

# WOMEN'S AND MEN'S CAREER CHOICES IN ASTRONOMY AND ASTROPHYSICS

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# LONGITUDINAL STUDY OF ASTRONOMY GRADUATE STUDENTS

- Partnership between American Institute of Physics and American Astronomical Society (AAS)
- Includes everyone who was in graduate school in astronomy or astrophysics in the US, 2006-07
- Data have been collected from the same cohort of people in order to document individual career paths
- Three waves of data have been collected:
  - 2007-08
  - 2012-13 *five years later*
  - 2015-16 *eight years later*

# THIS ANALYSIS

- Second and third surveys
- limited to people who
  - completed PhDs at the time of the 2<sup>nd</sup> survey
  - were not postdocs at the time of the surveys

# LONGITUDINAL STUDY OF ASTRONOMY GRADUATE STUDENTS

- Result of Women in Astronomy Conference, 2003 in California, USA
- At that time, about 60% of younger members were women, and AAS wanted to know outcomes for these members.
- Would women have a higher attrition rate? Are women more likely to leave the field? If so, why?

# HYPOTHESIS

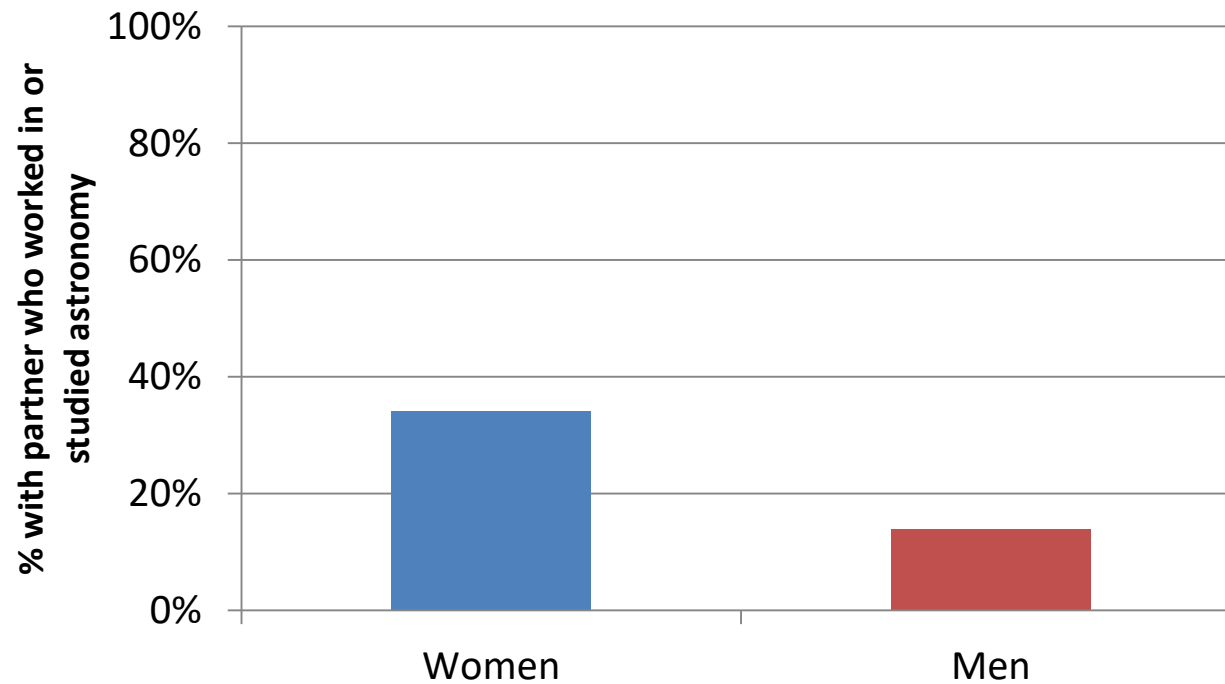
We hypothesized that women would be more likely to work outside of astronomy and physics. In other words, being female would have a direct effect on leaving the field, independent of other factors.

## IS WORKING IN OR OUT OF FIELD AFFECTED BY

- Being male or female (40% female respondents)
- Taking a postdoc
- *Two-body problem* (a work/family balance problem that refers to the difficulty of finding 2 jobs in same geographic area)
- Having a *mentor other than advisor*
- *Relationship with advisor*
- *Imposter syndrome* (at time of first survey)
- Time since degree

