symptoms. We divided the variable Years Lived Together by 10 to turn it into decades together—it ranged from 0.08 to 3.35 decades. There were 290 heterosexual couples who provided complete data for the example variables. We centered the moderator and predictors using the mean across husbands and wives for depression ( $M = 7.70$ ), decades together ( $M = 1.75$ ).

**Saturated model.** Treating the dyads as distinguishable, we used SEM to estimate first the saturated model whose estimates are presented in Table 6. We see that all four actor and partner effects are negative and statistically significant. People who are depressed and who have depressed partners report that they are unhappy with the role responsibility. When we look at the moderating effects of decades together, we see that three of the four interactions are negative, the one positive effect being husband’s actor effect by moderator. Three of the effects are statistically significant, the one not significant being the husband to wife partner effect by moderator.

**Submodels.** Following the strategy outlined above, we first tested whether the two interactions differed by gender by fitting two submodels. Table 7 includes the unrestricted model, the model with no moderation effects. We found that the interactions differed by gender

for actor ( $\chi^2(1) = 12.905, p < .001$ ) but not for partner ( $\chi^2(1) = 0.326, p = .568$ ) and the combined test was also statistically significant ( $\chi^2(2) = 13.535, p = .001$ ). In the next step we tested for separate patterns for wives and husbands. The estimates of the interaction effects suggest a couple pattern for wife and contrast pattern for husband. Table 7 also includes results for the wife couple model, the husband contrasts, and finally the wife couple with husband contrast model. Using our Four Criteria, we see that the wife couple husband contrast model is the best fitting model. It has the smallest SABIC, its coefficients are significant, it fits as well as the unrestricted model, better than the model with no coefficients, and better than models with other patterns. The predicted structural equation of this simpler model for wives is

$$\hat{Y}_w = 3.741 - 0.025X_w - 0.035X_h - 0.006M_w - 0.022XM_w - 0.022XM_h \quad (4)$$

and for husbands it is

$$\hat{Y}_h = 4.037 - 0.032X_h - 0.018X_w - 0.027M_h + 0.022XM_h - 0.022XM_w \quad (5)$$

For wives, the longer the couple has lived together the stronger the effect of her own and his depression on her happiness. However, for husbands, the pattern is very different. The longer the two have lived together the greater the effect of her depression relative to his depression on his unhappiness.

As seen in Figure 3, for couples who have recently gotten together, with one exception, depression of either spouse has little or no effect on happiness. The one exception is the effect of husband's depression on his own happiness which is negative: More depressed husbands are unhappier. For those who have been in long-term relationships, depression of both persons decreases happiness; however, for husbands, their own depression has little or no effect on their own happiness.

### Mixed Moderator

For the model with a mixed moderator, we used marital satisfaction as the outcome, work-family conflict as the predictor, and degree of depressive symptoms as the moderator. Marital satisfaction was assessed by the ENRICH marital inventory (Olson, Fournier, & Druckman, 1983). The composite score of the 15 items could range from 15 to 50 with higher scores reflecting higher satisfaction. Work-family conflict was assessed by the item “How often do you feel that work roles and family roles conflict?” rated on a five point scale with range of 0 (never) to 4 (almost always). Depressive symptoms were again measured by the CES-D. A total of 218 heterosexual couples provided complete data on the variables. We centered both the predictor and moderator using the mean across husbands and wives ( $M = 2.31$  for work-family conflict and  $M = 8.07$  for depression).

**Saturated Model.** First, we estimated the saturated model treating the dyads as distinguishable (see Table 8). Both actor effects and partner effects of depressive symptoms on satisfaction are negative and statistically significant. That is, husband’s and wife’s satisfaction seem to be affected by one’s own and the partner’s depressive symptoms. Of the eight interaction effects, three are statistically significant, the wife’s actor effect is moderated by her own and by her partner’s depressive symptoms and the partner effect of work-family conflict from the wife to the husband is moderated by the wife’s depressive symptoms. That is, the association between wife’s work-family conflict and her own marital satisfaction depends on her own and the partner’s depressive symptoms and the association between the wife’s work-family conflict and the husband’s satisfaction depend on her depressive symptoms.

