

Interpreting Signals in the Labor Market: Evidence from Medical Referrals

Heather Sarsons, Chicago Booth

Presented by: Hosein Joshaghani

Tehran Institute for Advanced Studies (TelIAS)

August 2019

Main Question of the Paper

- Does a person's gender influence the way we interpret information about his or her ability?

Main Question of the Paper

- Does a person's gender influence the way we interpret information about his or her ability?
- Why does it matter?

Main Question of the Paper

- Does a person's gender influence the way we interpret information about his or her ability?
- Why does it matter?
 - Hiring and promotion → gender gap

Main Question of the Paper

- Does a person's gender influence the way we interpret information about his or her ability?
- Why does it matter?
 - Hiring and promotion → gender gap
 - Work opportunity → gender gap

Main Question of the Paper

- Does a person's gender influence the way we interpret information about his or her ability?
- Why does it matter?
 - Hiring and promotion → gender gap
 - Work opportunity → gender gap
- Notice that the same mechanism may work for any minority in any other context.

Physicians Referring Patients to Surgeons

- Surgeon quality is a primary consideration in a physician's choice.

Physicians Referring Patients to Surgeons

- Surgeon quality is a primary consideration in a physician's choice.
- Surgeon availability

Physicians Referring Patients to Surgeons

- Surgeon quality is a primary consideration in a physician's choice.
- Surgeon availability
- Good communication skills

Physicians Referring Patients to Surgeons

- Surgeon quality is a primary consideration in a physician's choice.
- Surgeon availability
- Good communication skills
- Insurance status → she only looks at patients with Medicare coverage

Pay Raise and Promotion

- Surgeons pay raise and promotion depends on many factors including:

Pay Raise and Promotion

- Surgeons pay raise and promotion depends on many factors including:
 - 1 number of procedures

Pay Raise and Promotion

- Surgeons pay raise and promotion depends on many factors including:
 - ① number of procedures
 - ② risky procedures

Pay Raise and Promotion

- Surgeons pay raise and promotion depends on many factors including:
 - ① number of procedures
 - ② risky procedures
 - ③ risky patients

Pay Raise and Promotion

- Surgeons pay raise and promotion depends on many factors including:
 - 1 number of procedures
 - 2 risky procedures
 - 3 risky patients
- Learning-by-doing is important for surgeon learning → human capital accumulation → earning and promotion

Findings of the Paper

- Two asymmetries:

Findings of the Paper

- Two asymmetries:
 - 1 Following a bad (good) outcome, physicians lower (increase) their beliefs about a female (male) surgeon's ability more than they do for male (female) surgeons.

Findings of the Paper

- Two asymmetries:
 - 1 Following a bad (good) outcome, physicians lower (increase) their beliefs about a female (male) surgeon's ability more than they do for male (female) surgeons.
 - 2 Physicians use information about individual female, and not male, surgeons to update their beliefs about other female surgeons in the same specialty.

Findings of the Paper

- Two asymmetries:
 - ① Following a bad (good) outcome, physicians lower (increase) their beliefs about a female (male) surgeon's ability more than they do for male (female) surgeons.
 - ② Physicians use information about individual female, and not male, surgeons to update their beliefs about other female surgeons in the same specialty.
- Who discriminate more?

Findings of the Paper

- Two asymmetries:
 - 1 Following a bad (good) outcome, physicians lower (increase) their beliefs about a female (male) surgeon's ability more than they do for male (female) surgeons.
 - 2 Physicians use information about individual female, and not male, surgeons to update their beliefs about other female surgeons in the same specialty.
- Who discriminate more?
 - 1 Physicians who just started referring to a particular surgeon.

Findings of the Paper

- Two asymmetries:
 - 1 Following a bad (good) outcome, physicians lower (increase) their beliefs about a female (male) surgeon's ability more than they do for male (female) surgeons.
 - 2 Physicians use information about individual female, and not male, surgeons to update their beliefs about other female surgeons in the same specialty.
- Who discriminate more?
 - 1 Physicians who just started referring to a particular surgeon.
 - 2 Physicians who have less experience working with female surgeons.

