# Asking about 'Which': Improving Substantive Interpretations of Duration Models

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# Research Question

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- Transition probabilities

# BTSCS: Current

- Event occurrence
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- Event occurrence
- Possible duration dependence
- Splines (Beck, Katz, and Tucker 1998)
- Time polynomials (Carter and Signorino 2010)

# BTSCS: Challenges

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1. Baseline hazard misspecification

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1. Baseline hazard misspecification
2. Proportional hazards (PH) violation(s)
3. Onset vs. ongoing (McGrath 2015)

# Cox Duration Models

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- Whether vs. <u>when</u>

1. Semi-parametric
2. Well-established PH tests
3. Flexibility
   (Jones and Branton 2005, Metzger and Jones 2016)

# Issue: Interpreting the Cox

"This approach [logit with time polynomials] is functionally equivalent to a traditional duration analysis and **offers clearer interpretation**."

*(emphasis added, Hall and Ura 2015, 824)*

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- Proportional hazard model
- $h(t)$: risk of experiencing event for an infinitesimally small increase in $t$'s value

- Hazard ratios
- % change in $h(t)$ (Box-Steffensmeier and Jones 2004)

# Solution: Transition Probabilities

- The probability of a subject experiencing the event by time *t*, given:

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  - Starting point ("stage")
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- R (`mstate`), Stata (*in progress*)

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**How does a dyad's level of economic interdependence affect whether it experiences a MID?**

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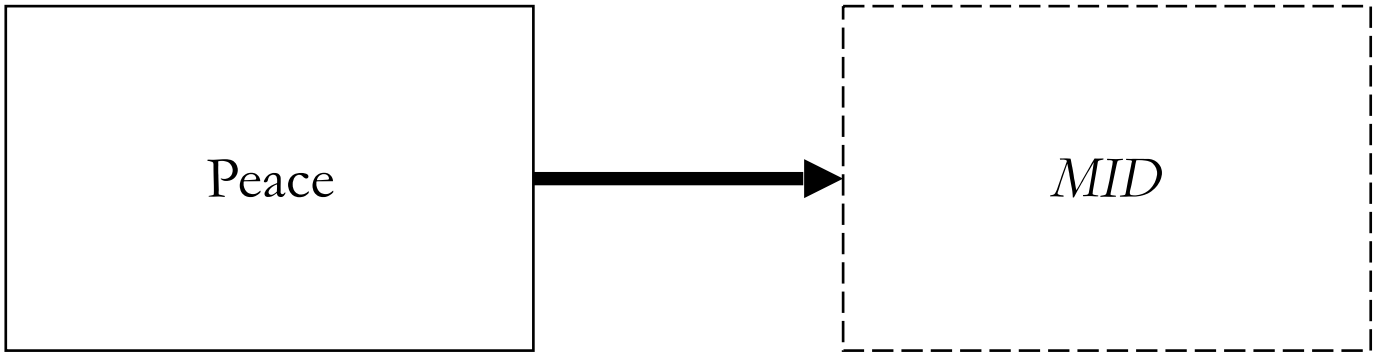
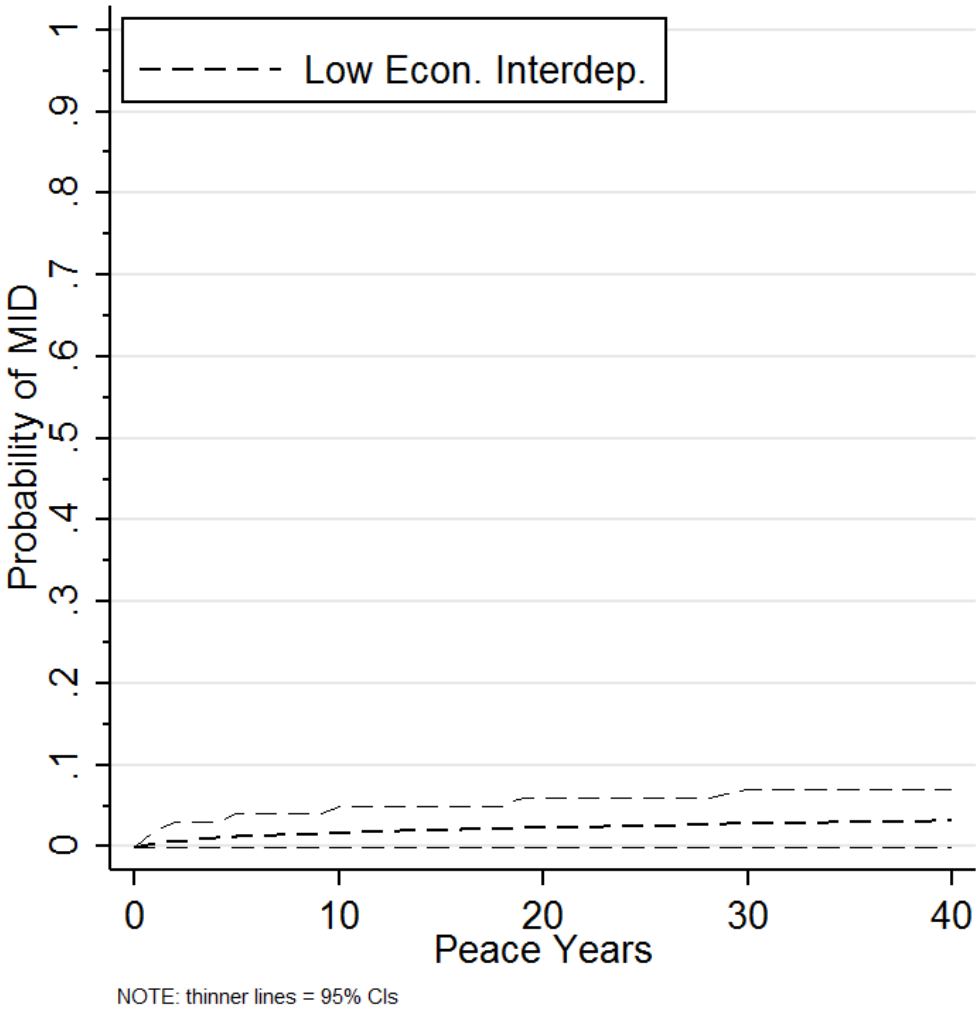