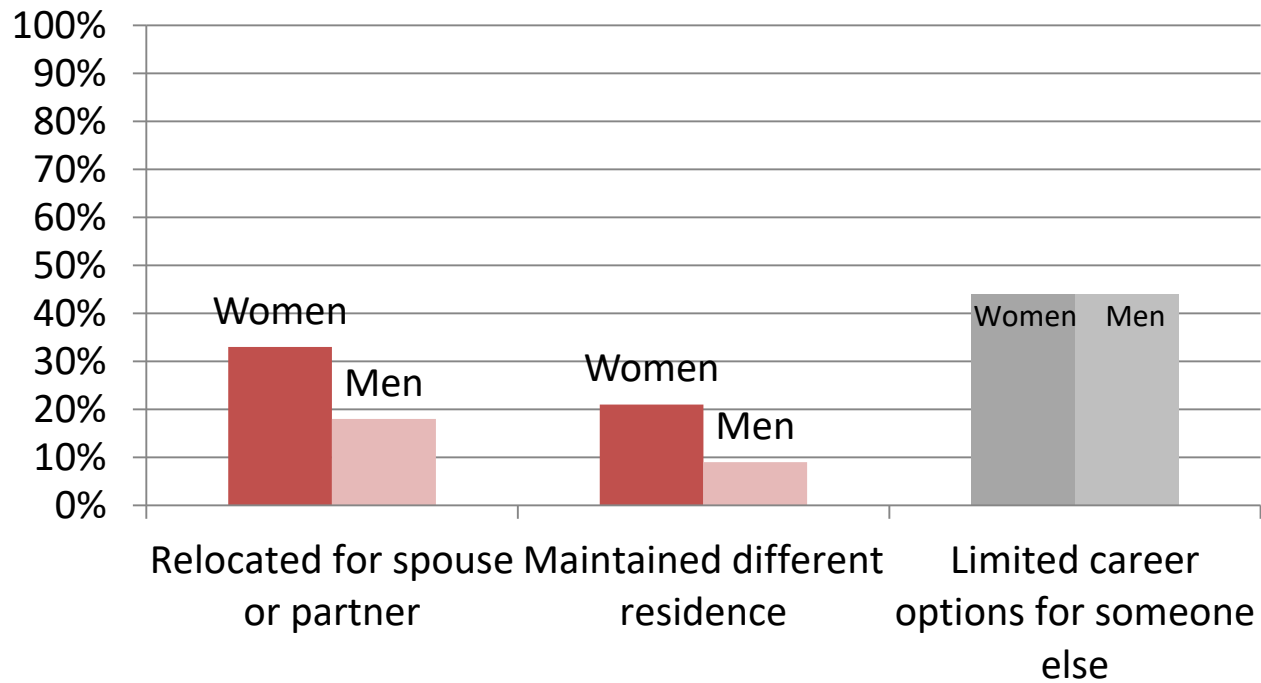
# SECOND SURVEY

## PARTNER IN ASTRONOMY



# SECOND SURVEY

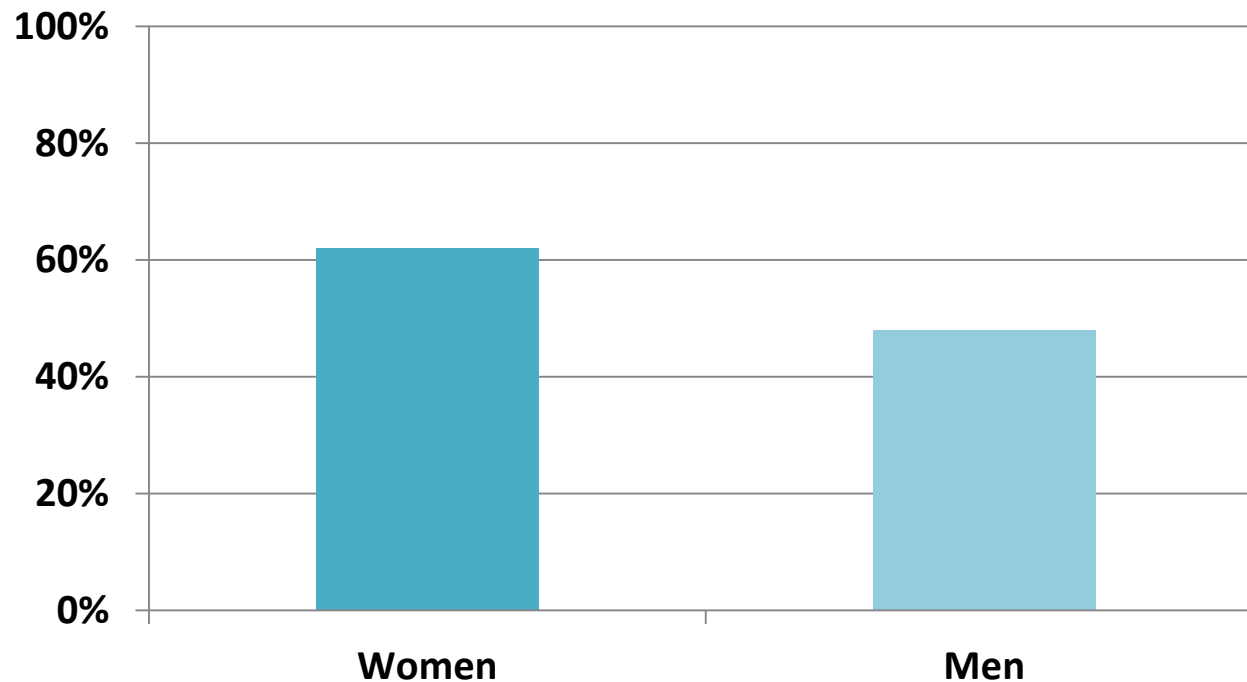
## TWO-BODY PROBLEM





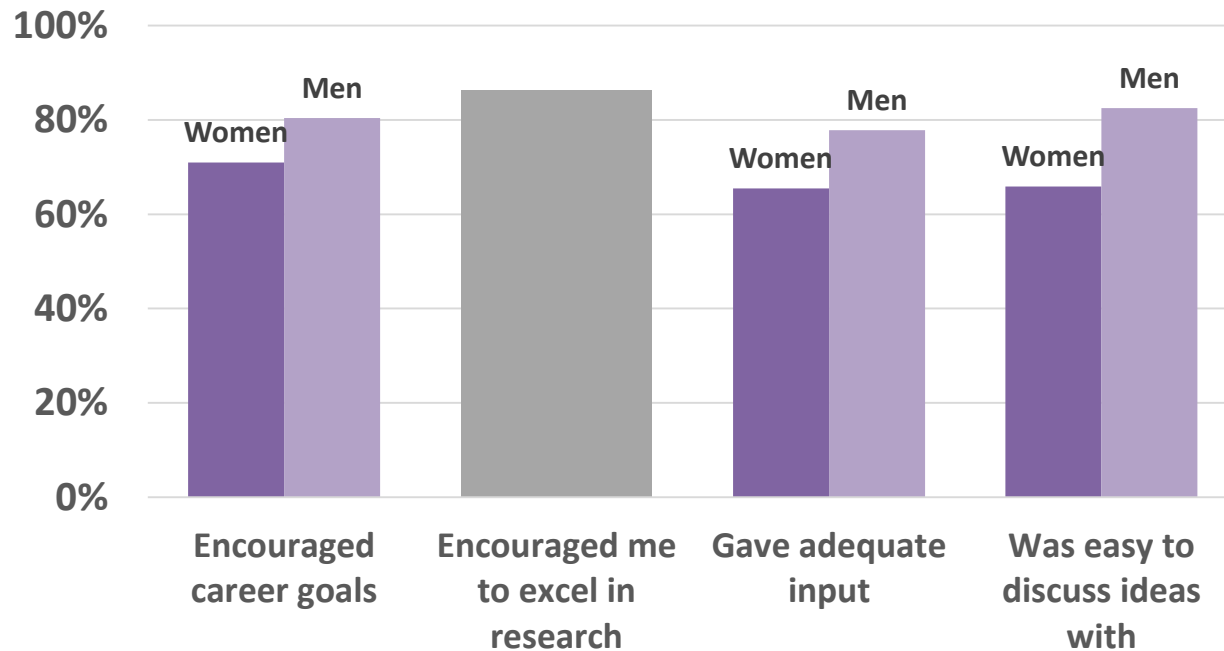