Findings of the Paper

- Two asymmetries:
 - ① Following a bad (good) outcome, physicians lower (increase) their beliefs about a female (male) surgeon's ability more than they do for male (female) surgeons.
 - ② Physicians use information about individual female, and not male, surgeons to update their beliefs about other female surgeons in the same specialty.
- Who discriminate more?
 - ① Physicians who just started referring to a particular surgeon.
 - ② Physicians who have less experience working with female surgeons.
- The physician's gender does not seem to play a role in how he or she reacts.

- 1 **Medicare Carrier file**, a 20% random sample of fee-for-service claims of all Medicare beneficiaries in the U.S. between 2008 and 2012:

- 1 **Medicare Carrier file**, a 20% random sample of fee-for-service claims of all Medicare beneficiaries in the U.S. between 2008 and 2012:
 - detailed information on patients: diagnoses, demographic information, medical history, and procedure codes.

- 1 **Medicare Carrier file**, a 20% random sample of fee-for-service claims of all Medicare beneficiaries in the U.S. between 2008 and 2012:
 - detailed information on patients: diagnoses, demographic information, medical history, and procedure codes.
 - referrals are frequent

- 1 **Medicare Carrier file**, a 20% random sample of fee-for-service claims of all Medicare beneficiaries in the U.S. between 2008 and 2012:
 - detailed information on patients: diagnoses, demographic information, medical history, and procedure codes.
 - referrals are frequent
 - track surgeons over time and see how well they perform on surgeries that the referring physician might not witness.

- 1 **Medicare Carrier file**, a 20% random sample of fee-for-service claims of all Medicare beneficiaries in the U.S. between 2008 and 2012:
 - detailed information on patients: diagnoses, demographic information, medical history, and procedure codes.
 - referrals are frequent
 - track surgeons over time and see how well they perform on surgeries that the referring physician might not witness.
- 2 **Physician Compare National file**: information on physicians and surgeons, such as the doctor's gender, specialty, medical school, and experience.

Data

- ① **Medicare Carrier file**, a 20% random sample of fee-for-service claims of all Medicare beneficiaries in the U.S. between 2008 and 2012:
 - detailed information on patients: diagnoses, demographic information, medical history, and procedure codes.
 - referrals are frequent
 - track surgeons over time and see how well they perform on surgeries that the referring physician might not witness.
- ② **Physician Compare National file**: information on physicians and surgeons, such as the doctor's gender, specialty, medical school, and experience.
- ③ **Dartmouth Atlas of Health Care**: geographic dataset to match physicians and surgeons to their Hospital Referral Region (HRR).

Primary Variables

- Referrals: a physician refers a patient to a surgeon and the surgeon sees the patient.

Primary Variables

- Referrals: a physician refers a patient to a surgeon and the surgeon sees the patient.
- Patient Risk: ICD-9 diagnosis codes to calculate the Elixhauser Index + age, gender, and race → predict in-hospital mortality

Primary Variables

- Referrals: a physician refers a patient to a surgeon and the surgeon sees the patient.
- Patient Risk: ICD-9 diagnosis codes to calculate the Elixhauser Index + age, gender, and race → predict in-hospital mortality
- Surgeon Ability:

$$Ability_i = \frac{\sum_{p_i} \left(Risk_p - \mathbf{1}(Death) \right)}{n_i}$$

Primary Variables

- Referrals: a physician refers a patient to a surgeon and the surgeon sees the patient.
- Patient Risk: ICD-9 diagnosis codes to calculate the Elixhauser Index + age, gender, and race → predict in-hospital mortality
- Surgeon Ability:

$$Ability_i = \frac{\sum_{p_i} \left(Risk_p - \mathbf{1}(Death) \right)}{n_i}$$

- Events (Signals): Bad signals are defined as patient deaths that occur within 7 days of a procedure.

Primary Variables

- Referrals: a physician refers a patient to a surgeon and the surgeon sees the patient.
- Patient Risk: ICD-9 diagnosis codes to calculate the Elixhauser Index + age, gender, and race → predict in-hospital mortality
- Surgeon Ability:

$$Ability_i = \frac{\sum_{p_i} \left(Risk_p - \mathbf{1}(Death) \right)}{n_i}$$

- Events (Signals): Bad signals are defined as patient deaths that occur within 7 days of a procedure.
- Propensity to Refer to Female Surgeons, $\pi_{j,s}$

Empirical and Identification Strategy

She goes through a three step empirical strategy:

- 1 *Coarsened Exact Match*: Identify and match observably similar male and female surgeons who perform the same procedure on similar patients.

