Inequalities and Social Determinants of Gender Reservation Wages:

Workers' Decision-Making Under an Economic Shock

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Content

Introduction

Labor Market Profile

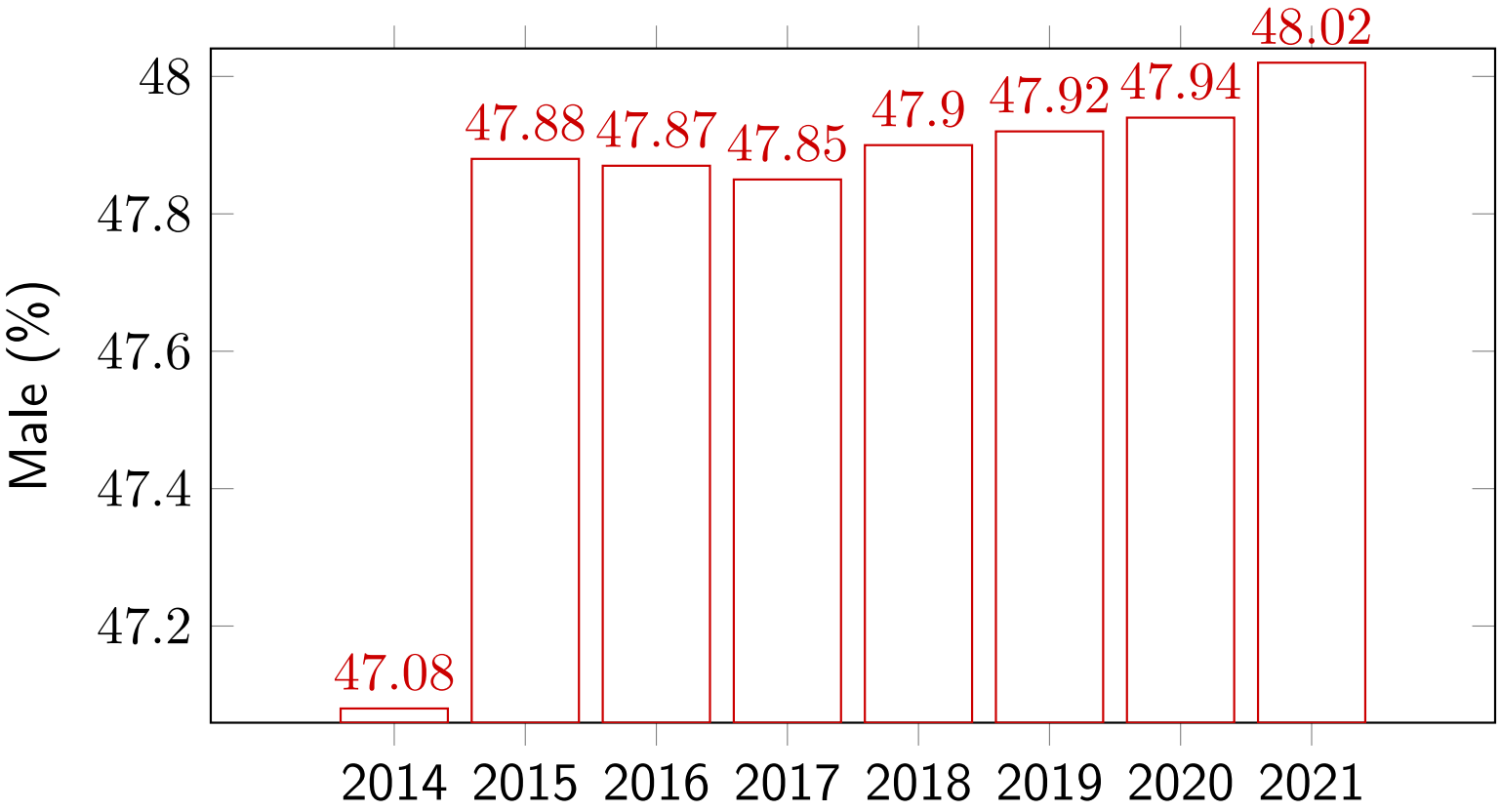


Figure: Male Population (%)