We followed our recommended strategy and fitted the unrestricted model and the model with no effects from the interaction terms. The fit measures and interaction estimates are in Table

9. First we tested individually whether the four interactions differed by gender. All submodels showed a good fit but the one with the partner effects moderated by the partner depressive symptoms constrained to equality. The model with equality constraints on all pairwise interaction effects that did not differ by gender showed good fit. Using this model, the predicted equation for wives is

$$\hat{Y}_w = 36.525 + 0.171X_w - 0.790X_h - 0.444M_w - 0.205M_h + 0.221X_wM_w - 0.160X_wM_h - 0.116X_hM_w + 0.054X_hM_h \quad (6)$$

and for husband it is

$$\hat{Y}_w = 37.057 - 1.166X_h + 0.188X_w - 0.375M_h - 0.281M_w + 0.221X_hM_h - 0.160X_hM_w - 0.116X_wM_h + 0.271X_wM_w. \quad (7)$$

Next, we tested for separate patterns in this simplified model. The estimates of the interaction effects suggests four specific patterns: A couple pattern for the actor  $X$  with partner  $M$  effect (-0.160) and the partner  $X$  with actor  $M$  interaction effect (-0.116) and for the actor  $X$  with actor  $M$  effect (0.221) and the wife partner  $X$  with wife Partner  $M$  effect (0.271), an actor  $X$  only pattern for the actor  $X$  with partner  $M$  effect (-0.160) and the partner  $X$  with partner  $M$  effect (0.054), and a contrast  $X$  pattern for the actor  $X$  with actor  $M$  effect (0.221) and the actor  $X$  with partner  $M$  effect (-0.116). We tested this four pattern separately and found evidence for each. Using again our Four Criteria, we find that all models suggesting a specific pattern are better fitting models than the models testing indistinguishability and the unrestricted model. Implying all those patterns in addition to the indistinguishable effects we see that this model is the best model. The predicted equation for wives is

$$\hat{Y}_w = 36.484 + 0.168X_w - 0.733X_h - 0.448M_w - 0.207M_h + 0.201X_wM_w - 0.201X_wM_h - 0.201X_hM_w + 0X_hM_h \quad (8)$$

and for husbands it is

$$\hat{Y}_w = 37.122 - 1.110X_h + 0.095X_w - 0.383M_h - 0.275M_w + 0.201X_hM_h - 0.201X_hM_w - 0.201X_wM_h + 0.201X_wM_w. \quad (9)$$

Figure 4 illustrates how work-family conflict and marital satisfaction related to each other as a function of wives' and husbands' depression. Both wives and husbands actor effects become more positive with an increase in one's own depression. The effect from wives to husbands becomes also more positive with an increase of wives depression. The effect of husbands work-family conflict on her marital satisfaction is negative and independent of the level of husbands' depression. Wives and husbands actor effect become more negative with an increase in the partners level of depression. Likewise, the both partner effects become more negative with an increase of one's own depression.

We conclude that negative effects of work-family conflict on marital satisfaction in couples is exacerbated when the partners are depressed.

### Conclusion

With the goal of describing systematically how moderation can be incorporated into the APIM, we have limited the models presented to include a single  $X$ ,  $Y$ , and  $M$ . As with any model, we can make it more complicated by adding more variables—additional moderators and covariates. Furthermore, Lederman, Macho and Kenny (2011) describe in detail how mediation models can be tested within the APIM. Combining these two models, we also could have added moderated mediation or mediation moderation. No doubt the reader is grateful that we have not added these complications, but they could each be added in a relatively straightforward fashion.

Because our focus was on moderation effects we have not talked in any detail about the main effects in these models. Patterns can be found among the main effects just as with the

moderation effects and it may be theoretically important to determine if the main effects pattern is consistent with moderation patterns. For example, if the moderator effects show a couple model, then perhaps the main effects are also couple level.