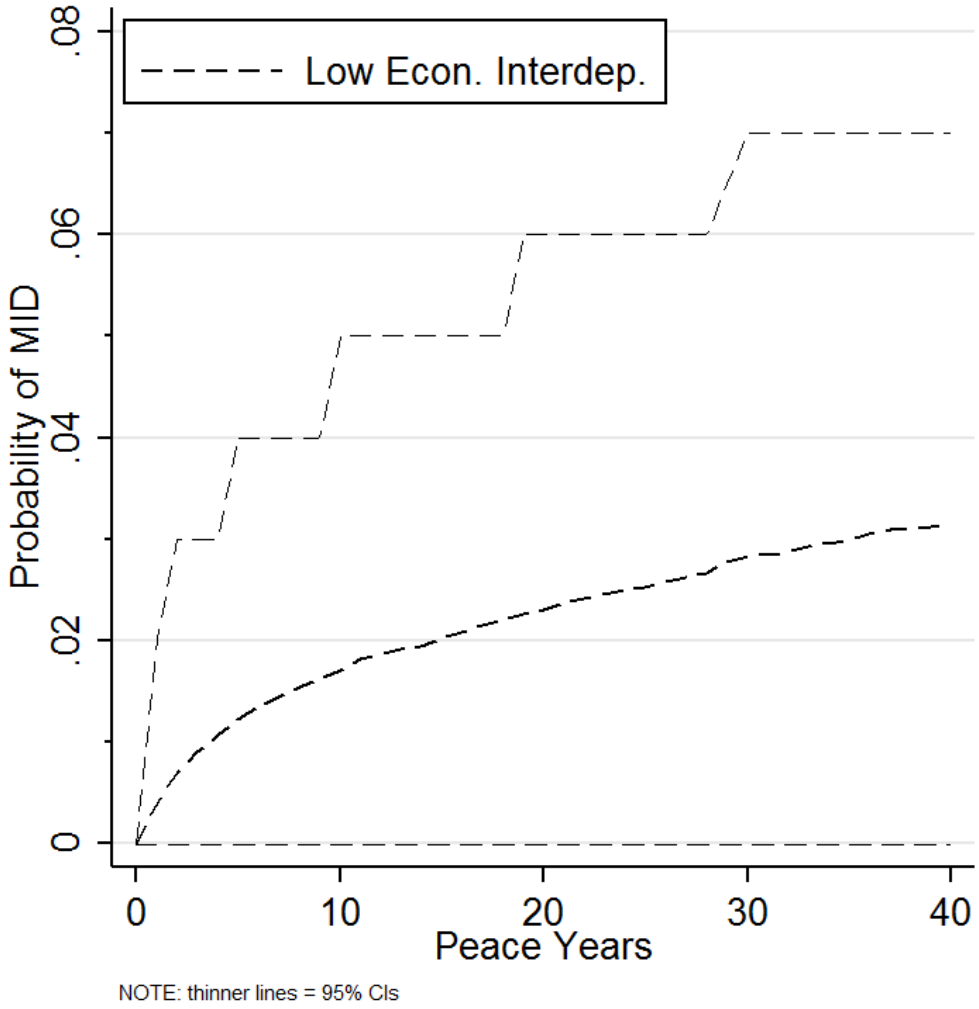

in dataset

*not in dataset*

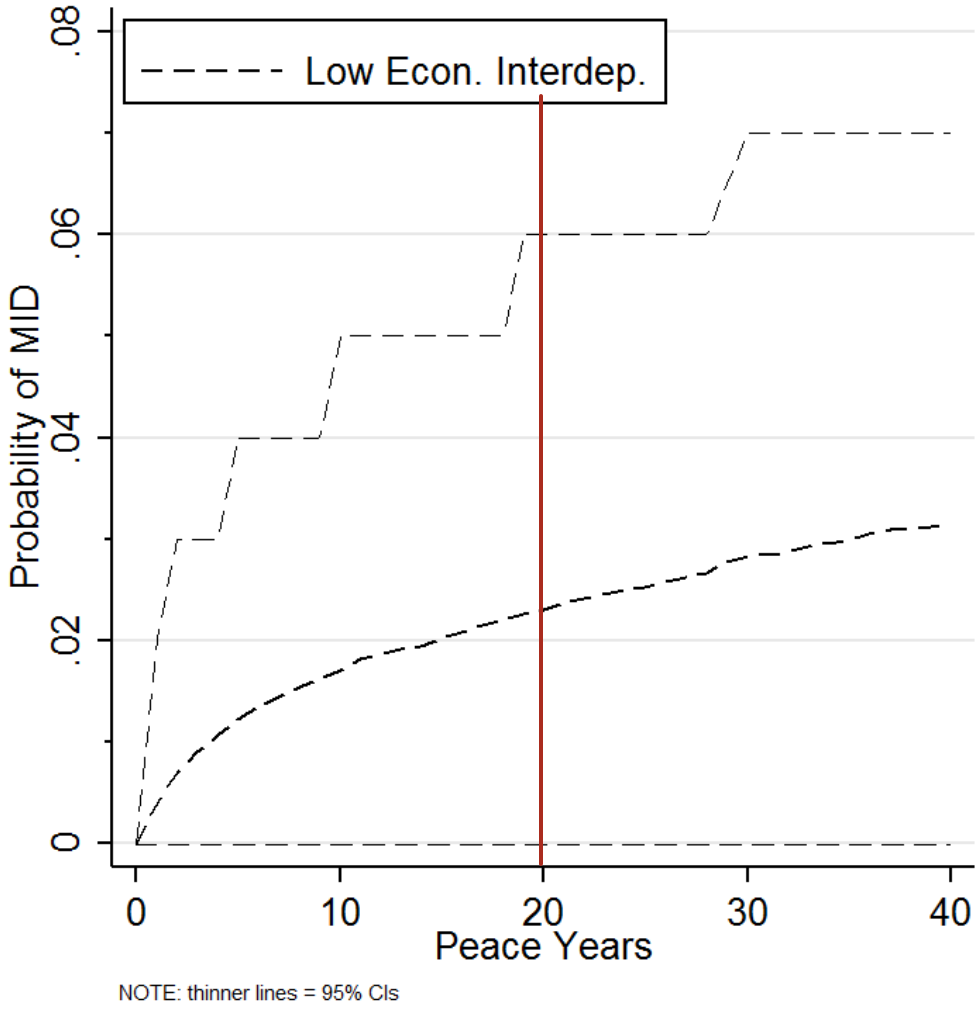
# MID Onset


Low Econ. Interdep.
Probability of MID
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
1
0
10
20
30
40
Peace Years
NOTE: thinner lines = 95% CIs

# MID Onset


Low Econ. Interdep.
Probability of MID
0
.02
.04
.06
.08
0
10
20
30
40
Peace Years
NOTE: thinner lines = 95% CIs