Labor Market Profile

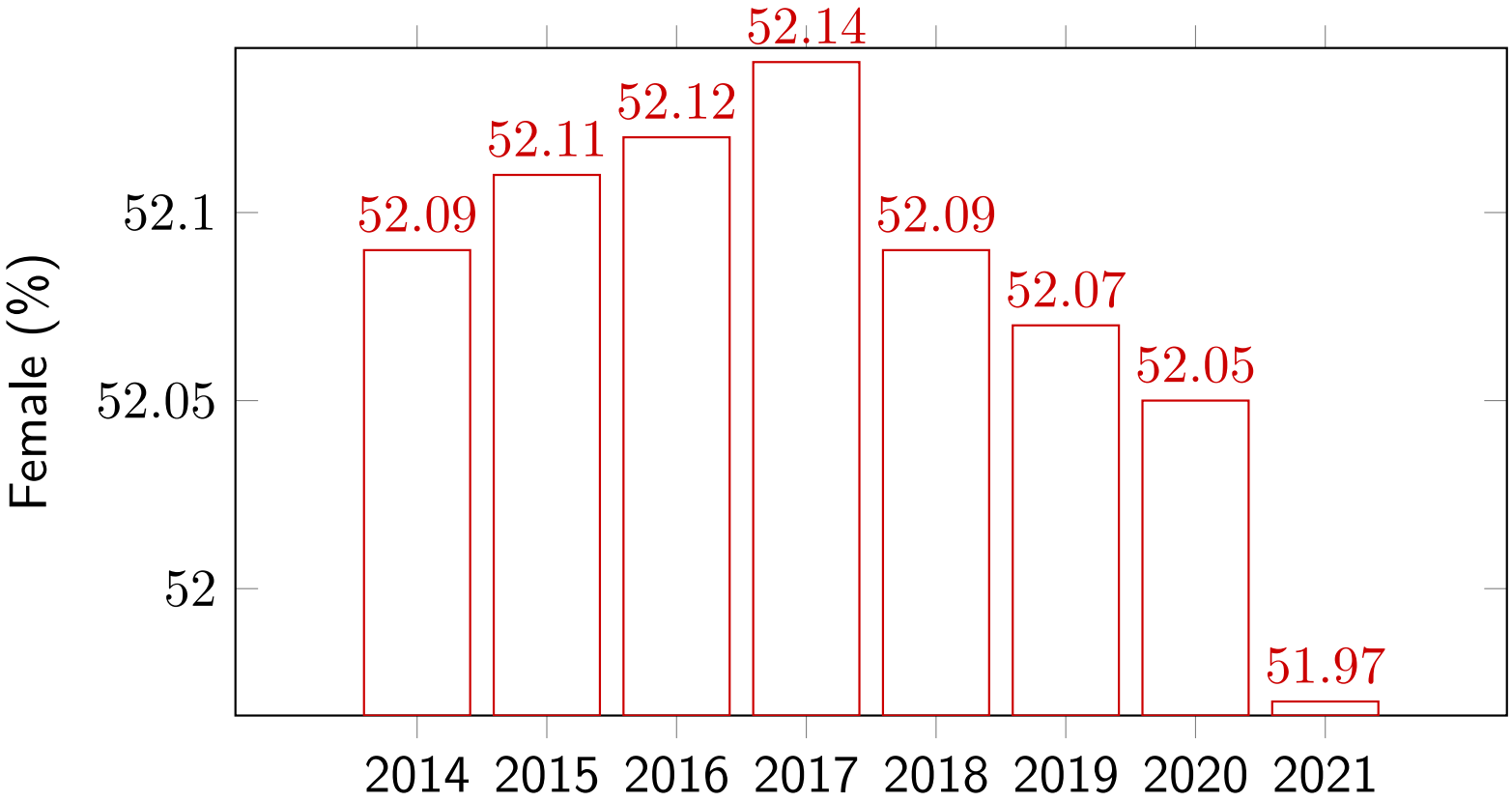


Figure: Female Population (%)

Labor Market Profile

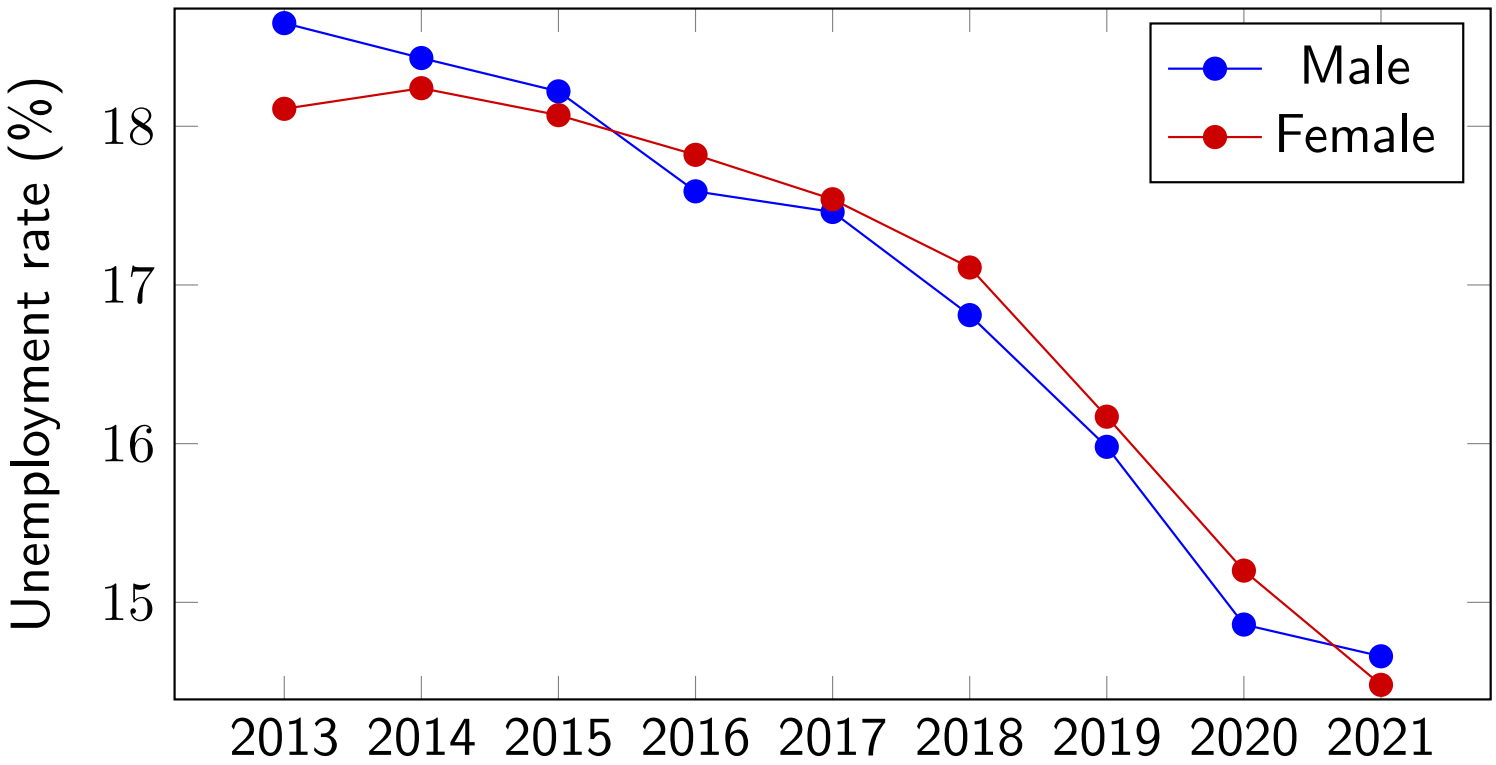


Figure: Unemployment rate by gender (%)

