

Sourcing Air Supremacy:

Determinants of Change in the International Fighter Jet Network



Ray Rounds
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Plan

The Puzzle

Answer

Methodology

Motivating the Puzzle

Fighter Sourcing Change (FSC) Theory & Framework

Cases and Results

Puzzle

Very few states produce fighter jets; most import

Importing fighter aircraft is costly and complex

- Strong state-to-state interaction

Changing sourcing-state is economically and operationally inefficient and costly; large incentives to maintain status quo sourcing arrangements

- **So why does change occur?** (Devore and Weiss 2012; Johnson 2013)

Question: Under what conditions are states willing to accept the inefficiencies and costs associated with sourcing change?

Answer

1) As expected, change is rare

2) Sourcing change driven largely by politico-security factors (~67%), occasionally tactical capabilities (~33%)

Methodology

Descriptive SNA measures (centrality and density); summary statistics to motivate puzzle (H1)

Typological theory for hypothesis generation

Qualitative case studies for hypothesis testing

- Focused comparison of cases; not cross-case comparison
- Within-unit, over time for variation on DV
- Overcoming endogeneity

Data - Elite / media interviews, primary / secondary written sources

Motivating the Puzzle

Recent work on arms trade shows diffusion and decentralization

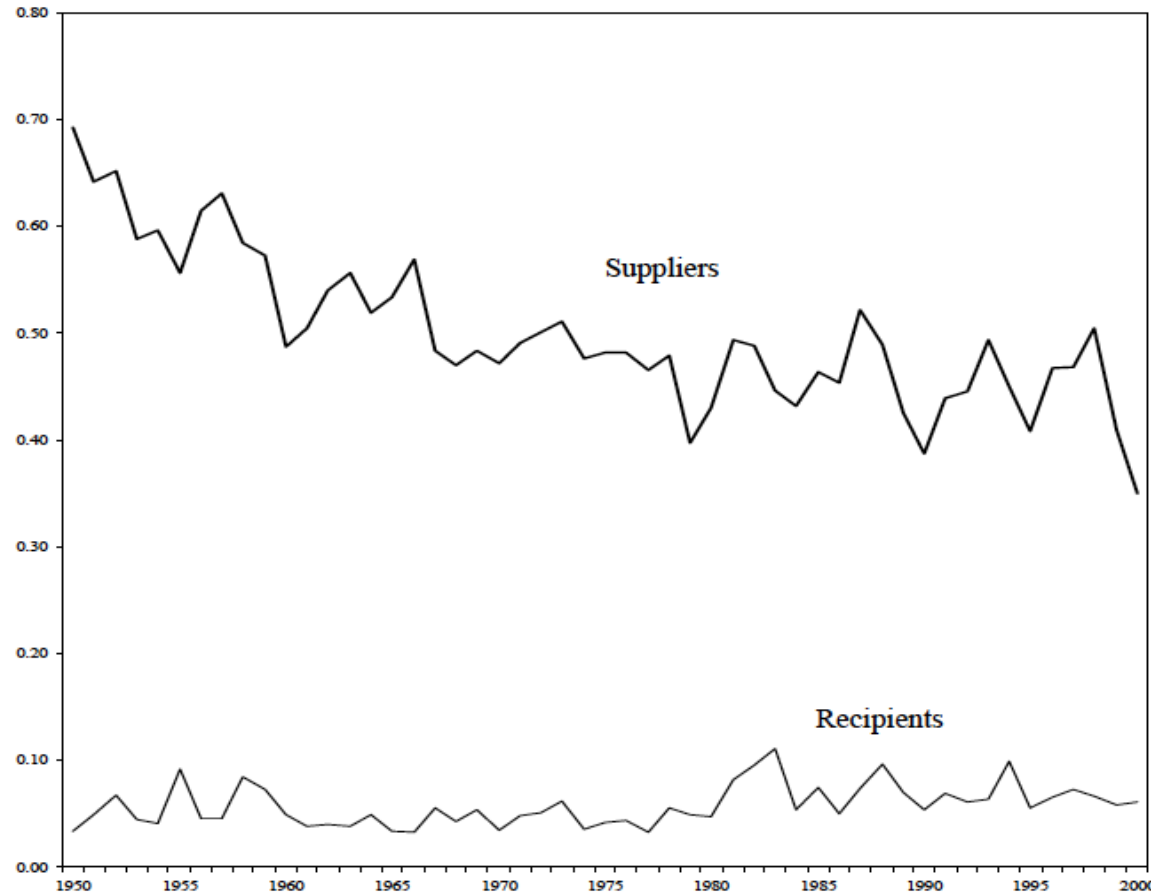
- All use SIPRI data

Arms trade network now far less centralized than early Cold War

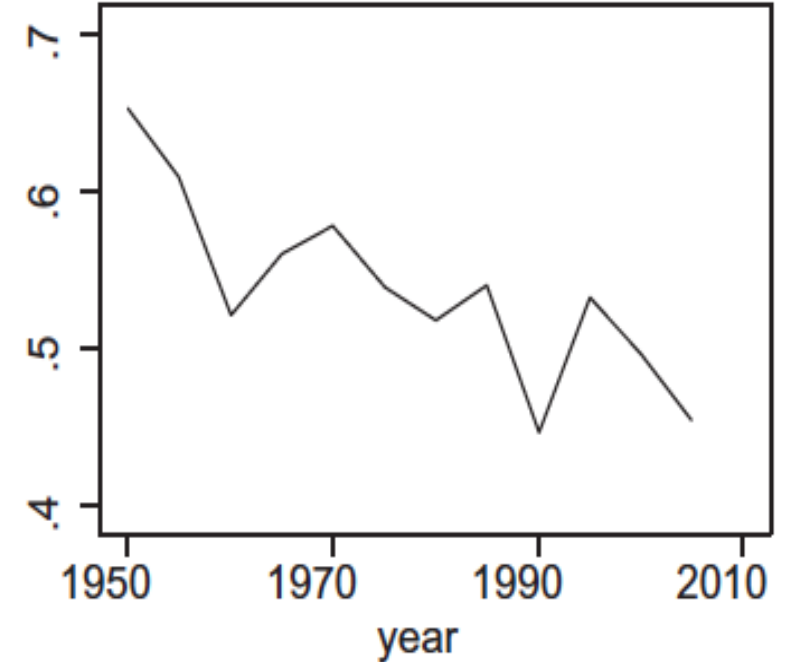
- Including fighter jets

If true, change should not be rare or puzzling

Previous Work – decentralizing arms network



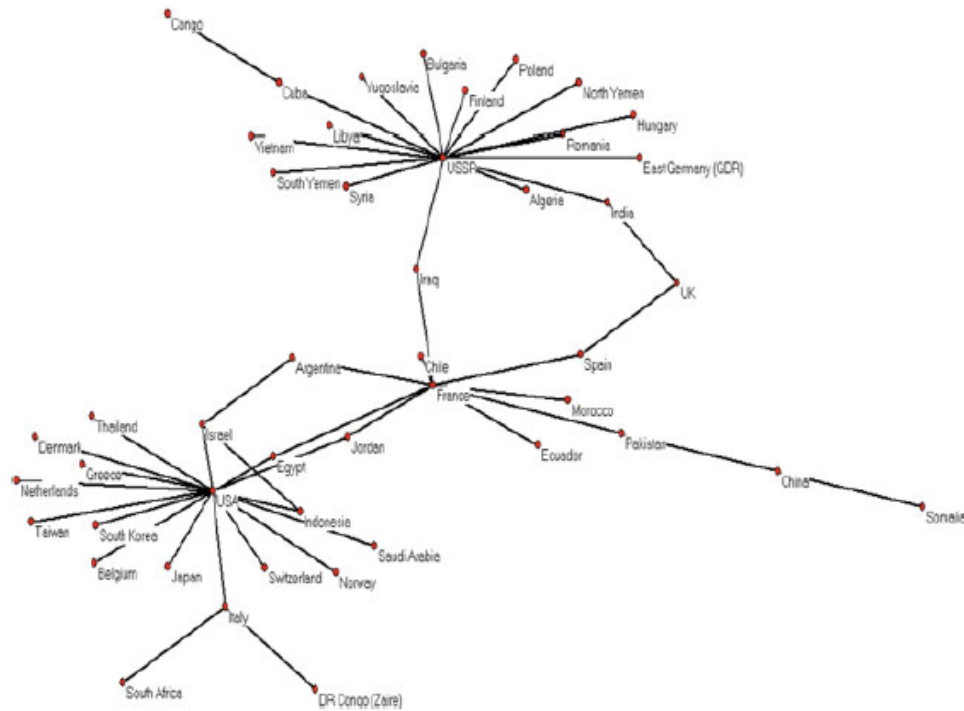
Kinsella (2003)