# MID Onset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# Solution: Transition Probabilities

**How does legislative support affect the risk of significant legislation being invalidated by the Supreme Court?**

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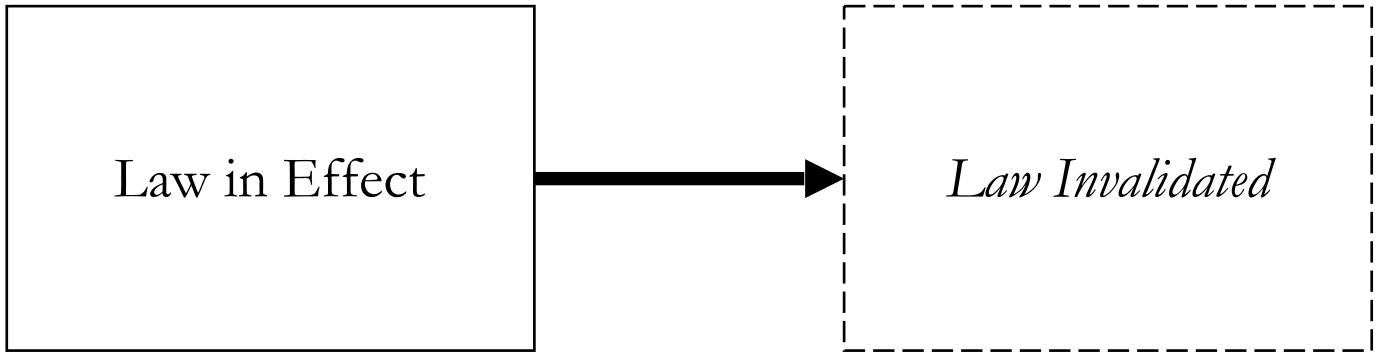
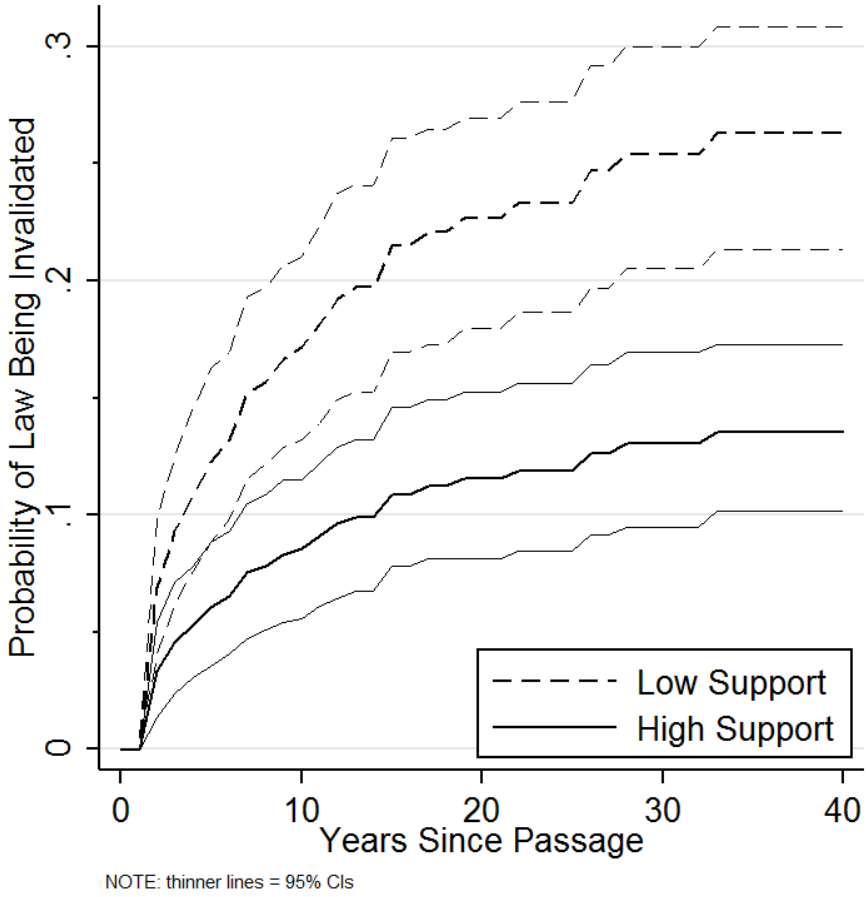