Labor Market Profile

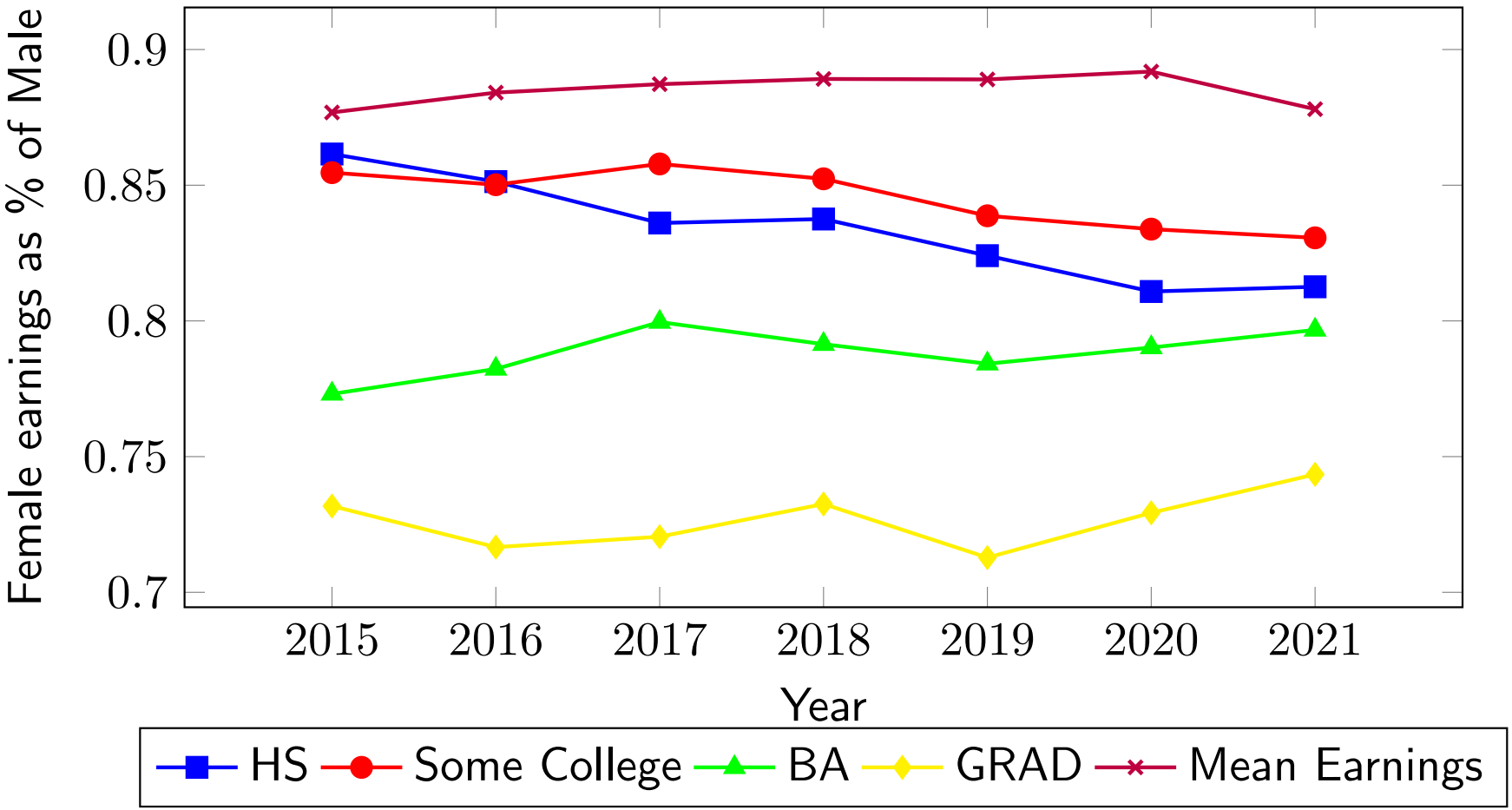


Figure: Female Earnings as Percentage of Male's Earnings by Education (2015-2021)

"Women can't educate their way out of gender wage gap" - Gould and Kroeger (2017)

Labor Market Profile (Aggregate)

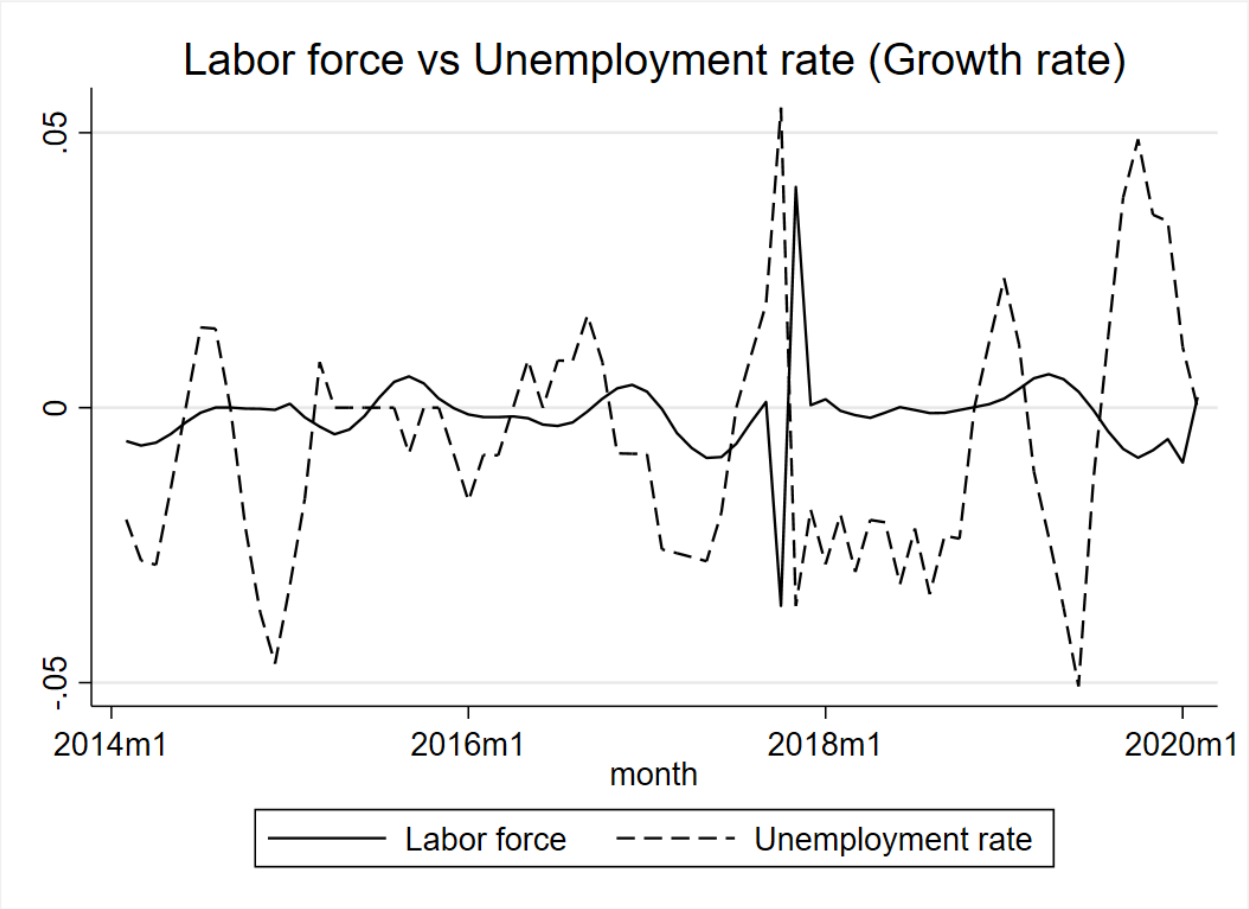
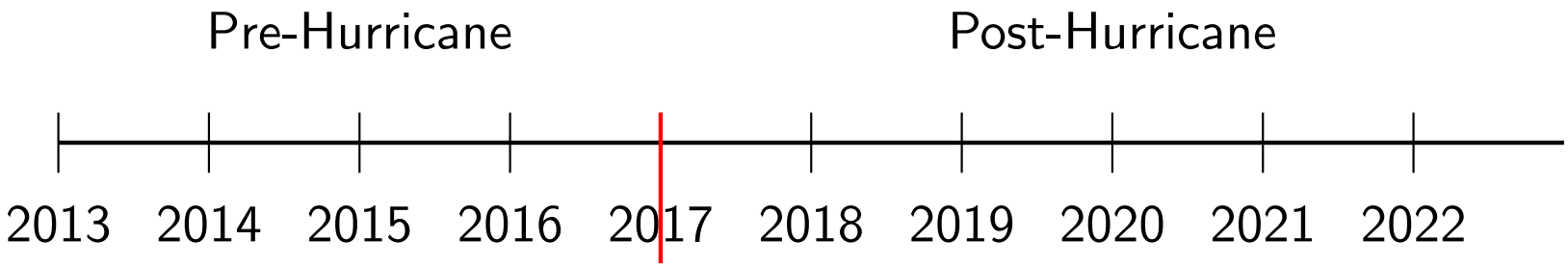