# SECOND SURVEY

## MENTOR OTHER THAN ADVISOR IN GRAD SCHOOL



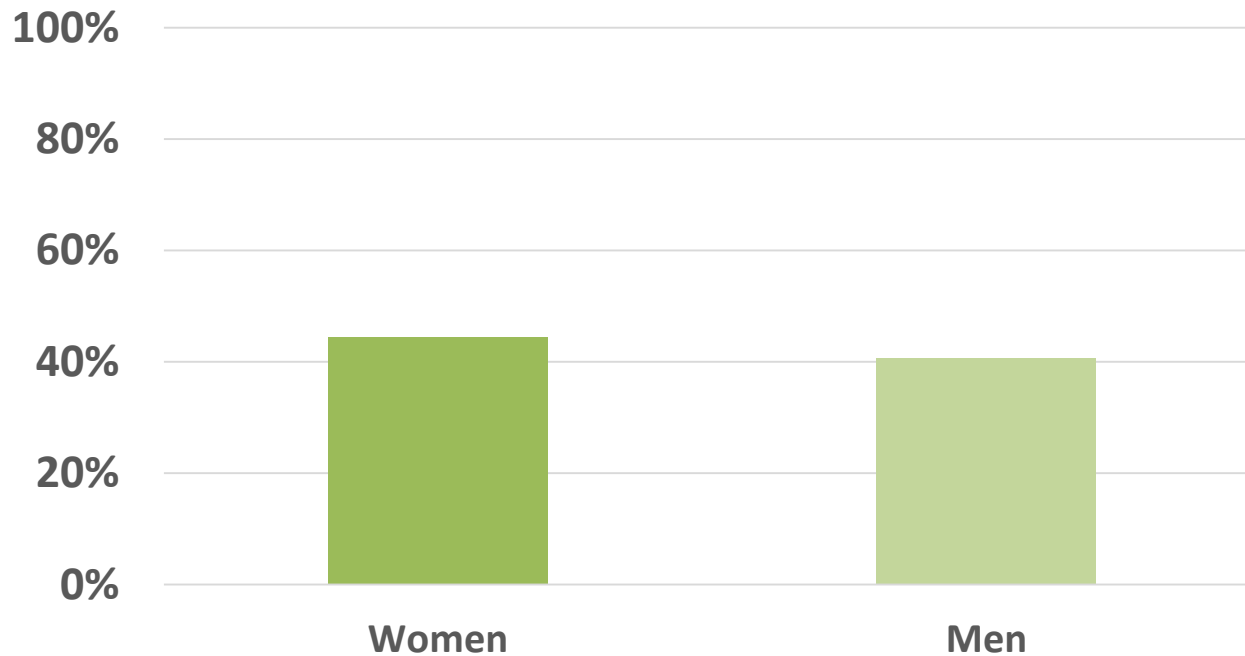
## SECOND SURVEY

### FOUR MEASURES OF ADVISOR RELATIONSHIP



# FIRST SURVEY

## IMPOSTER SYNDROME

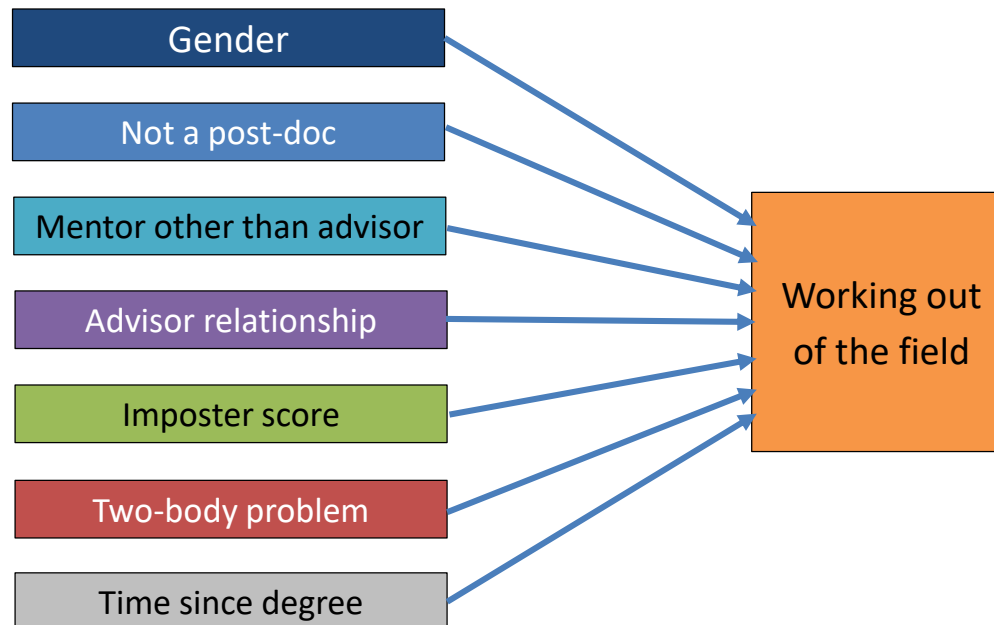


# HYPOTHESIS

We hypothesized that women would be more likely to work outside of astronomy and physics. In other words, being female would have a *direct* effect on leaving the field, *independent* of other factors.