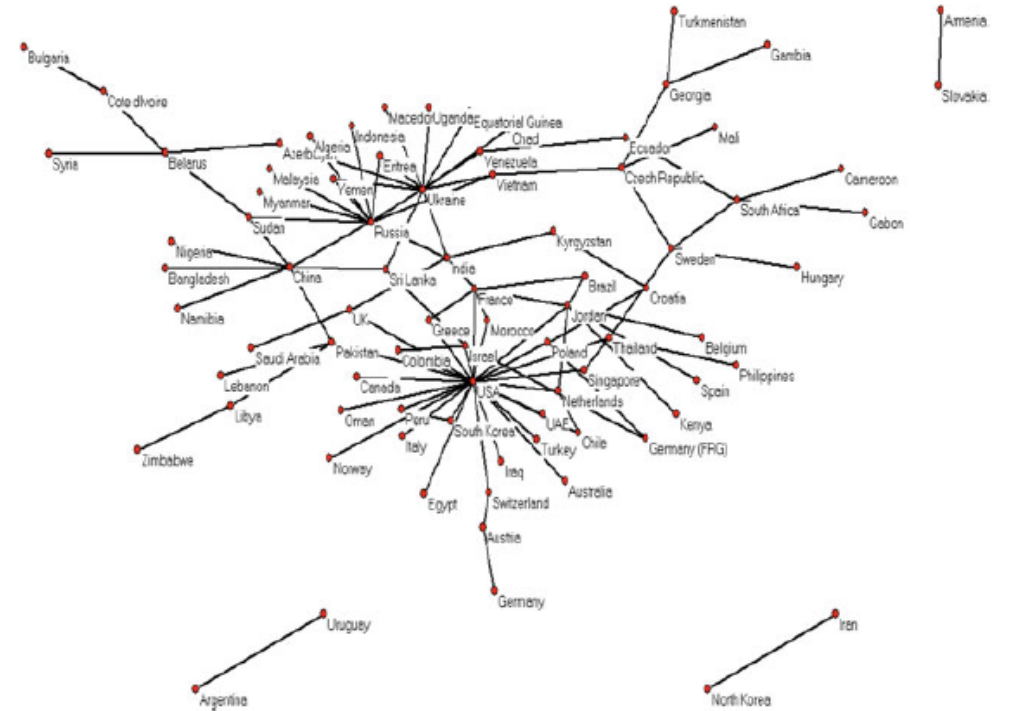
Akerman and Seim (2014)

Previous Work – decentralizing fighter network

Network Analysis of Fighter Jet Transfers during the Cold War (1970s, N = 47)



Network Analysis of Fighter Jet Transfers after the Cold War (2000s, N = 83)



Vucetic and Tago (2015)