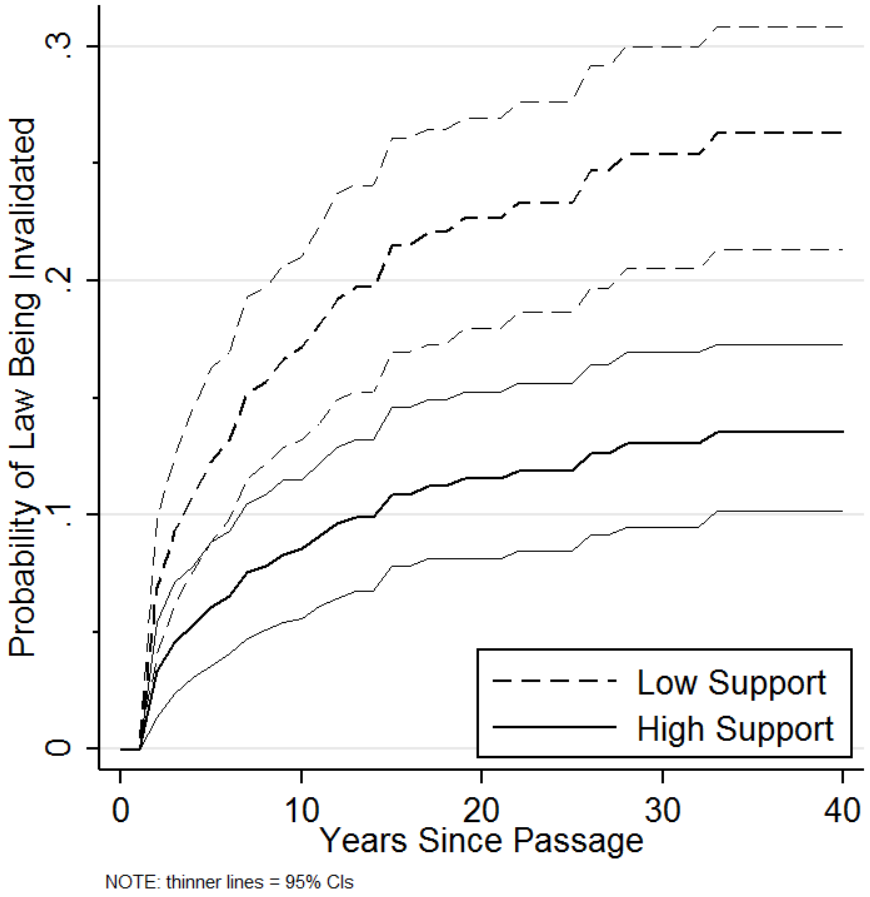

in dataset

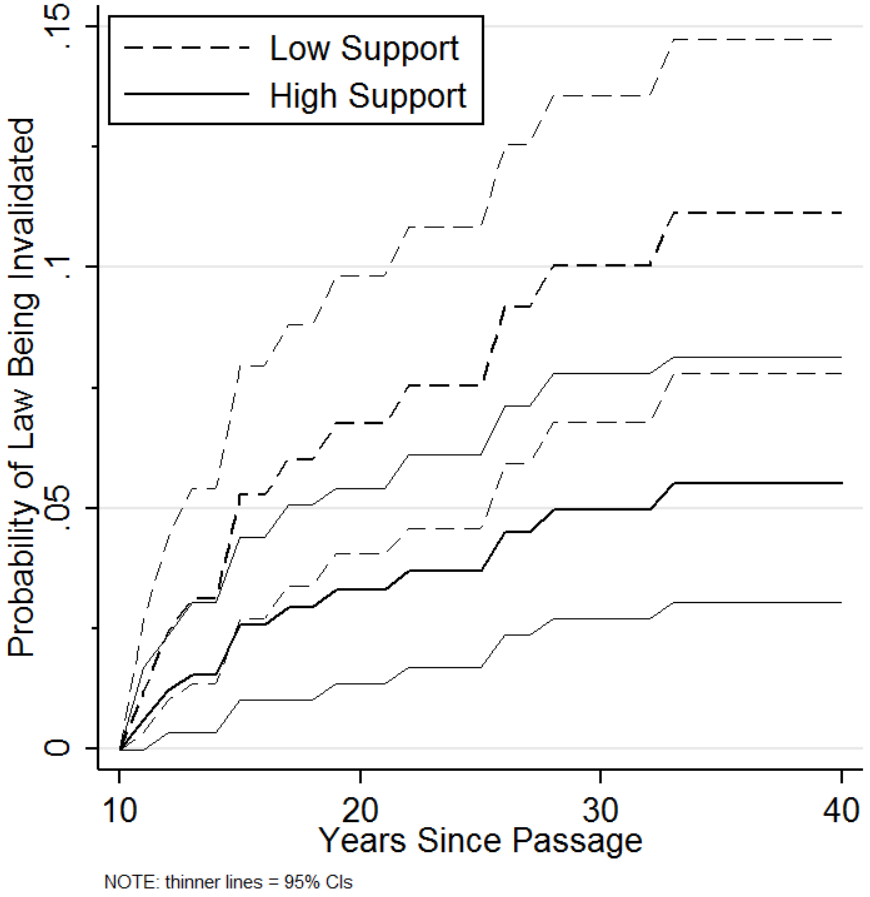
*not in dataset*

# Judicial Invalidation– *s* = 0

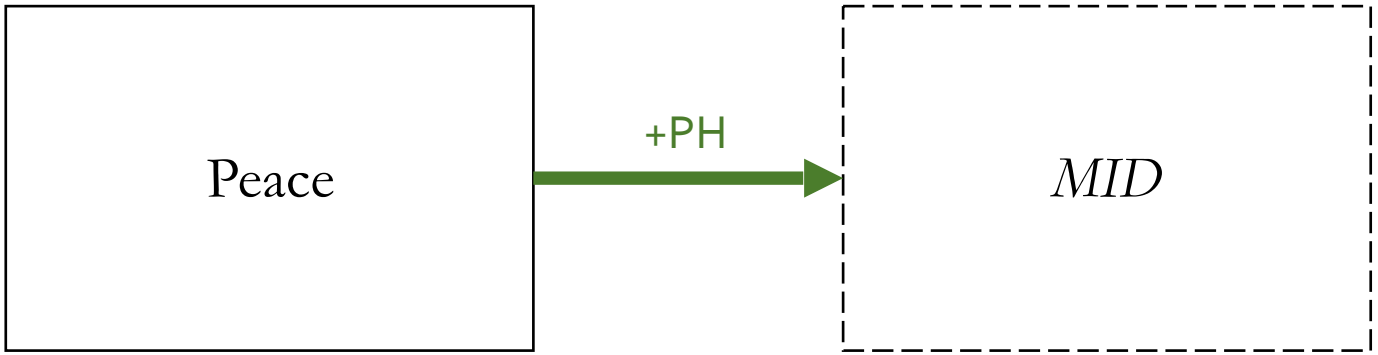


# Judicial Invalidation– *s* = 10



# PH Violations



# PH Violations

| | *Logit* | *Cox* |
|---|---|---|
| Allies | -0.205* | -0.081 |
| | (0.090) | (0.062) |
| Democracy (Low) | -0.064** | -0.065** |
| | (0.007) | (0.005) |
| Joint IGOs | 0.011** | 0.021** |
| | (0.002) | (0.002) |

† = $p \leq 0.10$, * = $p \leq 0.05$, ** = $p \leq 0.01$, two-tailed tests.

# PH Violations

| | *Logit* | *Cox* | *Cox with PH Corrections* |
|---|---|---|---|
| Allies | -0.205* | -0.081 | -0.261** |
| | (0.090) | (0.062) | (0.091) |
| Democracy (Low) | -0.064** | -0.065** | -0.056** |
| | (0.007) | (0.005) | (0.007) |
| Joint IGOs | 0.011** | 0.021** | 0.037** |
| | (0.002) | (0.002) | (0.003) |
| Allies * ln(Time) | | | 0.103* |
| | | | (0.044) |
| Democracy * ln(Time) | | | -0.006† |
| | | | 0.0034 |
| Joint IGOs * ln(Time) | | | -0.012** |
| | | | (0.001) |