We hope that this paper has provided helpful information about this important but neglected topic. Most APIM papers examine moderation—even by simply including a distinguishing variable—and we hope that we have provided the tools to make this effort easier and the possibilities of these models clearer.

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Footnotes

<sup>1</sup>We thank Tony Kong who suggested this to us.

<sup>2</sup>It is possible that there might be a pattern with a distinguishable variable where the effects refer to one member of the dyad. For instance, with gender as the distinguishing variable, it might be that the moderator interacts with actor and partner effects for males and not females or vice versa.

Table 1

*Patterns of Basic Models for Distinguishable Dyads (Dichotomous Within-Dyads Moderator)*

Effect	Actor-only	Partner-only	Couple	Contrast
Role 1				
Actor	A	0	a	a
Partner	0	a	a	-a
Role 2				
Actor	B	0	b	b
Partner	0	b	b	-b

*Note.* If dyad members are indistinguishable, then  $a = b$ .

Table 2

*Patterns of Moderation Models for Indistinguishable Dyads with a Between-Dyads Moderator*

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Moderation Effect	Actor-only	Partner-only	Couple	Contrast
Actor by Moderator	a	0	a	a
Partner by Moderator	0	a	a	-a

---

Table 3

*Patterns of Moderation Models for Distinguishable Dyads with a Between-Dyads Moderator*

Moderation Effect	Actor-only	Partner-only	Couple	Contrast
Role 1				
Actor by Moderator	a	0	a	a
Partner by Moderator	0	a	a	-a
Role 2				
Actor by Moderator	b	0	b	b
Partner by Moderator	0	b	b	-b

*Note.* If  $a = b$ , this table becomes the same as that in Table 2.

Table 4

*Patterns of Moderation Models for Indistinguishable Dyads with a Mixed Moderator*

Moderation Effect	Actor <i>M</i> Only	Partner <i>M</i> Only	Actor <i>X</i> Only	Partner <i>X</i> Only	Couple <i>M</i>	Couple <i>X</i>	Contrast <i>M</i>	Contrast <i>X</i>
Actor <i>X</i> by Actor <i>M</i>	a	0	a	0	a	a	a	a
Partner <i>X</i> by Actor <i>M</i>	b	0	0	a	a	b	-a	b
Actor <i>X</i> by Partner <i>M</i>	0	A	b	0	b	a	b	-a
Partner <i>X</i> by Partner <i>M</i>	0	B	0	b	b	b	-b	-b

Table 5

*Patterns of Moderation Models for Distinguishable Dyads with a Mixed Moderator*

Moderation Effect	Actor <i>M</i> Only	Partner <i>M</i> Only	Actor <i>X</i> Only	Partner <i>X</i> Only	Couple <i>M</i>	Couple <i>X</i>	Contrast <i>M</i>	Contrast <i>X</i>
Role 1								
Actor <i>X</i> by Actor <i>M</i>	a	0	a	0	a	a	a	a
Partner <i>X</i> by Actor <i>M</i>	b	0	0	a	a	b	-a	b
Actor <i>X</i> by Partner <i>M</i>	0	A	b	0	b	a	b	-a
Partner <i>X</i> by Partner <i>M</i>	0	B	0	b	b	b	-b	-b
Role 2								
Actor <i>X</i> by Actor <i>M</i>	c	0	c	0	c	c	c	c
Partner <i>X</i> by Actor <i>M</i>	d	0	0	c	c	d	-c	d
Actor <i>X</i> by Partner <i>M</i>	0	C	d	0	d	c	d	-c
Partner <i>X</i> by Partner <i>M</i>	0	D	0	d	d	d	-d	-d



Table 6

*Saturated Model with a Between-Dyads Moderator<sup>a</sup>*

Effect	Coefficient	SE	p
Intercept			
Husband	3.736	0.167	<.001
Wife	4.082	0.137	<.001
Actor Effects of Depression			
Husband	-0.032	0.008	<.001
Wife	-0.026	0.009	.006
Partner Effects of Depression			
Wife to Husband	-0.018	0.008	.021
Husband to Wife	-0.036	0.009	<.001
Decades Together			
Husband	-2.611	7.211	.717
Wife	-0.131	8.767	.988
Actor Depression by Decades			
Husband	0.024	0.010	.019
Wife	-0.031	0.011	.005
Partner Depression by Decades			
Wife to Husband	-0.023	0.009	.011
Husband to Wife	-0.014	0.012	.244