Empirical and Identification Strategy

She goes through a three step empirical strategy:

- ① *Coarsened Exact Match*: Identify and match observably similar male and female surgeons who perform the same procedure on similar patients.
- ② Performing an *event study* on these two groups

Empirical and Identification Strategy

She goes through a three step empirical strategy:

- 1 *Coarsened Exact Match*: Identify and match observably similar male and female surgeons who perform the same procedure on similar patients.
- 2 Performing an *event study* on these two groups
- 3 Calculating *diff in diff* effects

Main Specification

- Sum the number of referrals a surgeon received from the referring physician in each quarter, starting 4 quarters before the event and ending 6 quarters after the event, leaving out the patient referred for surgery.

Main Specification

- Sum the number of referrals a surgeon received from the referring physician in each quarter, starting 4 quarters before the event and ending 6 quarters after the event, leaving out the patient referred for surgery.
- Estimate the following equation:

$$R_{ijk} = \sum_{k=-4}^6 \beta_k event_{ij,t+k} + \sum_{k=-4}^6 \gamma_k (event_{ij,t+k} \times fem_i) + \theta_{ij} + \epsilon_{ijk}$$

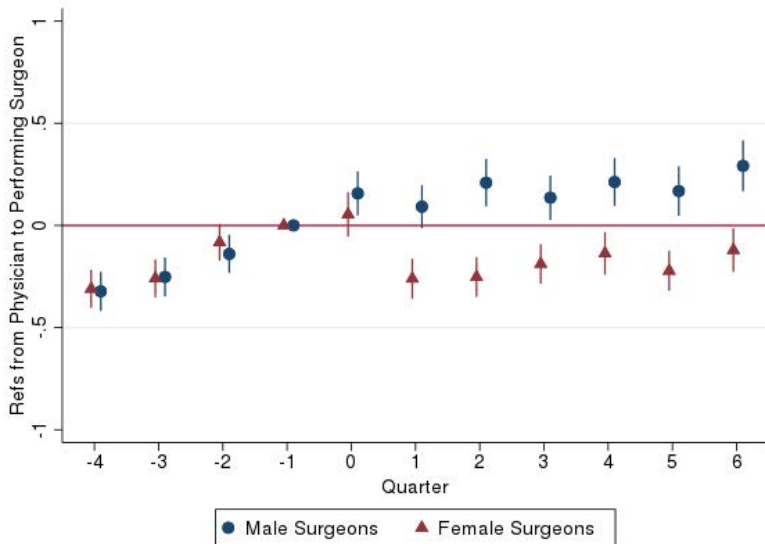
Main Specification

- Sum the number of referrals a surgeon received from the referring physician in each quarter, starting 4 quarters before the event and ending 6 quarters after the event, leaving out the patient referred for surgery.
- Estimate the following equation:

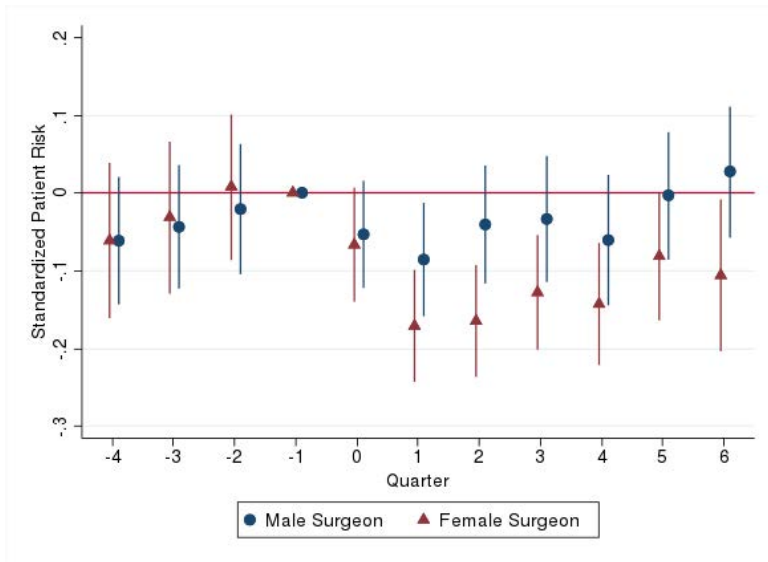
$$R_{ijk} = \sum_{k=-4}^6 \beta_k event_{ij,t+k} + \sum_{k=-4}^6 \gamma_k (event_{ij,t+k} \times fem_i) + \theta_{ij} + \epsilon_{ijk}$$