Motivating the Puzzle

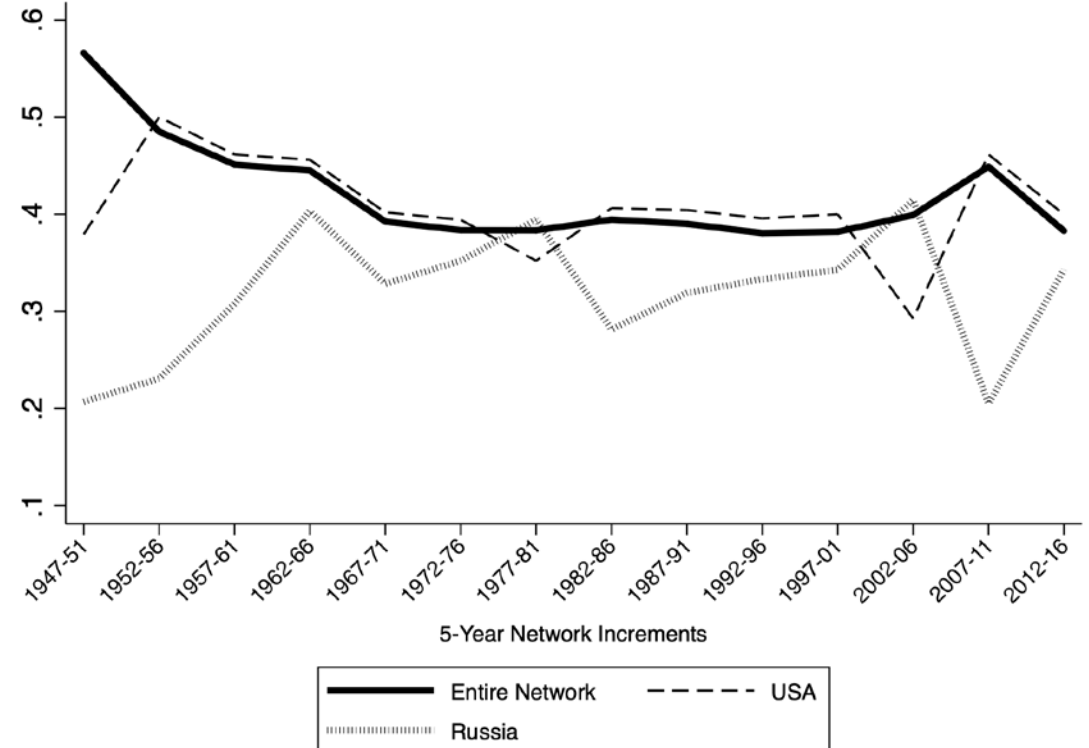
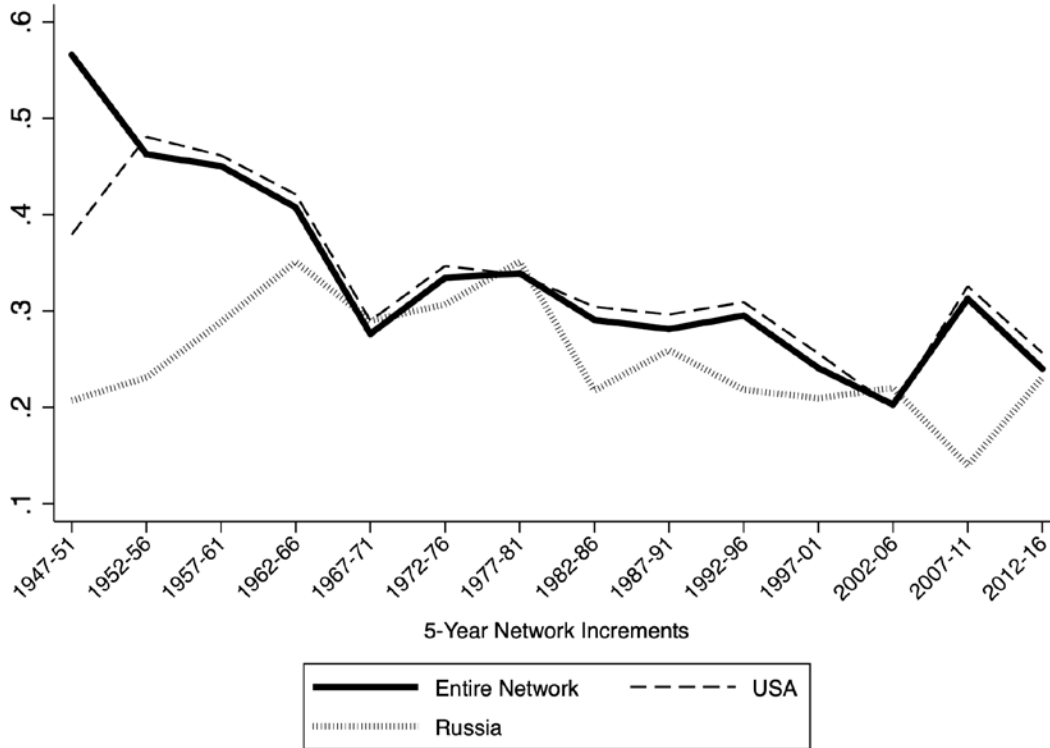
Does not match with personal experience/knowledge and previously mentioned deductive theorizing – especially fighters