Note. <sup>a</sup>The outcome variable is Happiness with Role Responsibility

Table 7

*Moderation Submodels with the Distinguishable Dyads with a Between-Dyads Moderator*

Submodel	Effect Interacting with Decades Together				Fit			
	Wife Actor	Wife Partner	Husband Actor	Husband Partner	$\chi^2$	df	p	SABIC
Interaction effects set to 0	0	0	0	0	19.922	4	.001	107.38
Unrestricted model	-0.031*	-0.014	0.024*	-0.023*	--	0	--	87.45
Wife only couple, husband unrestricted	-0.022***	-0.022**	0.022*	-0.022***	0.999	2	.607	83.46
Husband only contrast, wife unrestricted	-0.030**	-0.021***	0.021***	-0.021***	0.353	2	.838	82.81
Wife couple husband contrast	-0.022***	-0.022***	0.022***	-0.022***	1.002	3	.801	80.96

*Note.* In the models wife only couple, husband only contrast, and wife couple husband contrast, the partner interactions effect were equated to be equal.

Table 8

*Saturated Model with a Mixed Moderator*

Effect	Coefficient	SE	p
Intercept			
Husband	37.173	0.417	<.001
Wife	36.441	0.422	<.001
Actor Effect			
Husband	-1.219	0.579	.035
Wife	0.204	0.469	.663
Partner Effect			
Wife to Husband	0.164	0.463	.724
Husband to Wife	-0.830	0.586	.157
Moderator Actor Effect			
Husband	-0.372	0.059	<.001
Wife	-0.457	0.064	<.001
Moderator Partner Effect			
Wife to Husband	-0.271	0.063	<.001
Husband to Wife	-0.197	0.060	.001
Actor X by Actor M			
Husband	0.117	0.083	.156
Wife	0.294	0.069	<.001
Actor X by Partner M			
Husband by Wife	-0.070	0.092	.443
Wife by Husband	-0.210	0.068	.002
Partner X by Actor M			
Wife to Husband by Husband	-0.076	0.067	.256
Husband to Wife by Wife	-0.161	0.093	.082
Partner X by Partner M			
Wife to Husband by Wife	0.268	0.068	<.001
Husband to Wife by Husband	-0.059	0.084	.479

*Note.*  $Y$  = marital satisfaction,  $X$  = work-family conflict,  $M$  = Depressive symptoms.

Table 9

*Estimates and Fit Statistics for the Moderation Submodels with a Mixed Moderator*

Submodel	Effect								Fit			
	Actor <i>X</i> by Actor <i>M</i> (Husband)	Actor <i>X</i> by Actor <i>M</i> (Wife)	Actor <i>X</i> (Husband) by Partner <i>M</i> (Wife)	Actor <i>X</i> (Wife) by Partner <i>M</i> (Husband)	Partner <i>X</i> (Wife to Husband) by Actor <i>M</i> (Husband)	Partner <i>X</i> (Husband to Wife) by Actor <i>M</i> (Wife)	Partner <i>X</i> (Wife to Husband) by Partner <i>M</i> (Wife)	Partner <i>X</i> (Husband to Wife) by Partner <i>M</i> (Husband)	$\chi^2$	<i>df</i>	<i>p</i>	<i>SABIC</i>
Interaction effects set to 0	0	0	0	0	0	0	0	0	36.660	8	<.001	12196.1
Unrestricted model	0.117	0.294***	-0.070	-0.210**	-0.076	-0.161	0.268***	-0.059	--	0	--	12177.1
Step 1: Testing indistinguishability												
Equal Actor <i>X</i> by Actor <i>M</i>	0.222***	0.222***	-0.074	-0.209**	-0.098	-0.145	0.254***	-0.031	2.929	1	.087	12178.8
Equal Actor <i>X</i> by Partner <i>M</i>	0.118	0.291***	-0.162**	-0.162**	-0.066	-0.191*	0.279***	-0.075	1.598	1	.206	12176.5
Equal Partner <i>X</i> by Actor <i>M</i>	0.126	0.287***	-0.052	-0.216**	-0.104	-0.104	0.269***	-0.060	0.600	1	.439	12175.5
Equal Partner <i>X</i> by Partner <i>M</i>	0.171*	0.269***	-0.042	-0.252***	-0.075	-0.169	0.140*	0.140*	9.920	1	.002	12184.8
All Equal but Partner <i>X</i> by Partner <i>M</i> Interaction	0.221***	0.221***	-0.160**	-0.160**	-0.116*	-0.116*	0.271***	-0.054	5.101	3	.165	12175.6