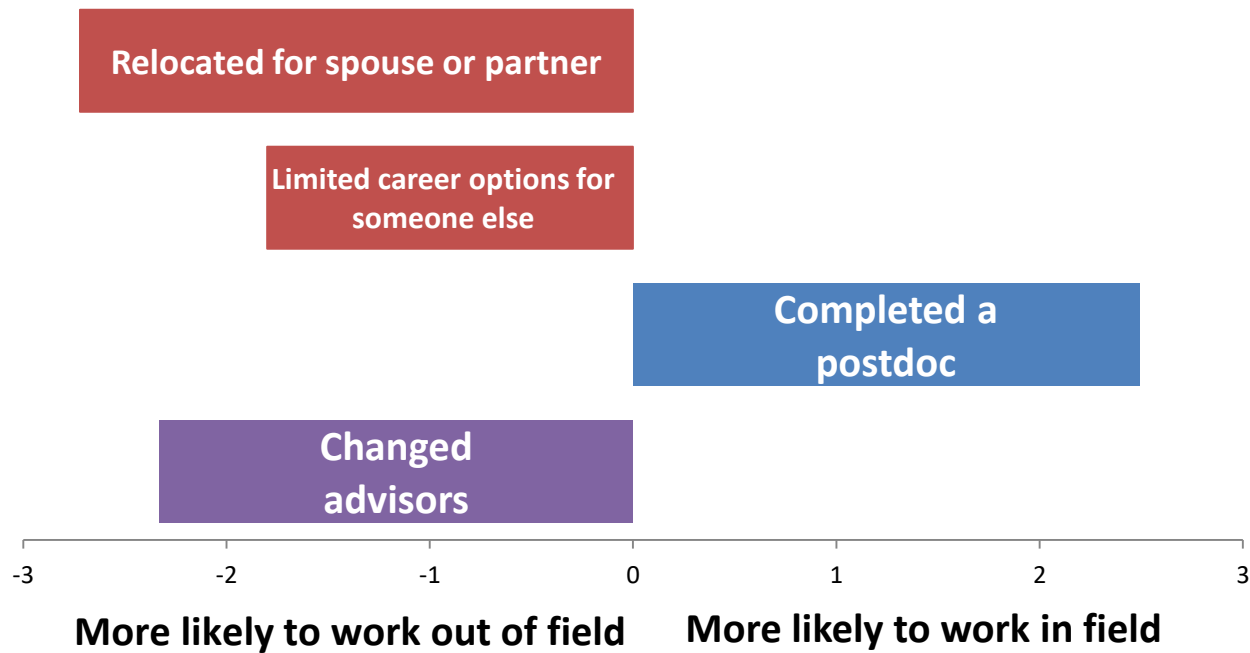
## SECOND SURVEY

# DOES BEING MALE OR FEMALE INDEPENDENTLY AFFECT OTHER VARIABLES IN MODEL?



# SECOND SURVEY

## FACTORS THAT INFLUENCE WORKING OUT OF FIELD



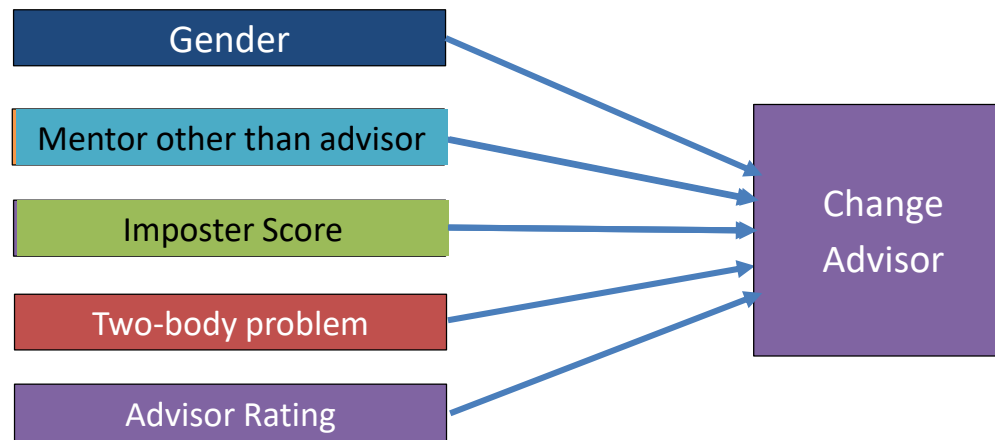
## ANOTHER HYPOTHESIS

- There may be indirect effects of gender on working out of field.
- In other words, women may be more likely to have experiences that increase the likelihood of working out of field.