Figure: Labor force and Unemployment rate

Path



Hurricane Irma (Sept 7, 2017) and Hurricane Maria (Sept 17, 2017)

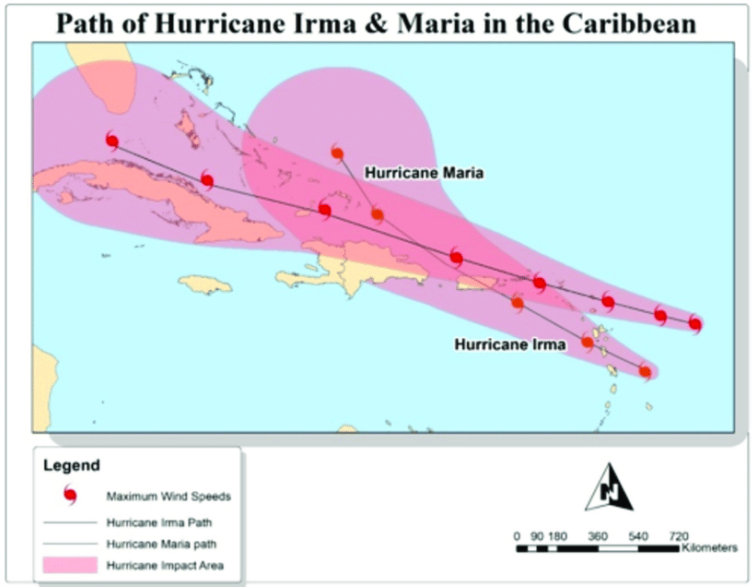


Figure: Path and impact area of Hurricane Irma and Hurricane Maria[1]

[1] Collymore et al. (2018)

Aftermath

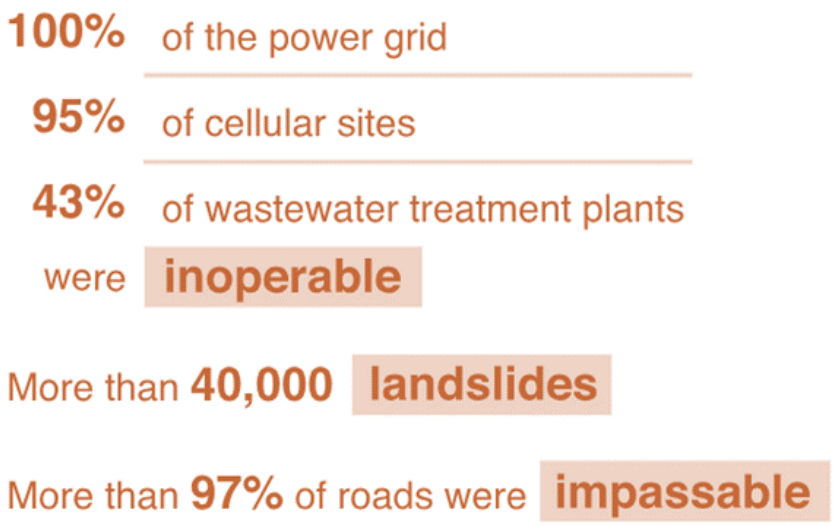


Figure: Damages by Hurricane Irma and Hurricane Maria)

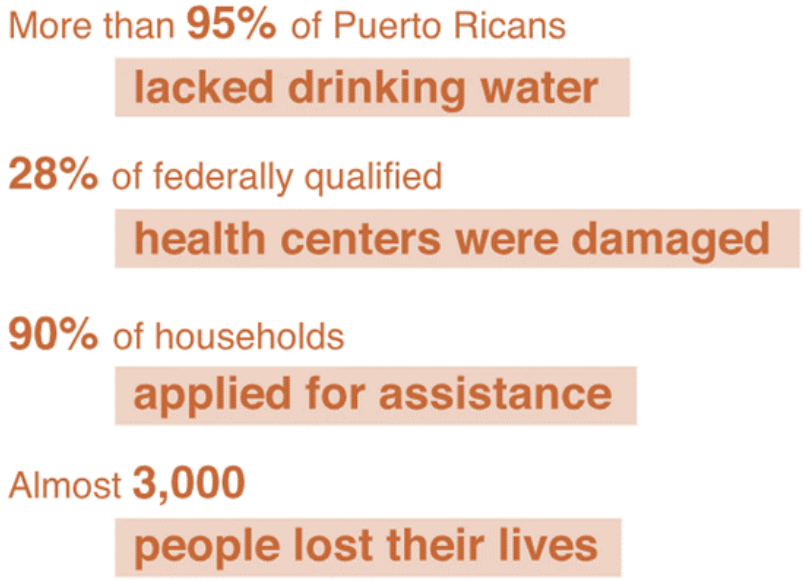


Figure: Damages by Hurricane Irma and Hurricane Maria)

Climate Disaster events exposed and expanded inequalities in the labor market

Purpose

- Understand the link between **gender** and **reservation wages** and their decision to work when an **economic shock**.
- Analyze how a **workers' decision to work** is influenced by factors that socially construct their opportunity set.
- Identify gender gaps in disaster outcomes and resilience and long-run stability.
- Address the gap in labor market literature using a **Markov Switching model (MSM)** to determine the transition probabilities and resiliency with **Puerto Rico** as a case study.

Defining Resiliency

Resiliency

- Reacts to shock
- Bounces back
- Stable

Resiliency

- Mean reversion
- Dynamic process
- Bounce to a new normal

Robustness

- Ability to withstand a shock
- Rigidity
- Less stable

Risk Avoidance

- Risk Management
- Static process

Resiliency helps take more risk, rebound, and grow; kicking a can vs. being mugged