Step 2: Testing specific patterns in the model with all equal but Partner X by Partner *M* Interaction

Actor X by Partner M and Partner X by Actor M Couple	0.223***	0.223***	-0.183**	-0.183**	-0.183**	-0.183**	0.272***	-0.062	5.781	4	.216	12174.0
Actor X by Actor M and Partner X by Partner M (Husband) Couple	0.237***	0.237***	-0.161**	-0.161**	-0.118*	-0.118*	0.237***	-0.041	5.689	4	.224	12174.0
Actor X by Partner M and Partner X by Partner M (Wife) actor-only	0.236***	0.236***	-0.170**	-0.170**	-0.121*	-0.121*	0.277***	0	5.540	4	.236	12173.8
Actor X by Actor M and Actor X by Partner M Contrast	0.191***	0.191***	-0.191***	-0.191***	-0.126*	-0.126*	0.258***	-0.062	5.850	4	.211	12174.1
Final Model with all good-fitting constraints	0.201***	0.201***	-0.201***	-0.201***	-0.201***	-0.201***	0.201***	0	9.877	7	.196	12171.5

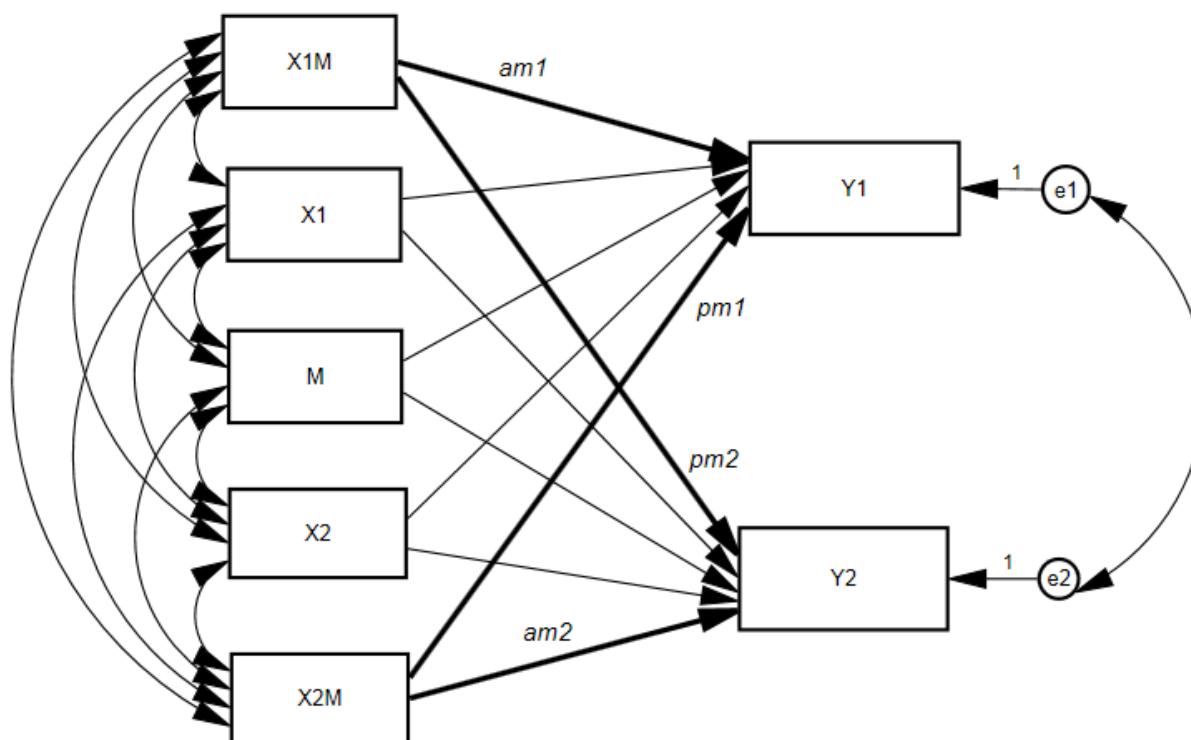


Figure 1. Structural Equation Model for APIM with a Between Dyads Moderator

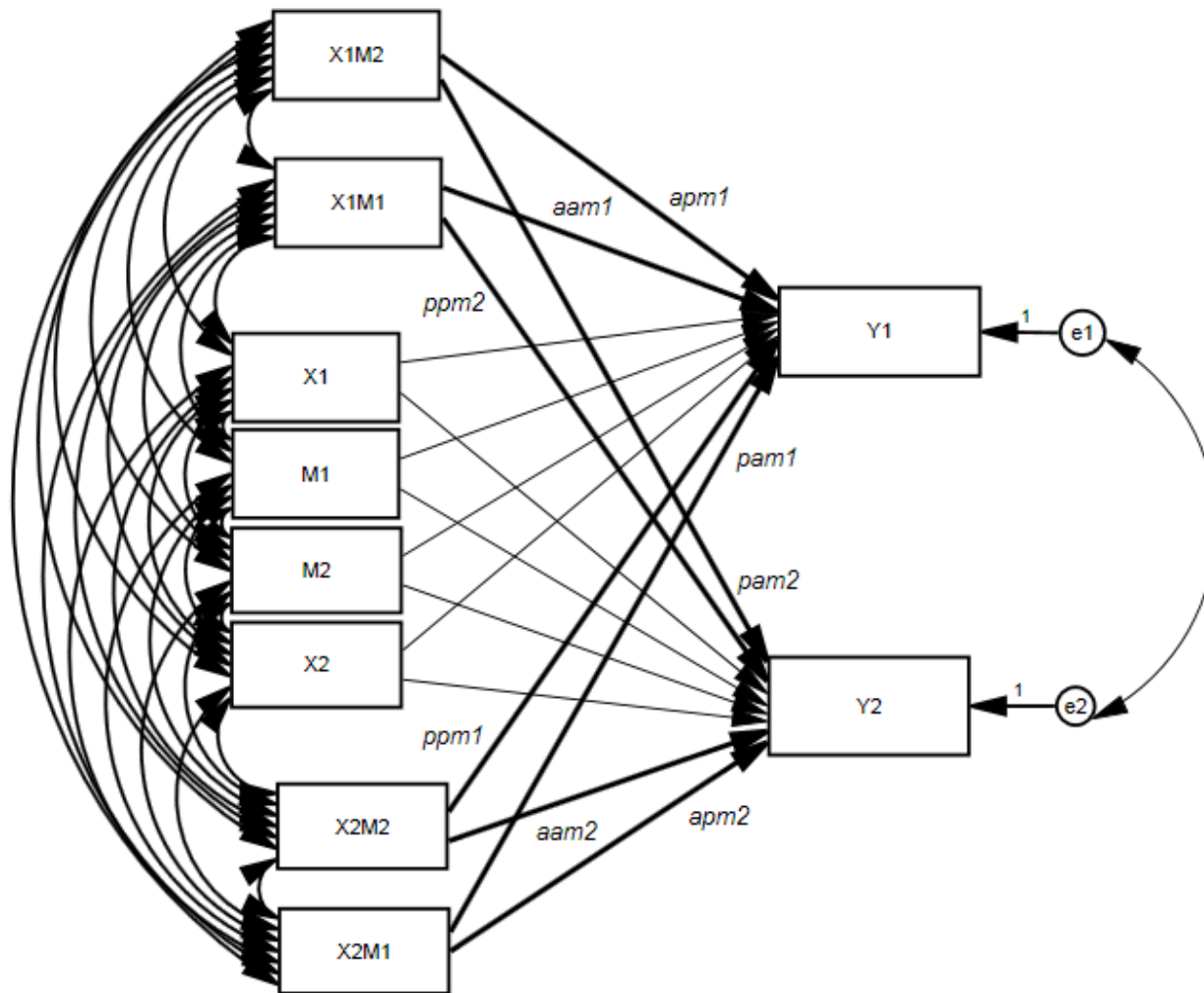


Figure 2. Structural Equation Model for APIM with a Mixed Moderator

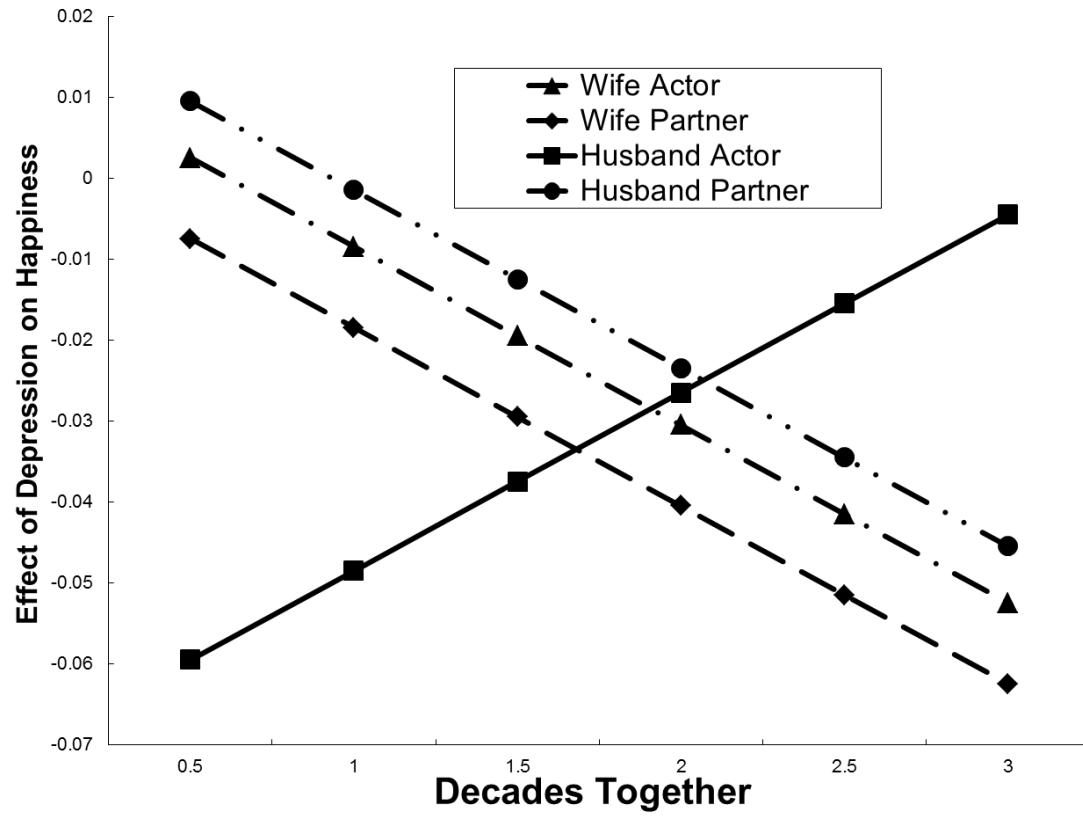


Figure 3. Actor and Partner Effects of Depression on Happiness for Wives and Husbands as a Function of the Number of Decades Together