# SECOND SURVEY

## TESTING INDIRECT EFFECTS OF GENDER

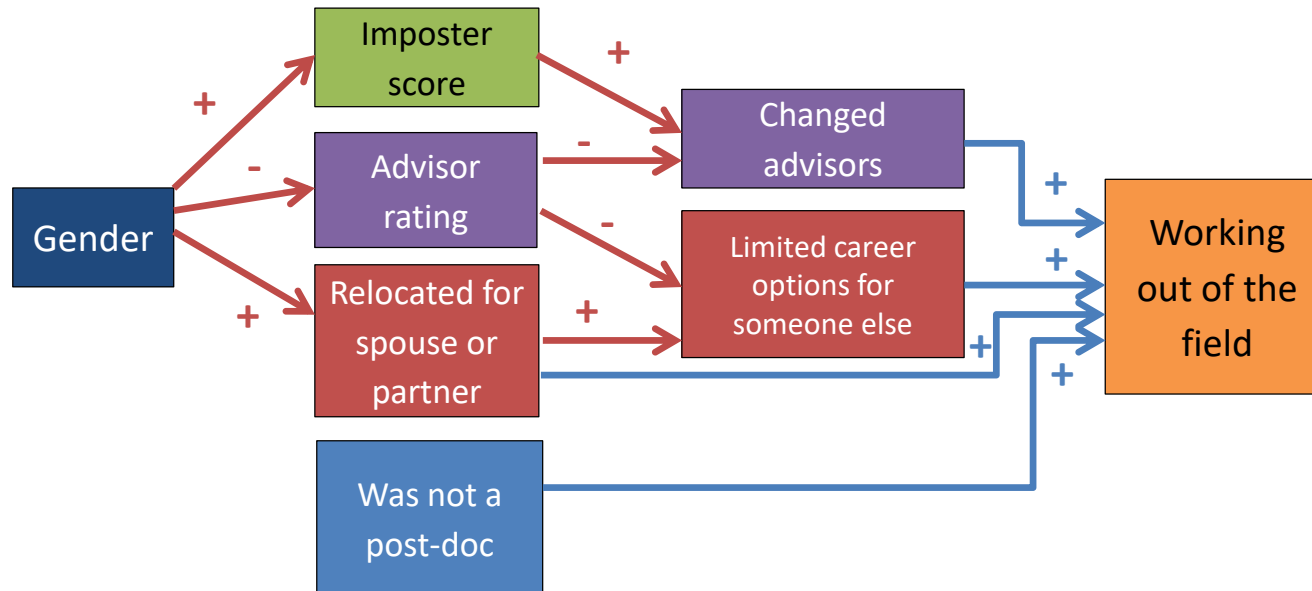
### EXAMPLE OF ONE MODEL





## SECOND SURVEY

### THE INDIRECT EFFECT OF GENDER ON WORKING OUT OF FIELD



## CONCLUSIONS FROM SECOND SURVEY

- We hypothesized that women would be more likely to work outside of astronomy and physics. In other words, being female would have a direct effect on leaving the field, independent of other factors.
- However, there is no direct effect of being female on working outside the field. The effect of being female comes through other factors.
- Women may be more likely to leave astronomy because
  - Women are more likely to report less than satisfactory advising.
  - Women are more likely to report two-body problems related to the need to find two jobs in the same geographic area for a spouse or partner.

## THIRD SURVEY, 2015

- What is it about the advising relationship that makes a difference?
- The 3<sup>rd</sup> survey has additional items about the advisor relationship.

## ADVISOR QUESTIONS, THIRD SURVEY (FROM AMERICAN CHEMICAL SOCIETY)

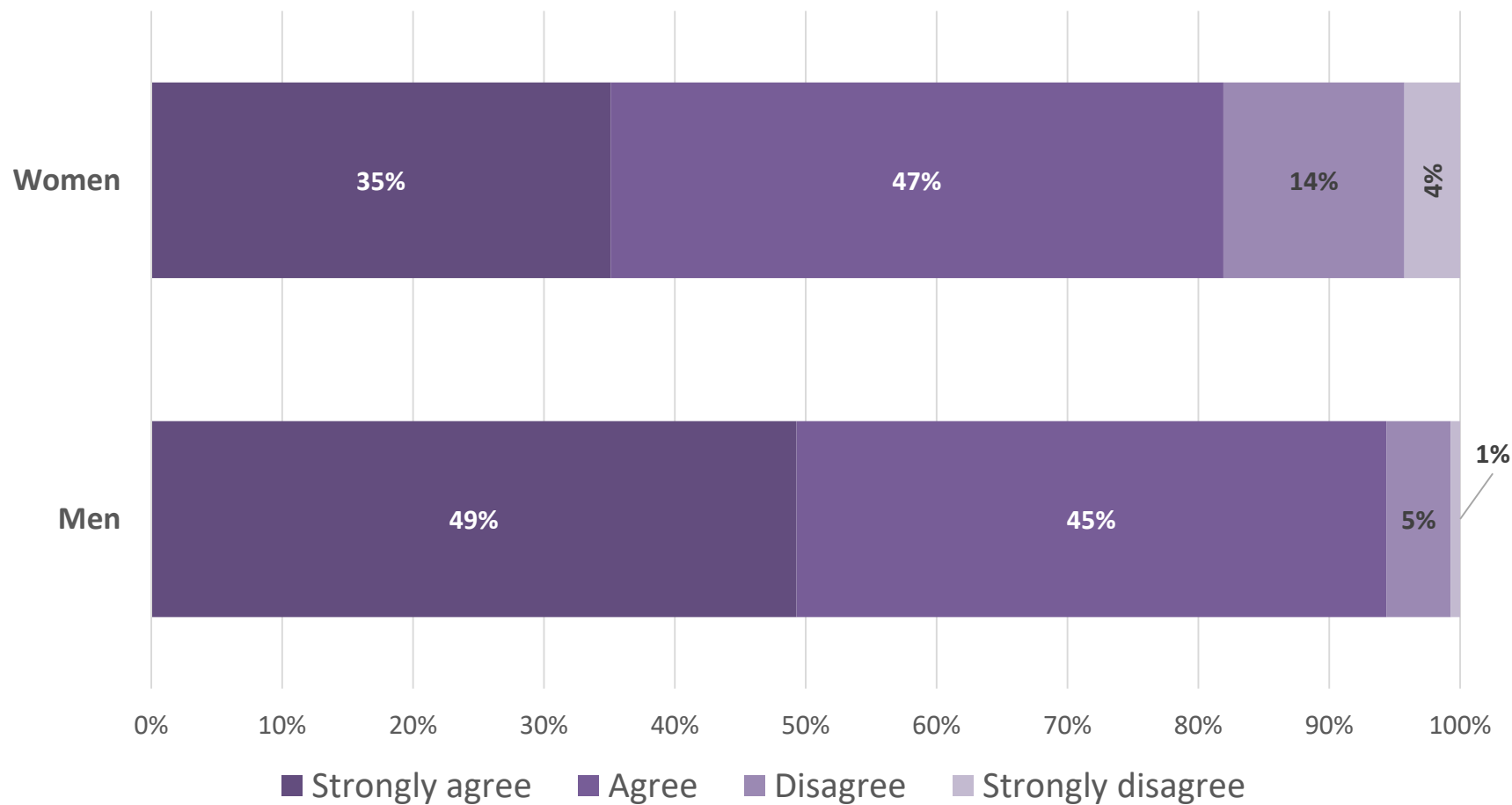
- Encourages me to present our research at scientific conferences
- Gives regular feedback on my research
- Gives the appropriate level of credit to me for my research contributions
- Engages me in writing grant proposals
- Provides information about academic career paths
- Provides information about non-academic career paths

