



Gender Disparity in Academic Science: Modeling Salary and Satisfaction with Rewards

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Determinants of Reward Outcomes in Academic Science

- Reward Outcomes in Academic Science
 - **Salary** (Bellas, 1993; Fox, 1981)
 - **Satisfaction with Rewards** (Bilimoria et al, 2006; August and Waltman, 2004).
- **Several programs** initiated by NSF and other professional organizations to **enhance participation of women in science** (Long, 2001; NAP, 2006).
- The number of women earning science degrees and serving as academic science faculty. However, **gender disparities in rewards still remain** (NAP, 2001, 2006)
 - ❑ *Do **women earn lower salaries** compared to their male counterparts?*
 - ❑ *Are **women less satisfied with rewards** compared to their male counterparts?*
 - ❑ *How are **collaborative networks, productivity, marital status and parenthood** related to salary and satisfaction with rewards of men and women scientists in six fields of science and engineering?*

Two Explanations of Gender differences in Rewards

- **Deficit Model:** Women as a group receive **fewer opportunities** and as a result have worse career outcomes because **social structures fail to convert effort to rewards** (Sonnert, 1999; Etzkowitz et al, 2000)
- **Difference in Socialization: Three versions**
 - Women have **lower self expectations and lower ambition**, so they are less likely to expect that they are capable of receiving rewards.
 - Women have **lower expectations from the system of science with respect to rewards**. In other words, women do not expect the system to reward them equitably as compared to men
 - Women are exposed to messages that **science is traditionally a male field**, and constant exposure to these messages results in lower expectations (Sonnert and Holton, 1995; Kemelgor and Etzkowitz, 2001; Etzkowitz et al, 2000).
- Both explanatory models are closely intertwined and **reinforce** each other (Sonnert and Holton, 1996; Kemelgor and Etzkowitz, 2001; Etzkowitz et al, 2000).

Explanations of Reward Outcome: Salary

- **Publications:** As scholars publish more, they are more likely to enhance their **visibility** and recognition within the field. Greater visibility has been found to have a strong positive effect on salary (Leahy, 2007).
- **Collaborative Network Resources:**
 - A larger number of **collaborative network ties** may also reflect a greater level of **visibility and recognition**, which in turn leads to tangible assets such as rewards in the form of increase in salary (Merton, 1968; Rijnsoever et al, 2008).
 - **Introductions** to potential collaborators outside of the university and **Nominations** for awards represent **credentials** of the scientists which may help secure a higher level of reward from their department and institution (Lin, 1999).
 - **Senior** network ties may exert **influence** on the departments and institutions that play a critical role in making decisions about rewarding the individual (Etzkowitz et al, 2000; Lin, 1999).

H1: Scientists that produce more will earn higher salaries.

H2: Scientists receiving greater amounts of resources from their networks will earn higher salaries.

Explanations of Reward Outcome: Salary

- **Deficit Model** explains lower reward outcomes of women due to **fewer opportunities, and lower support** (Kemelgor and Etkowitz, 2001; Sonnert, 1999).
- Women experience **isolation**, have **lower access to professional networks**, women's networks **lack closeness and reciprocity** (Etkowitz et al, 2000).
- Women experience **collaboration as a junior partner** (Sonnert, 1995, 1999).
- Previous research found **salary of women scientists to be lower than their male counterparts even after controlling for years of experience and field** (Long, 2001; Bellas, 1993; Ginther, 2003).

H₃: Women's salaries will be lower than men's salaries.

H₄: Men scientists will receive greater salary benefits from science production than women scientists.

H₅: Men scientists will receive greater salary benefits from network resources than women scientists.



Gender differences in Satisfaction with Rewards: Deficit Model *and* Difference in Socialization Model

- Women are socialized to form perceptions and attitudes that serve to reduce their drive for rewards (Sonnert, 1999). These perceptions act as barriers for women in science (Sonnert and Holton, 1996).
- Women provide a **lower estimation of their ambition, and expectation**. Men, on the other hand are more self-promoting, and aggressive in their pursuit of rewards (Kemelgor and Etzkowitz, 2001) .
- Deficit model argues that since women's careers have been impeded by obstacles within science, they have adjusted their self expectations and ambitions downwards (Sonnert and Holton, 1996)

Gender differences in Satisfaction with Rewards: Deficit Model *and* Difference in Socialization Model

- **Women respond to structural barriers in science ineffectively** . Women's ineffective response strategies are less likely to help women secure rewards (Kemelgor and Etzkowitz, 2001) .
- Women **perceive themselves as being a poor fit** within the system of science. A poor fit is consistently been found to be associated with lower levels of satisfaction (Olsen, 1995).
- Because of deficits within the system of science *and* socialization barriers, **women may not perceive either publications or collaborators to help them secure rewards** (Kemelgor and Etzkowitz, 2001) .