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# PH Violations

Logit: –, SS

The Effect of Alliances

Logit: +, SS

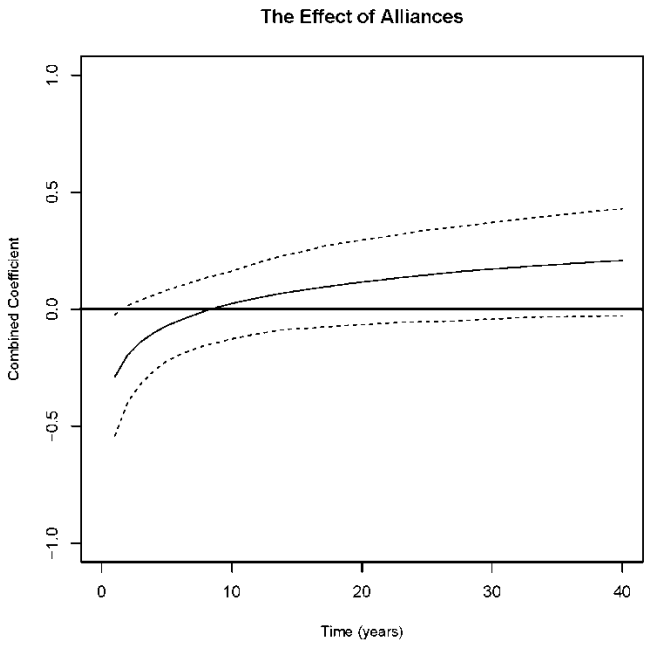
The Effect of Joint IGO Membership

Logit: –, SS

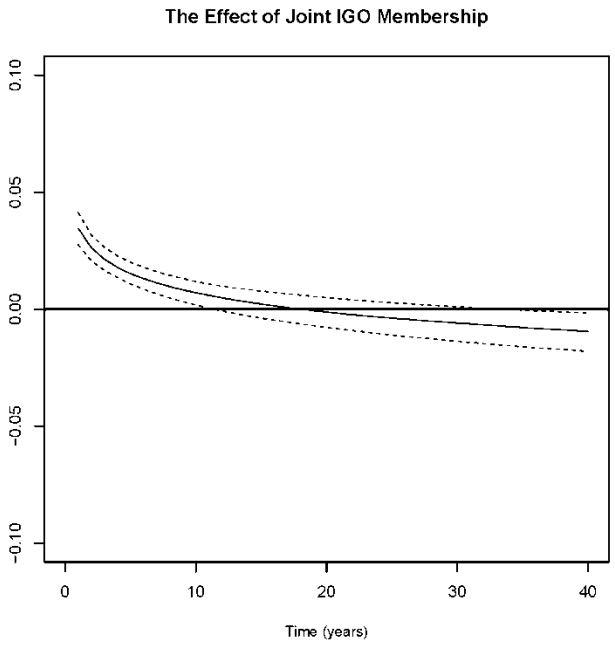
The Effect of Democracy

# PH Violations

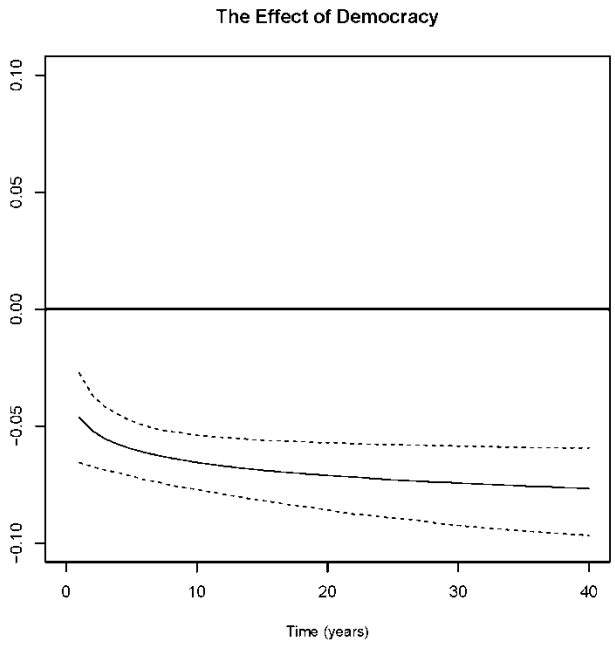
Logit: –, SS




Logit: +, SS




Logit: –, SS



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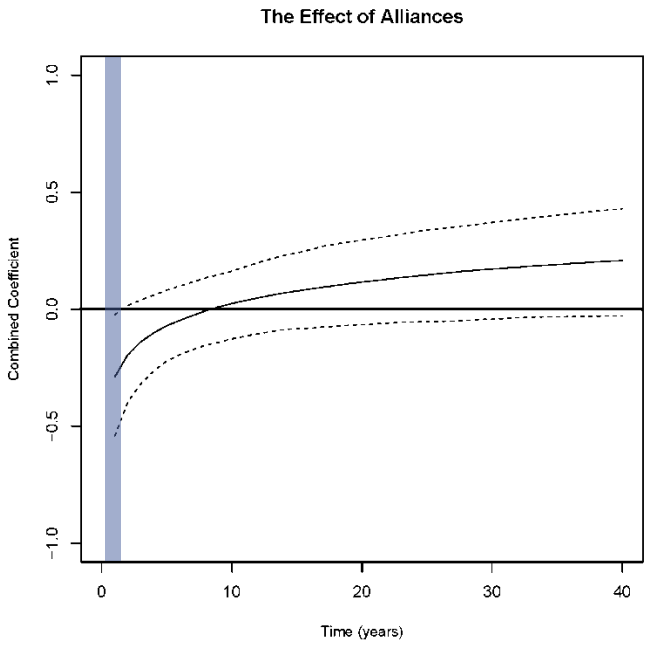
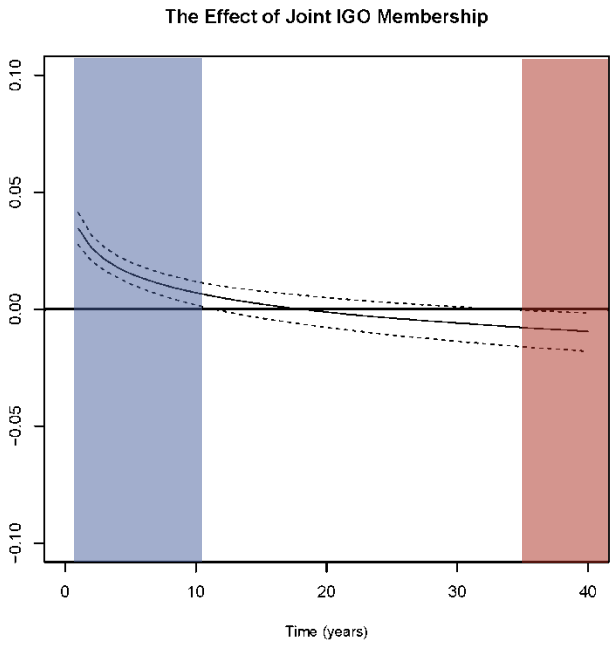
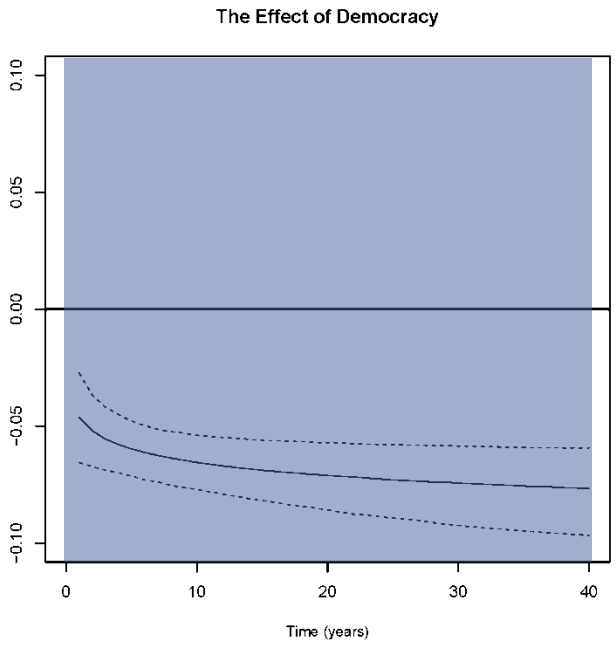
Logit: –, SS