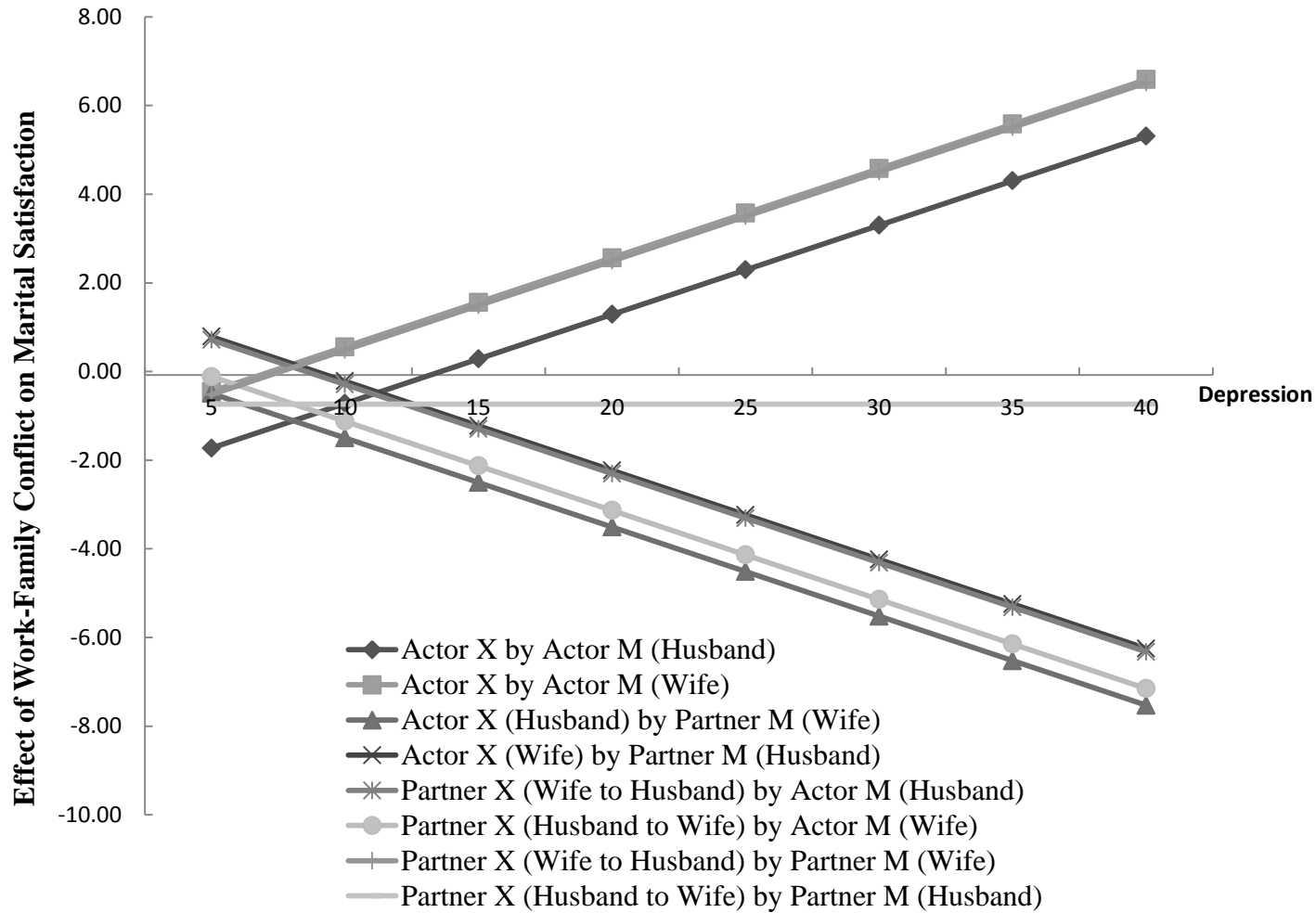


Figure 4. Actor and Partner Effects of Work-Family Conflict on Marital Satisfaction for Wives and Husbands as a Function of their Depression.