Reasons for disconnect – second-hand transfers

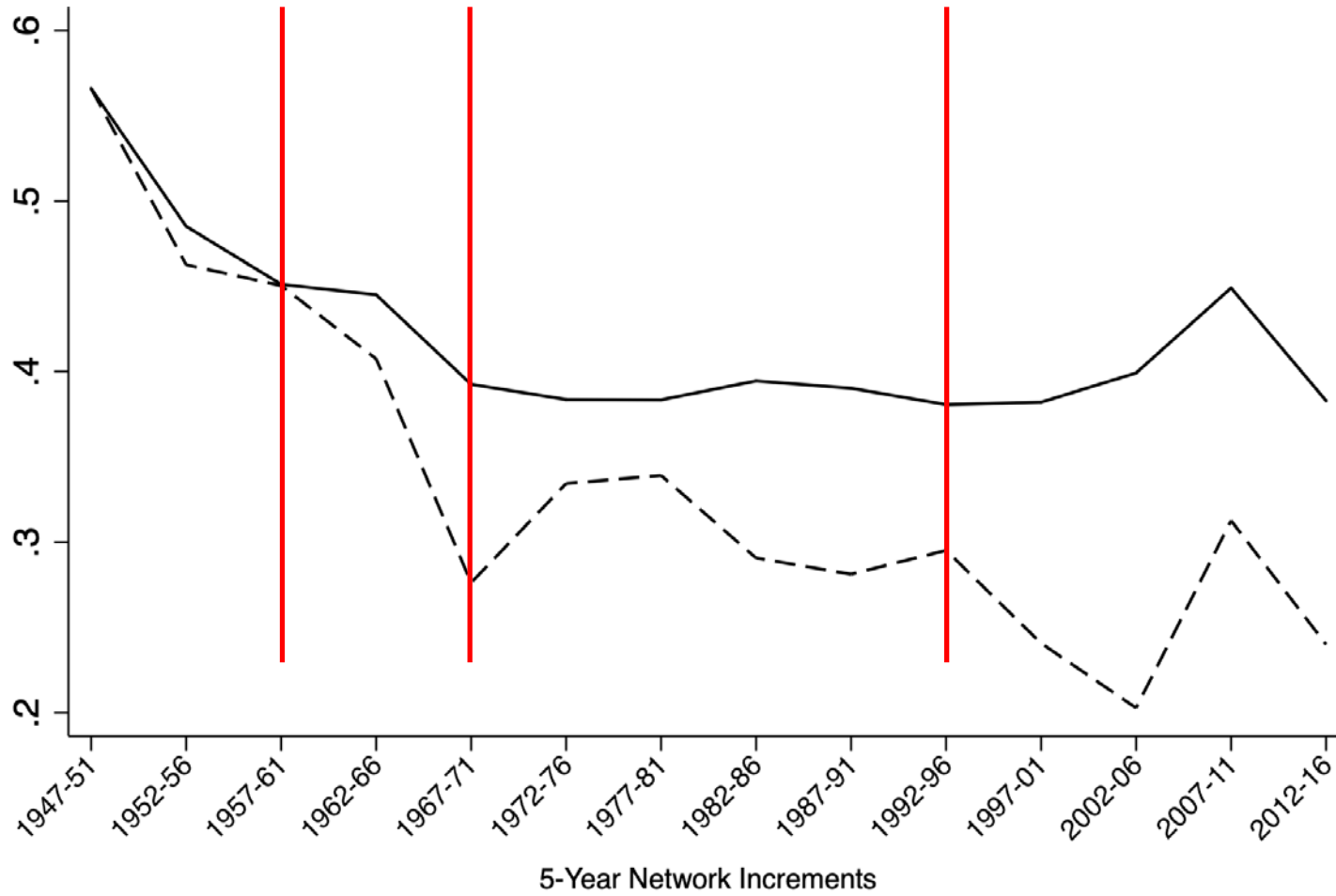
- New “contextual coding”