- The coefficient $\hat{\gamma}_k$ tells us how a physician's reaction to an event changes when the surgeon is a woman.

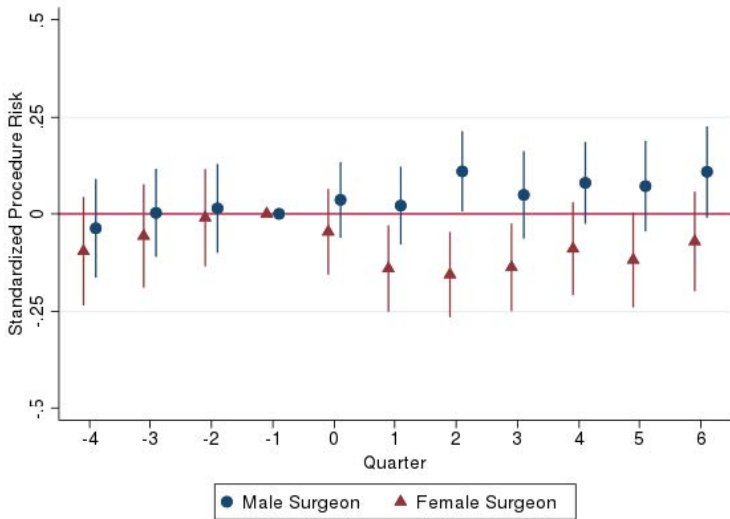
Estimates of Physician's Reaction to Death



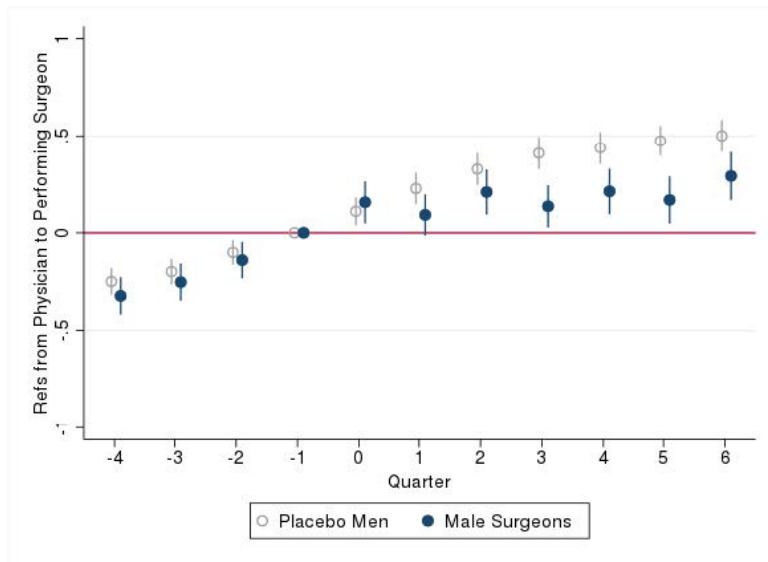
Riskiness of Future Procedures and Patients