Shocks in complex economic dynamics

- Endogenous vs Exogenous

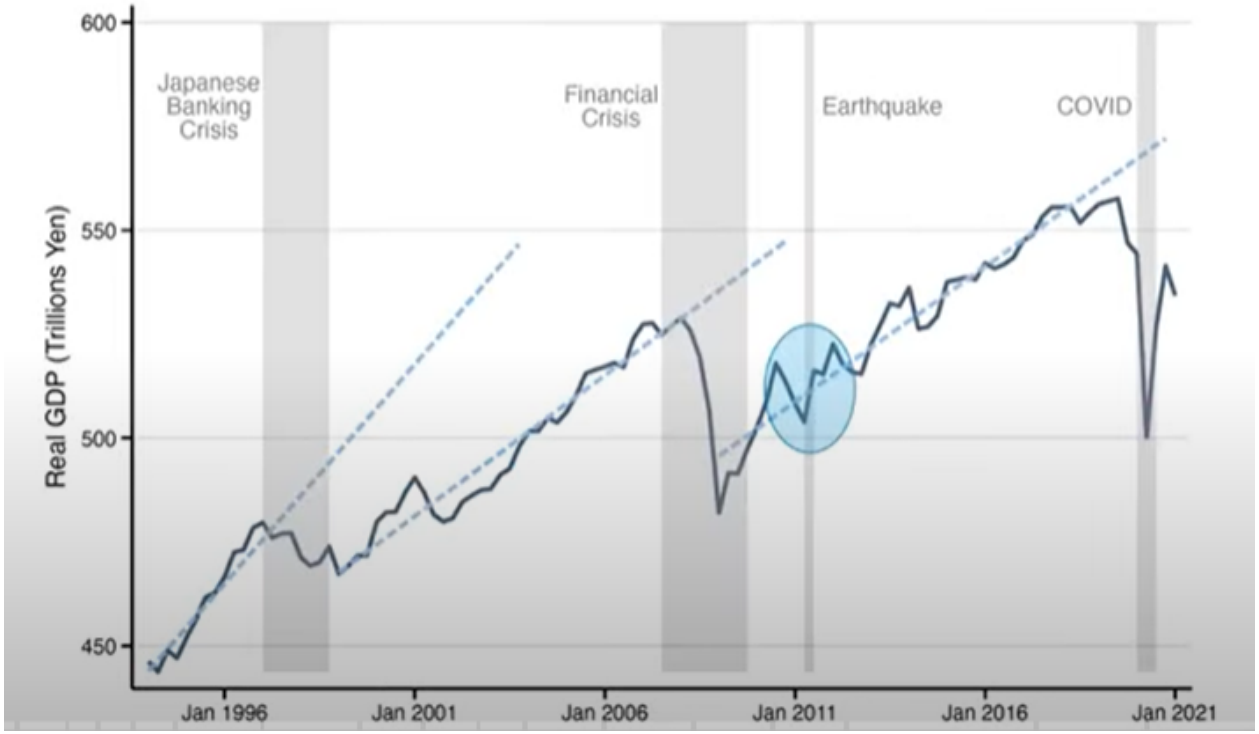


Figure: Resilience after Exogenous vs Endogenous shocks (GDP Japan)[2]

[2] Brunnermeier (2021)

Resiliency destroyers

- Traps

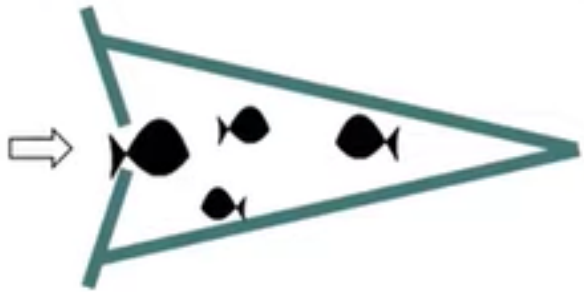


Figure: Traps[3]

[3] Brunnermeier (2021)

Resiliency destroyers

- Traps
- Feedback externalities (loops)

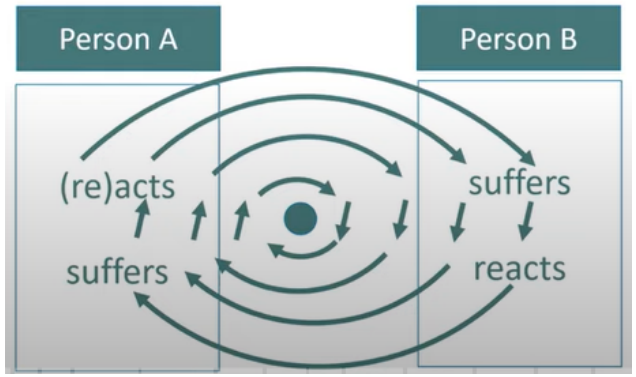


Figure: Feedback externalities (loops)[4]

[4] Brunnermeier (2021)

Resiliency destroyers

- Traps
- Feedback externalities (loops)
- Tipping Points

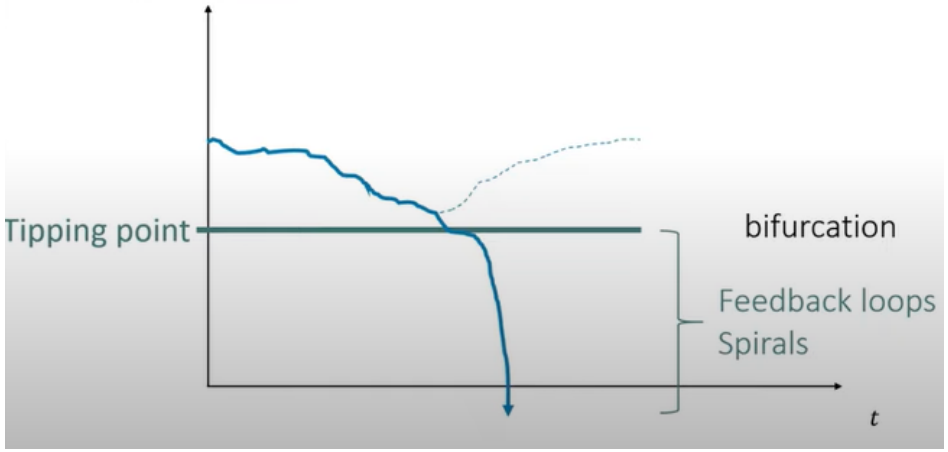


Figure: Tipping points[5]

[5] Brunnermeier (2021)

Literature

Theoretical Review

Dual Labor Market

- Markets are segmented into "Goods jobs" and "Bad jobs"