I argue little change in network over time (next slide)

New Work – centralized fighter network



Fighter Network – Centrality



— Production State Coding - - - - SIPRI Coding

Conclusions with New Coding

High centralization, few producers

Very limited sourcing change (22/294 cases post-1991)

Validates *puzzle*: high barriers to change theoretically, demonstrated empirically – **so what causes change when it does happen?**

FSC Theory and Framework - DV

DV = **Sourcing Change** at two levels for each observation/case

- “Change” “No Change” at 1) state level and 2) political bloc
- Any change from current arrangement at moment of transfer
- DV is not “sole-source”, “multi-source”; different question

FSC Theory and Framework – Hypotheses / IVs

Willingness + Opportunity = Change

H1 – Status Quo

H2/IV-1 – Capability: Supply-Side Target of Opportunity (W & O)

H3/IV-2 – Bloc-Fleet Alignment (W) – West and the Rest

H4/IV-3 – High-Threat Environment (W)

H4a) IV-4 – Security Reliance (W)

H4b) IV-5 – Supply Security (W)

H5/IV-6 – Increased Desire for Prod Autonomy and Tech Transfer (W)

*C1 - Desired Capability Available from New Source (O)

*C2 - State Wealth (O)

Typological Space (compressed)

Supply-Side	Bloc-Fleet Alignment	Threat Environment	Security Reliance	Supply Security	Domestic Production / Tech Transfer	DV – State	DV – Bloc
Yes	Yes	Not-High	N/A	N/A	Yes / No	Change	No Change
Yes	Yes	High	Not-High	Yes	Yes / No	Change	No Change
Yes	Yes	High	Not-High	No	Yes / No	Change	Change
Yes	Yes	High	High	Yes	Yes / No	Change	No Change
Yes	Yes	High	High	No	Yes / No	Change	No Change
Yes	No	Not-High	N/A	N/A	Yes / No	Change	Change
Yes	No	High	Not-High	Yes / No	Yes / No	Change	Change
No	Yes	Not-High	N/A	N/A	Yes	Change*	No Change
No	Yes	Not-High	N/A	N/A	No	No Change	No Change
No	Yes	High	Not-High	Yes	Yes	Change*	No Change
No	Yes	High	Not-High	Yes	No	No Change+	No Change
No	Yes	High	Not-High	No	Yes / No	Change	Change
No	Yes	High	High	Yes	Yes / No	No Change	No Change
No	Yes	High	High	No	Yes / No	Change	No Change
No	No	Not-High	N/A	N/A	Yes / No	Change	Change
No	No	High	Not-High	Yes / No	Yes / No	Change	Change

Assume both C1 - desired capability offered by different source, and C2 – not-low state wealth, are fulfilled; otherwise there is no opportunity for change and thus no change, regardless of willingness values.