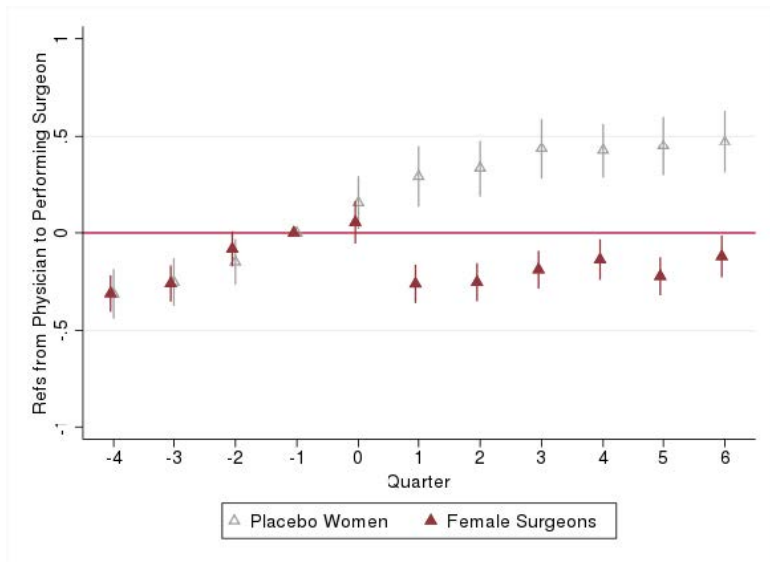
Riskiness of Future Procedures and Patients



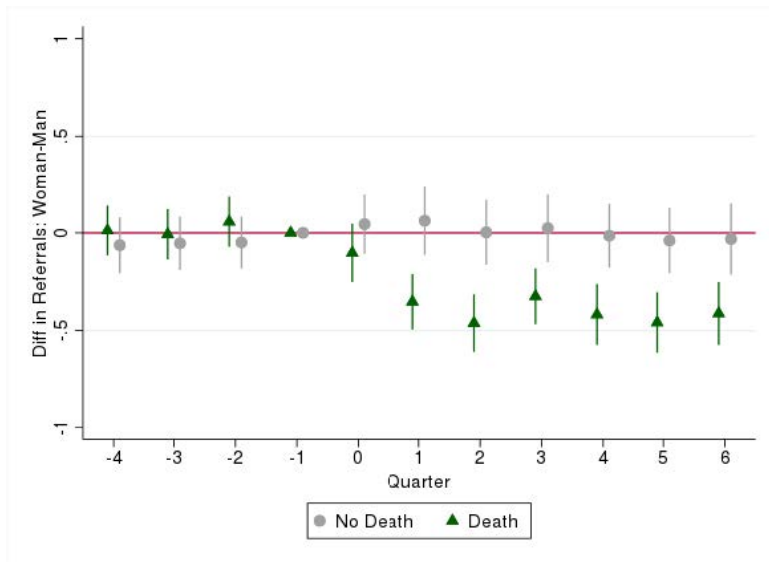
Comparison with Placebo Surgeons



Comparison with Placebo Surgeons



Comparison with Placebo Surgeons



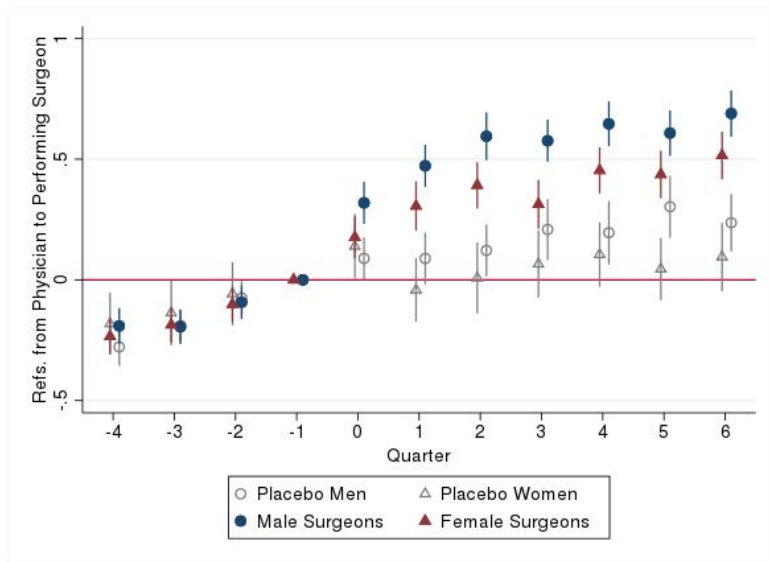
Updating after a Good Event

- It is possible that physicians react more to bad signals from women because the variance of women's ability is larger.