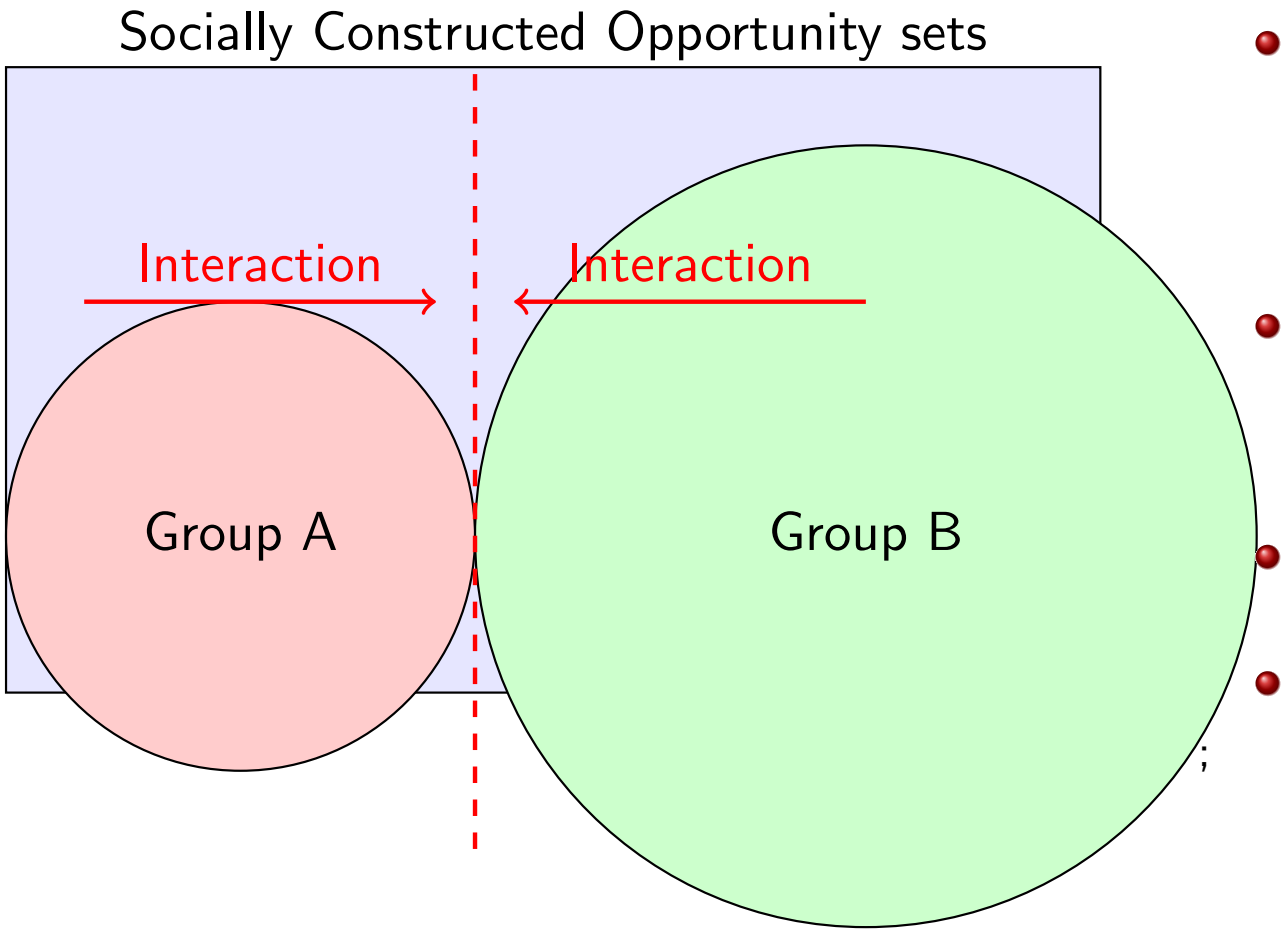
Occupational crowding hypothesis

- Bregman (1971); black workers are crowded in some occupations, increasing supply for those occupations and reducing the wages in those jobs

Stratification Economics

- Explains different manifestations of inequality as a process in which social relationships, power dynamics, and public policies shape the outcomes of different groups
- When it comes to wages, workers are often explained and understood in terms of human capital-disparities in skills, knowledge, and education associated with greater or lesser rewards

Freedom



- Stiglitz's (2024) concept of freedom - extends to how the opportunity set of an individual is socially constructed and restricted
- Coercion - reduces exploitation and expands the opportunity sets or "common opportunity"
- Gender-differentiated impacts of disaster
- Hierarchy

;

Group A has a smaller opportunity set.

Reservation Wages and Climate events

Shibata (2009) - Allows for unobserved heterogeneity's using a HMM

Krueger & Mueller (2014) - Empirically modeled reservation wages

Gould and Kroeger (2017) - women workers are not only paid less than men at every level of formal education, but the gender pay gap even widens as workers acquire more education. Women with high school are paid 80% of what men are paid, and women with advanced degrees are paid 73% of what men are paid at the same level

Mahajan (2017) - Low rainfall shocks are associated with a decrease in female farm workers' wages in rice-growing areas but do not affect men's wages

Caraballo-Cueto and Segarra-Almestica (2019) - Found a negative gender gap disappears when we adjust for educational attainment

Erman, Robbé, Thies, Kabir, Maruo (2021) - Gender dynamics impact both the way they are affected by disasters and their capacity to withstand and recover from them

Theoretical Framework

Definition

Reservation Wage - the lowest wage at which an individual is willing to work

Plays a key role in theoretical models of job search, labor supply, and labor market participation. However, it is not adequate to describe all labor formats across class, gender, and society, as well as market inequalities and workers' social determinants.

Definition

Compelling Wage - economic or social pressures that force an individual to work, implying external preferences, not personal ones

The process in which a worker transitions between a state of employment measured in probabilities.

Batista et al. (2024) - wages have consistently shaped working people's experiences and failed to protect workers from coercion. Instead, wages emerge as versatile tools to bind, control, and exploit workers **(Coercive)**.

Model Construction

Data

- Database

  US Census, Puerto Rico Community Survey (PCS)
  Bureau of Labor Statistics

- Variables (2014 - 2020)

  Workers income, age, gender, education
  Civilian Employment 16 to 64; Male and Female
  Civilian Unemployment 16 to 64; Male and Female
  Regime (hurricane indicator; 2017)

Econometric Approach

- Switching regression model

  Markov-switching dynamic regression (MSDR) - Following a first-order Markov process to identify the **transition probabilities** and the state or regime-dependent dynamics.

- Resilience

  Feedback loops (matrix) - Demonstrate how systems react and return to stability (resilience) or how cycles of feedback influence the system's behavior.

  Stationary distribution parameters - Estimate the long-run stability of the state or regime.

Markov-switching transition probabilities

Definition: Let $X_0, X_1, X_2, ...$ be a Markov chain with state space S, where S has size N (possibly infinite). The transition probabilities of the Markov chain are

$$p_{ij} = \mathbb{P}(X_{t+1} = j | X_t = i) \text{ for } i, j \in S, t = 0, 1, 2... \quad (1)$$

The **transition matrix** of the Markov chain is $P = (p_{ij})$

The t step transition probabilities can be defined as

$$(P)_{ij} = p_{ij} = \mathbb{P}(X_1 = j | X_0 = i) = \mathbb{P}(X_{n+1} = j | X_n = i) \text{ for any } n. \quad (2)$$

p_{ij} - is the probability of making a transition FROM state i TO state j in a SINGLE step.

The transition probabilities will show how the dummy influences the likelihood of moving from one regime to another.

Markov-switching dynamic regression

- A general specification of the MSDR model is written as

Markov-switching dynamic regression (MSDR)

$$\mathbf{y_t} = \mu_\mathbf{s} + \mathbf{x_t}\alpha + \mathbf{z_t}\beta_\mathbf{s} + \epsilon_s$$

$\mathbf{y}_t$ - dependent variable
μ_s - state-dependent intercept
$\mathbf{x}_t$ - vector of exogenous variables with state-invariant coefficients α
$\mathbf{z}_t$ - vector of exogenous variables with state dependent coefficients β_s
ϵ_s - i.i.d normal error $\sim N(0, \sigma^{\mathbf{2}}{}_s)$

Simple Two-state model

$$f(z) = \begin{cases} \mu_1 + \epsilon_{t,1} & \text{if} \quad \mu_s = 1 \\ \mu_2 + \epsilon_{t,2} & \text{if} \quad \mu_s = 2 \end{cases}$$

μ_1,μ_2 - intercept terms in state 1 and 2

Markov-switching dynamic regression

Then, the evolution of $\mathbf{y_t}$ depends on the realization of the switching intercept at time t.