H7: Women will be less satisfied with rewards compared to their male counterparts

H8: Collaborative network resources will positively affect men's satisfaction with rewards more than women's

H9: Publication productivity will positively affect men's satisfaction with rewards more than women's.

Survey Structure and Content

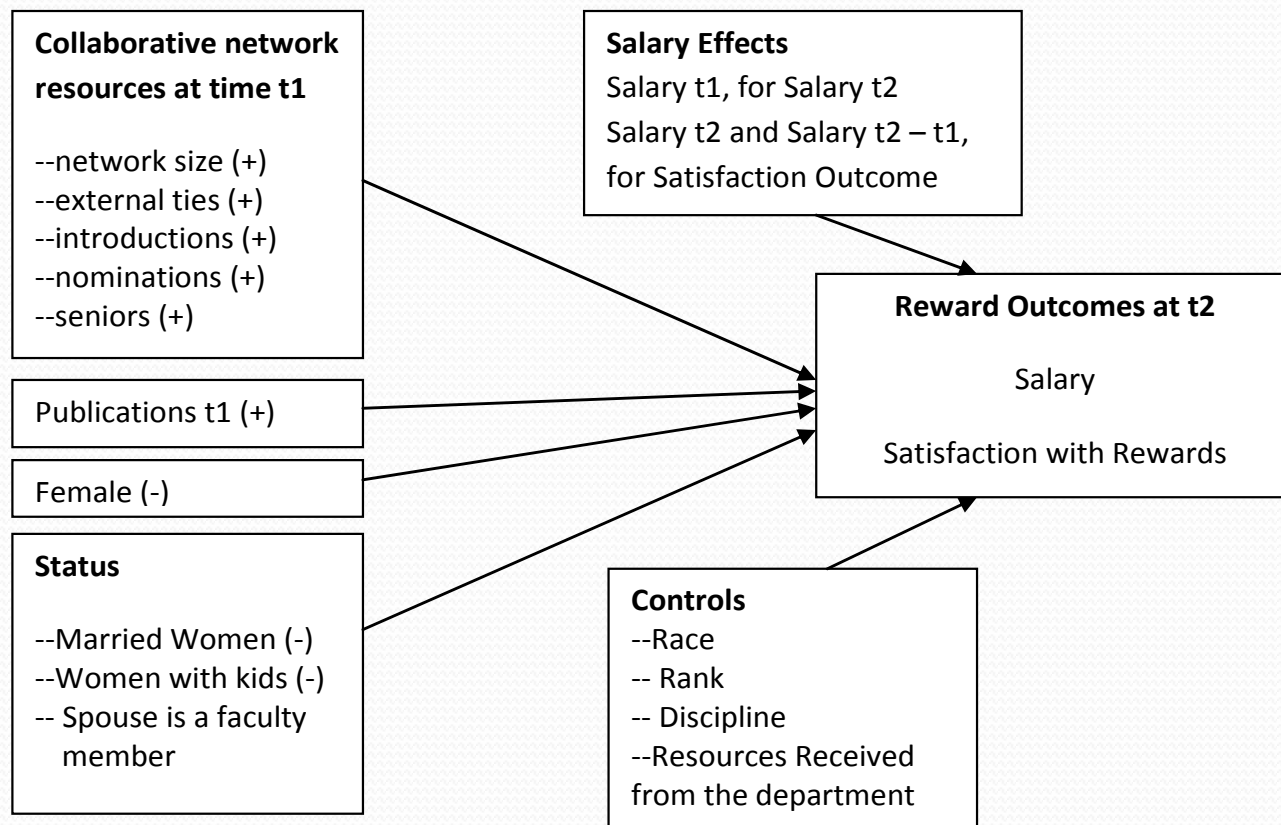
- **Longitudinal design** (2007, 2010)
- Online surveys (Sawtooth Software), response rate 45% at time t₁; response rate 51% at time t₂.
- National stratified random sample Carnegie Research I
 - Oversample of women,
 - Assistant, Associate and Full professors
 - Six fields of science and engineering: electrical engineering, computer science, earth and atmospheric science, physics, biology, chemistry
- Primarily close ended questions at both points in time
 - **Salary, satisfaction, productivity**, work and institutional environment, background and demographics, **career support resources**
 - Collaborative, and social network questions at both points in time
 - **name generators**
 - Close collaborators within and outside own institution
 - **name interpreters**
 - Close friend/junior/**senior**/peer
 - Resources received from collaborative networks: **introductions, nominations**