## ADVISOR QUESTIONS, THIRD SURVEY (FROM AMERICAN CHEMICAL SOCIETY)

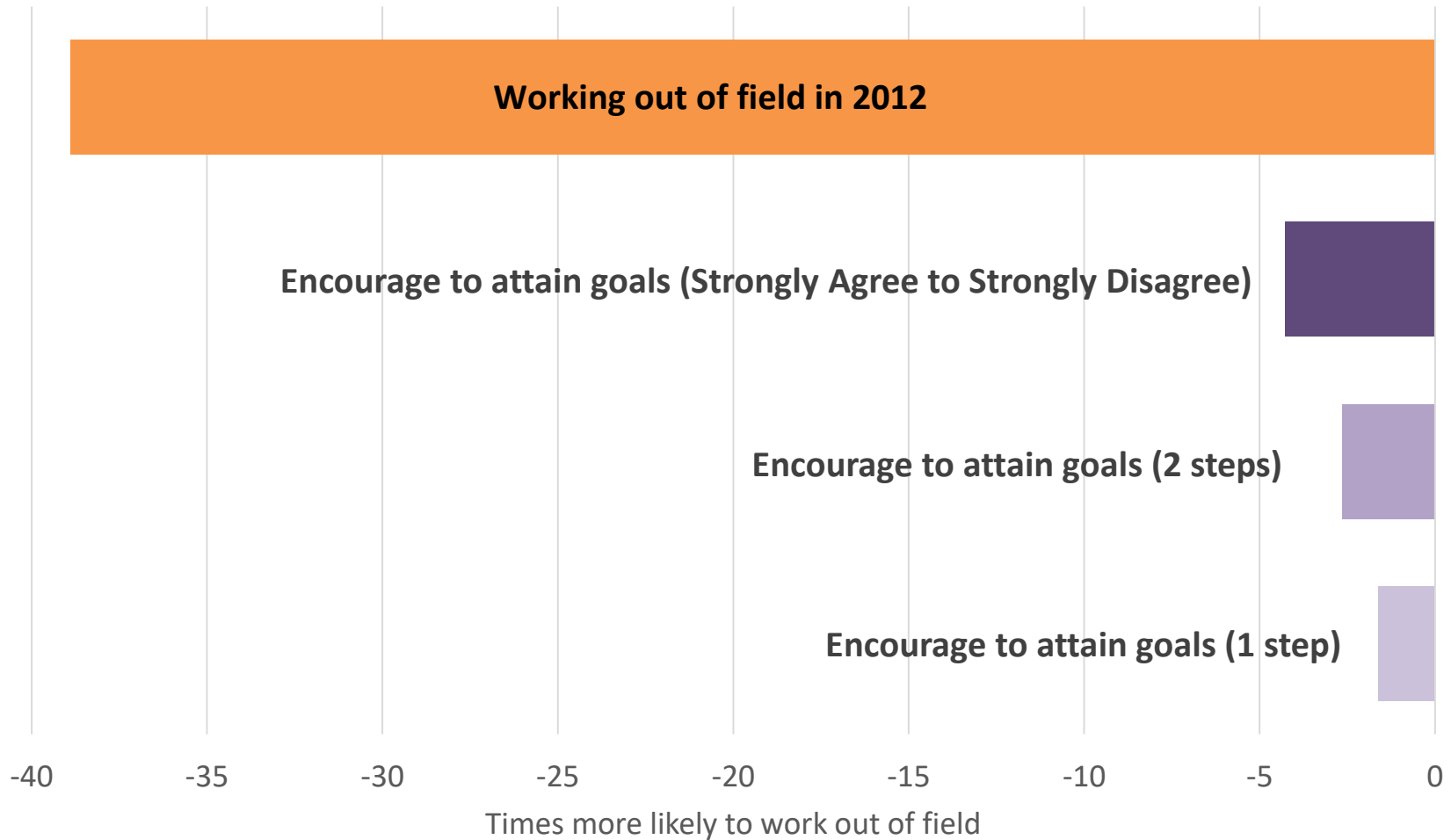
- Helps me to develop professional relationships
- Advocates for me
- Supports my career path of choice
- Models good professional relationships
- Encourages me to attain my goals
- Takes time to learn about my background, interests, and/or personal relationships