Transition matrix of s_t

$$P = \begin{bmatrix} \mathbf{p}_{11} & \mathbf{p}_{21} \\ \mathbf{p}_{12} & \mathbf{p}_{22} \end{bmatrix}$$

Estimations and Results

Transition Probability matrix (Female workers)

Transition diagram

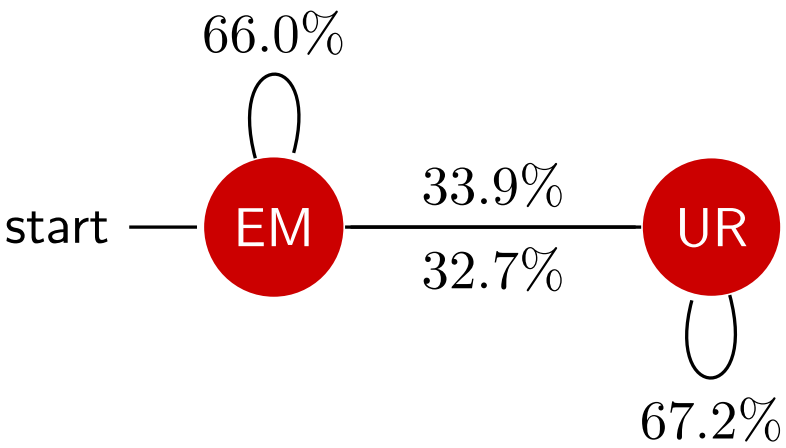


Figure: Ping Pong with self-loop transitions

These transition probabilities can also be represented in a transition matrix.

Transition matrix

	EM	UR
EM	0.660	0.339
UR	0.327	0.672

Employed (EM) - State 1

Unemployed (UR) - State 2

Unemployment is more persistent with a higher transition probability to Unemployment

Transition Probability matrix (Male workers)

Transition diagram

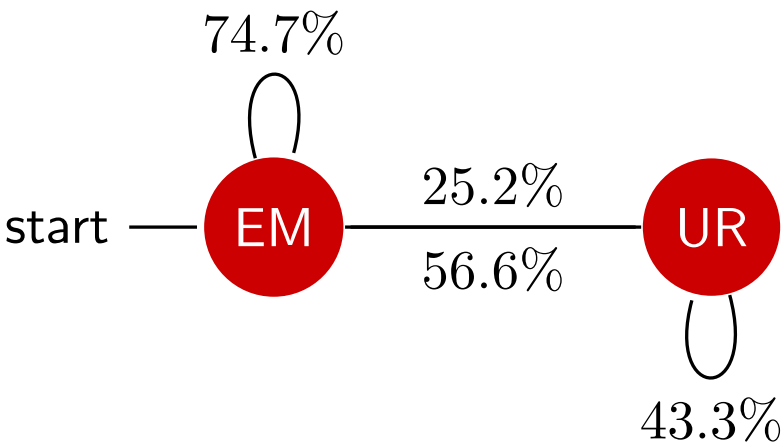


Figure: Ping Pong with self-loop transitions

These transition probabilities can also be represented in a transition matrix.