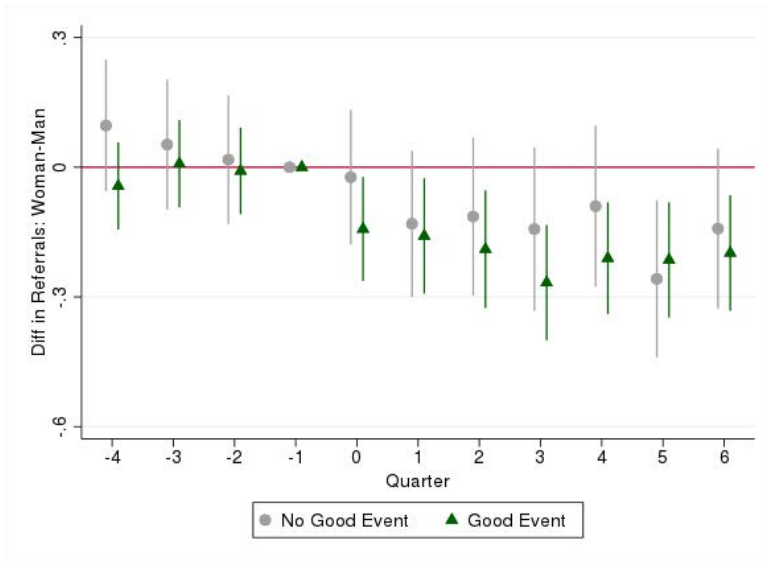
Updating after a Good Event

- It is possible that physicians react more to bad signals from women because the variance of women's ability is larger.
- If this is true, physicians should react strongly to good signals from women as well.