# THIRD SURVEY

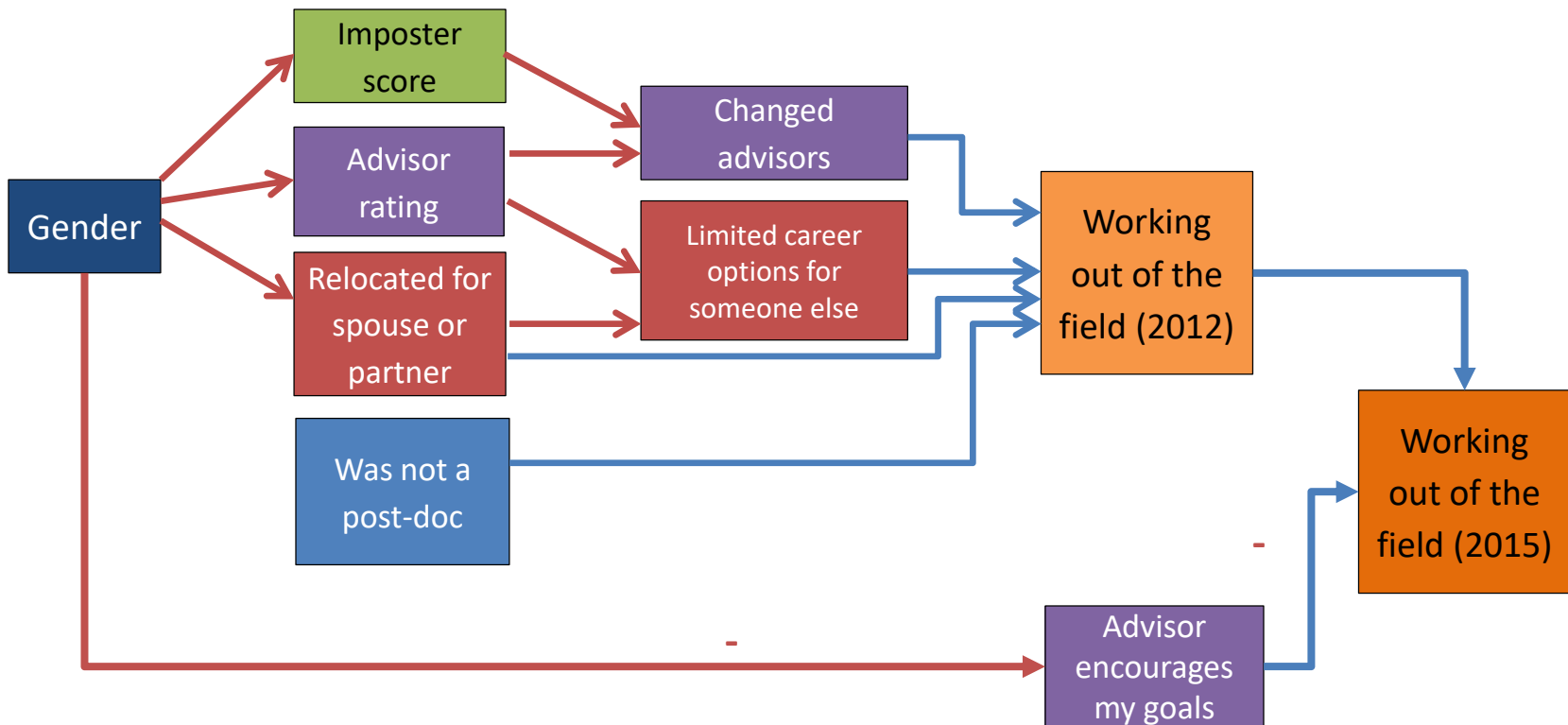
## MY ADVISOR ENCOURAGES ME TO ATTAIN MY GOALS



# FACTORS DIRECTLY AFFECTING WORKING OUT OF FIELD IN 2015



# THE INDIRECT EFFECTS OF GENDER ON WORKING OUT OF FIELD 2012 & 2015





## CONCLUSIONS FROM THIRD SURVEY

- There still is no direct effect of being female on working outside the field. The effect of being female comes through other factors.
- The 2015 survey found that the most important predictors of working out of field are
  - Having worked out of field previously
  - Reporting that your advisor did not encourage you to attain your goals
- In addition to the factors that contributed to working out of field in 2012, women may be more likely to leave astronomy because
  - Women are less likely to say that their advisor encouraged them to attain their goals.
  - Women were indirectly more likely to have worked out of field in 2012.

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For more information

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# OUTCOMES OF THOSE WITH PHDS, 2012-13