Transition matrix

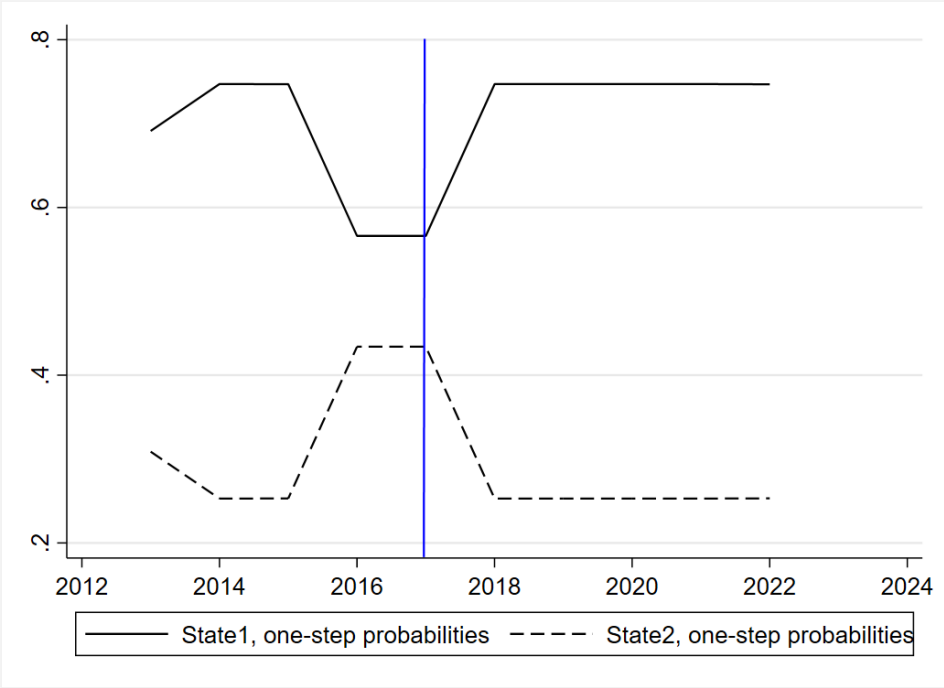
	EM	UR
EM	0.747	0.252
UR	0.566	0.433

Employed (EM) - State 1

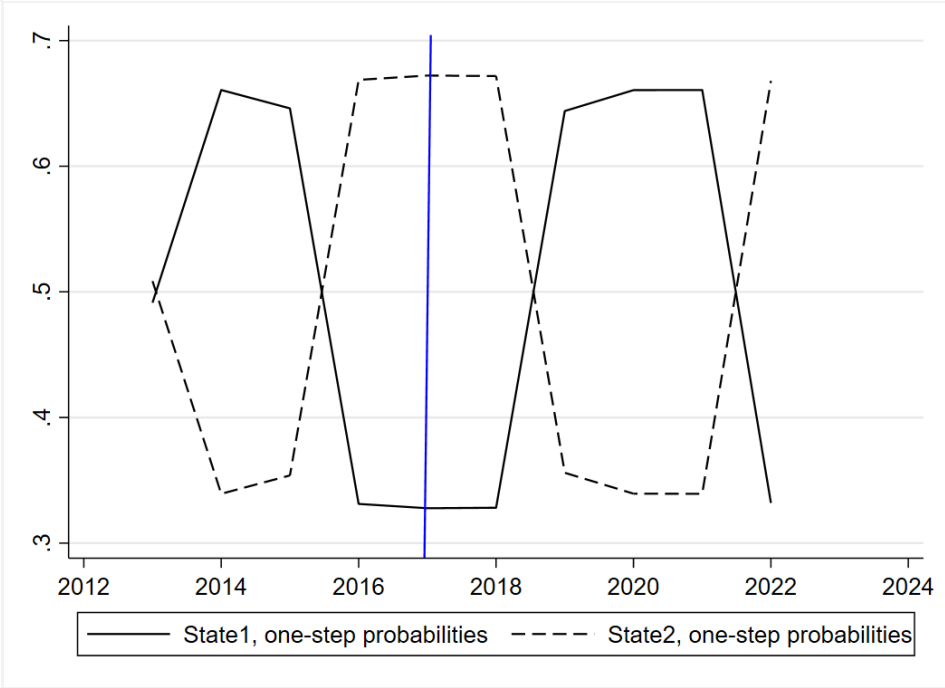
Unemployed (UR) - State 2

Employment is more persistent with a higher transition probability to Employment

Stability and Resiliency



(a) Civilian Labor Force



(b) Female workers

Figure: Predicted probabilities of Markov Chain

Stability and Resiliency

Duration Employed (State 1)

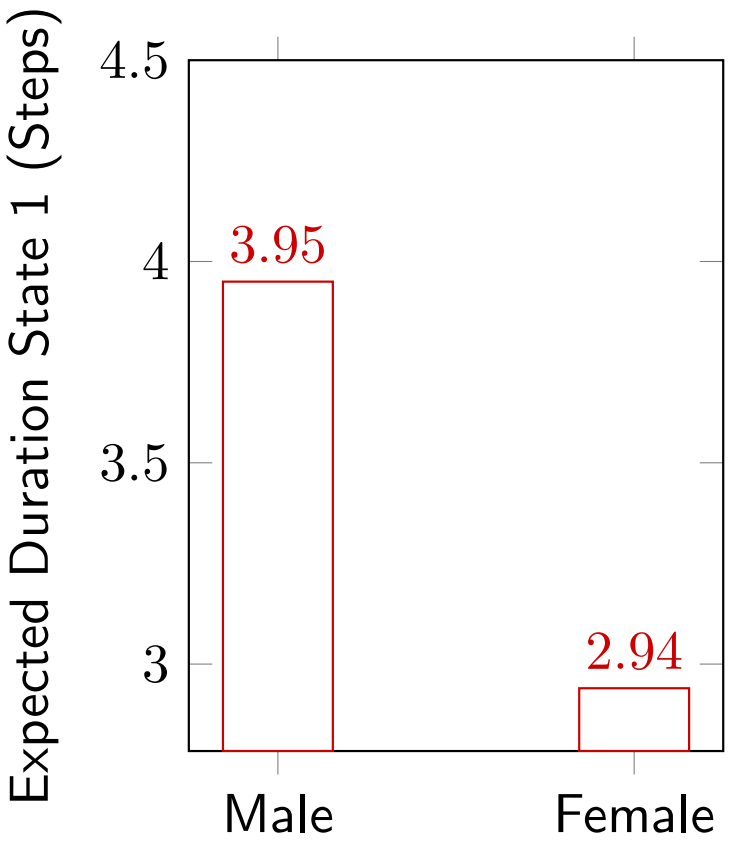


Figure: Expected Duration for Markov Chain State 1 (Steps)

Duration Unemployed (State 2)

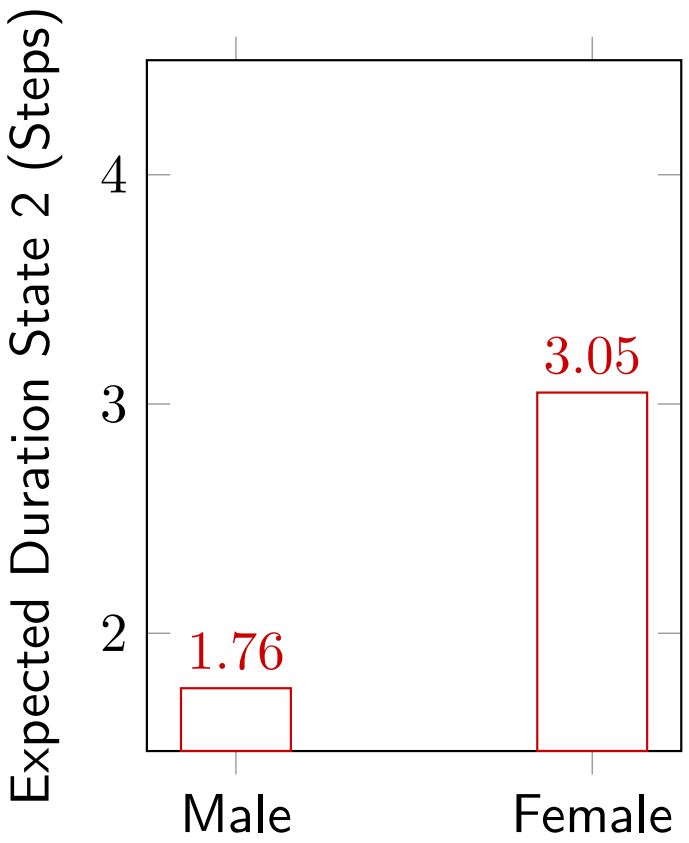


Figure: Expected Duration for Markov Chain State 2 (Steps)

Stability and Resiliency

Long-run stationary distribution (Female workers)

The stationary distribution represents the long-term probabilities of being in each state. To compute, we need to solve the equation:

$$\pi P = \pi \tag{3}$$

π - is the stationary distribution

$\mathbf{P}$ - is estimated transition matrix

$$\pi = \begin{bmatrix} \pi_1 & \pi_2 \end{bmatrix} \tag{4}$$

where,

$$\textbf{Employed} : \pi_1 = \frac{1}{1 + \frac{0.339}{0.672}} = \mathbf{0.664} \tag{5}$$

$$\textbf{Unemployed} : \pi_2 = 1 - \pi_1 = \mathbf{0.339} \tag{6}$$

In the long-run, State 1 will be occupied approximately 66.4% of the time and State 2, 33.6% of the time. **State 1** has a higher stationary probability and thus is more stable.

Stability and Resiliency

States	Male	Female
Employed	0.632	0.664
Unemployed	0.368	0.336

Table: Long-run stationary distribution after Hurricane Maria

In the long-run, employment is the most resilient state for Male and Female workers.

Conclusion

Conclusion and Next Steps

- The findings from applying an **MSM** indicate gender differences in the labor market after a climate disaster.
- Female workers are more likely to face unemployment after the climate disaster, showing a more persistent probability of remaining unemployed.
- The transition probabilities from Employed to Unemployed are higher for Female workers (33.9%). For male workers, the transition probability is higher toward the Employed state.
- Further Research: Use individual-level data to further analyze gender gaps and the relationship between aid and funds disbursement after the climate disaster event.

Thank you!