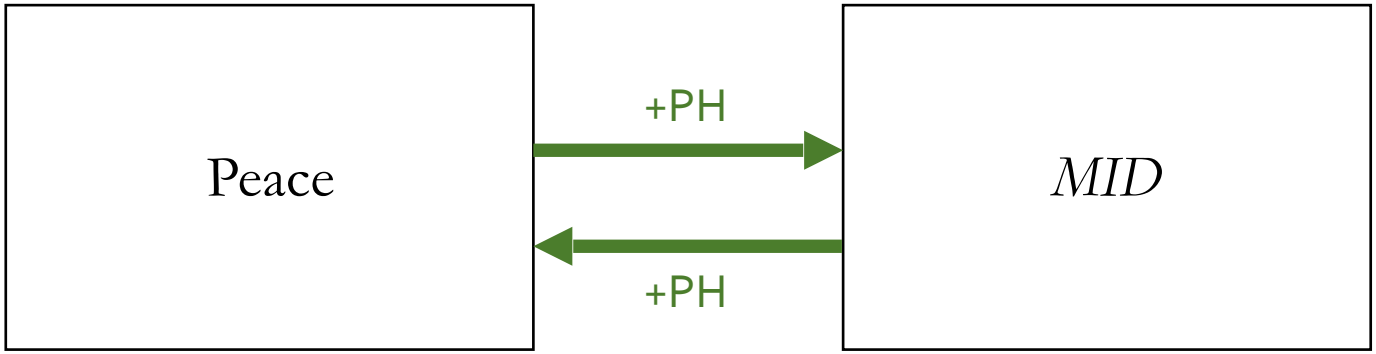

Logit: +, SS




Logit: –, SS



# Modeling Onset & Duration



# Onset & Duration + PH

| | *Cox* |
|---|---|
| | |
| Economic Interdep. (Low) | -28.15** |
| | (6.017) |

† = $p \leq 0.10$, * = $p \leq 0.05$, ** = $p \leq 0.01$, two-tailed tests.

# Onset & Duration + PH

| | *Cox* | *Two-Stage Cox + PH* | |
|---|---|---|---|
| | | Peace → MID | MID → Peace |
| **Economic Interdep. (Low)** | -28.15** | -23.230** | 12.620** |
| | (6.017) | (6.000) | (3.420) |

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- More holistic perspective

# Questions?