Measures and Method

- **Dependent variables:** Two dependent variables
 - Salary at time t₂
 - satisfaction with Rewards at time t₂ (alpha=0.827).
- **Independent variables: Three categories at time t₁**
 - **Collaborative Network Resources**
 - Collaborative network size (Total and External)
 - Resources received from collaborative networks
 - *Proportion of introductions, and nominations from collaborative networks*
 - Senior alters in collaborative networks
 - *Proportion of seniors in the collaborative network*
 - **Publication Average**
 - **Marital Status and Parenthood**
- **Methods: Descriptive Statistics, and Comparison of means**
- **Multiple Regression Analyses (OLS method of estimation)** with independent variables at time t₁ (2007), and dependent variables at time t₂ (2010)
- **OLS Regression for both Women and Men**

Empirical Model showing Determinants of Reward Outcomes



Gender differences in Salary: Deficit model

| | Full | Female only | Male only |
|---|------|-------------|-----------|
| (Constant) | *** | *** | *** |
| Ego is a female | *** | | |
| Collaborative Network Resources | | | |
| Proportion of seniors in the collaborative network | | | ** |
| Proportion of introductions from the collaborative network | | * | *** |
| Proportion of nominations from the collaborative network | *** | ** | *** |
| Collaboration network size | *** | *** | *** |
| External Collaborative Networks | | | |
| Proportion of seniors in the external collaborative network | | ** | *** |
| Proportion of introductions from the external collaborative network | | *** | *** |
| Proportion of nominations from the external collaborative network | | *** | ** |
| Proportion of external collaborative ties | | | |
| Non Network Resource | | | |
| Receipt of organizational resources | *** | ** | *** |
| Publication Average | | | |
| Salary at time t1 | *** | *** | *** |
| Marital and Family Status | | | |
| Married | ** | *** | ** |
| Spouse is a faculty member | *** | *** | *** |
| Cared for dependent children | ** | *** | ** |

Gender differences in Satisfaction with Rewards: Deficit Model *and* Difference in Socialization Model

| | Full | Female only | Male only |
|---|-------|-------------|-----------|
| (Constant) | *** | *** | *** |
| Ego is a female | -.*** | | |
| Collaborative Network Resources | | | |
| Proportion of seniors in the collaborative network | *** | ** | *** |
| Proportion of introductions from the collaborative network | | | |
| Proportion of nominations from the collaborative network | -.*** | | -.*** |
| Collaboration network size | -.*** | -.*** | -.** |
| External Collaborative Networks | | | |
| Proportion of seniors in the external collaborative network | | *** | ** |
| Proportion of introductions from the external collaborative network | | | -.** |
| Proportion of nominations from the external collaborative network | | | |
| Proportion of external collaborative ties | | ** | -.*** |
| Non Network Resource | | | |
| Receipt of organizational resources | *** | *** | *** |
| Publication Average | | | |
| Salary at time t2 | -.*** | -.*** | -.*** |
| Percentage change in salary over time | *** | *** | *** |
| Marital and Family Status | | | |
| Married | -.* | | |
| Spouse is a faculty member | | | ** |
| Cared for dependent children | | | -.** |



Conclusions

- **Deficit model explains women's salary outcome**
 - Women are not as effective in converting network benefits into tangible rewards in the form of a higher salary as compared to men.
 - There exists a **system bias** that favors men's collaborative relationships and collaborative outcomes; thereby confirming the deficits within the system of science.
- **Both deficit model and difference in socialization model explain women's and men's satisfaction with rewards**
 - Women's **expectations for rewards are negatively related to their collaborative activities**, while men expect more from their efforts. This perception may be the result of both negative experiences due to barriers in science (**deficit model**) *and* **lower self expectations and confidence in one's ability to achieve rewards**.
 - Women are socialized to seek help from seniors and **perceive that seniors may help them in securing rewards**.
 - Nominations may increase visibility but women do not consider them to fulfill expectations for rewards (**Difference in socialization model**).



Thank you.
Questions and Suggestions