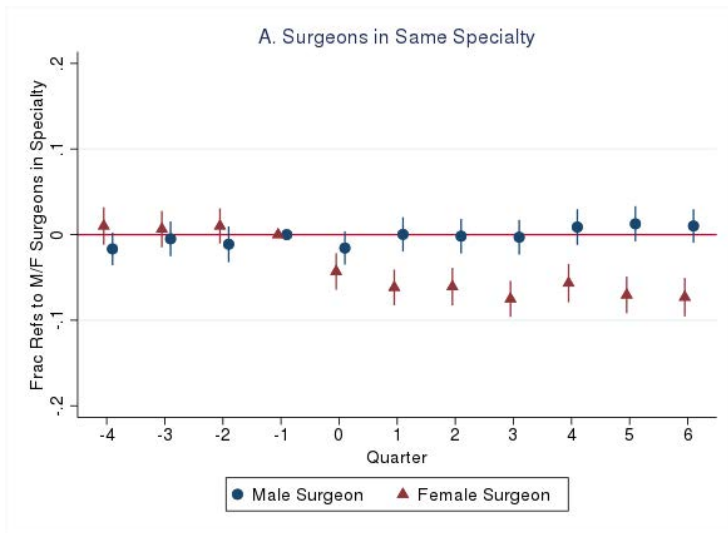
Updating after a Good Event



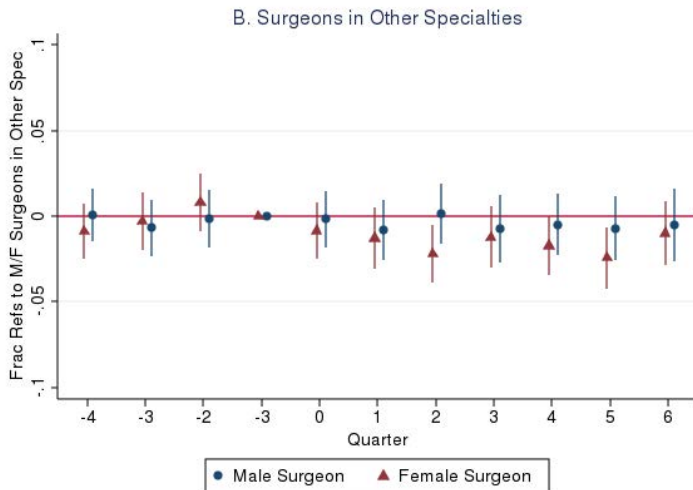
Updating after a Good Event



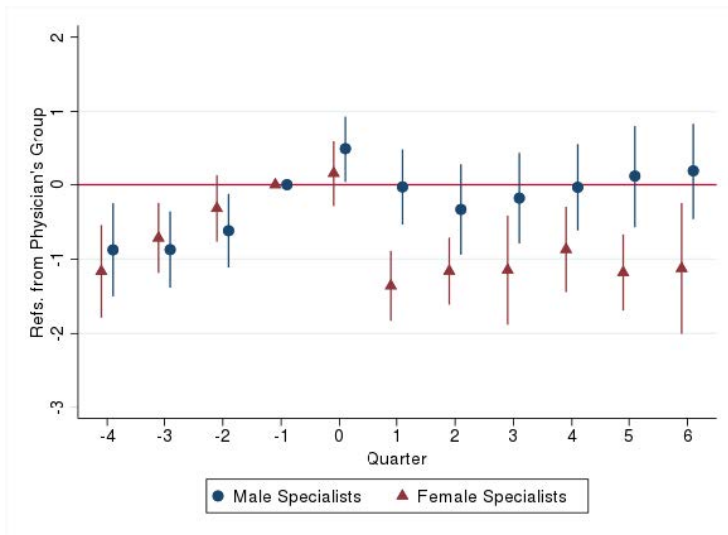
Spillovers to Other Surgeons after Bad Outcome



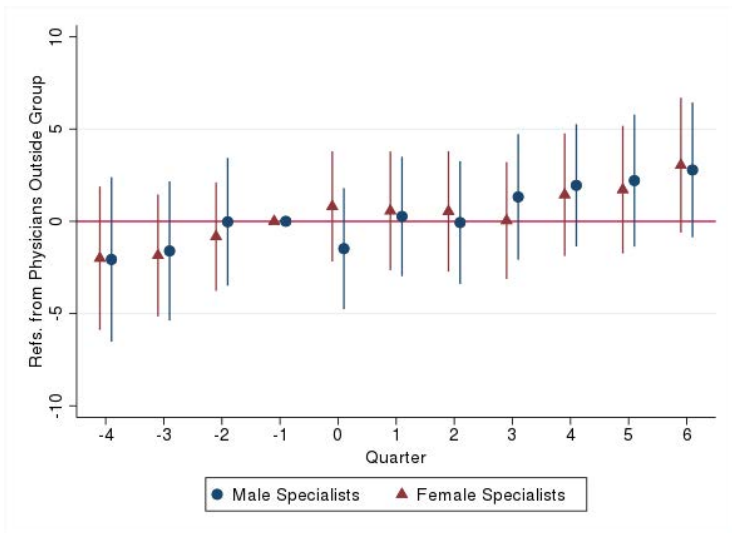
Spillovers to Other Surgeons after Bad Outcome



Information Spillovers to Other Physicians



Information Spillovers to Other Physicians



Conclusion

- Gender gaps in hiring, promotion, and pay persist in many industries.

Conclusion

- Gender gaps in hiring, promotion, and pay persist in many industries.
- Sarsons (2019) show that physicians exhibit asymmetric updating, lowering their referrals more to women than to men after bad outcomes and increasing them more to men than to women after good outcomes.

Conclusion

- Gender gaps in hiring, promotion, and pay persist in many industries.
- Sarsons (2019) show that physicians exhibit asymmetric updating, lowering their referrals more to women than to men after bad outcomes and increasing them more to men than to women after good outcomes.
- In addition, physicians use their experience with one woman to infer the ability of other female surgeons.

Conclusion

- Gender gaps in hiring, promotion, and pay persist in many industries.
- Sarsons (2019) show that physicians exhibit asymmetric updating, lowering their referrals more to women than to men after bad outcomes and increasing them more to men than to women after good outcomes.
- In addition, physicians use their experience with one woman to infer the ability of other female surgeons.
- After a bad experience with one female surgeon, physicians become less likely to refer to other female surgeons in the same specialty.