Cases and Results

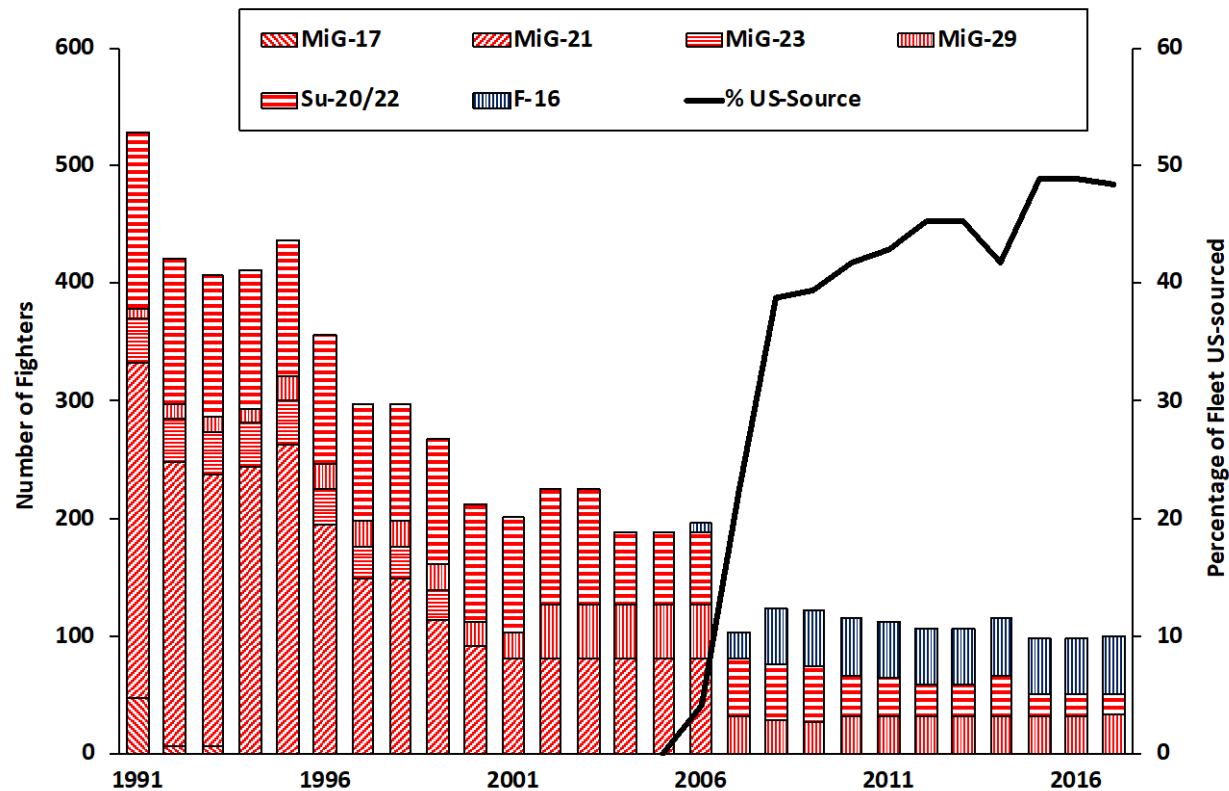
8 in-depth cases in 3 states test primary mechanisms (H1, H3, H4, H5)

- Poland (F-16, MiG-29, Future Fighter)
- Egypt (F-16, MiG-29M, Rafale)
- Brazil (Mirage 2000, Gripen E/F)

19 mini-studies for secondary mechanisms and deviant cases (H2)

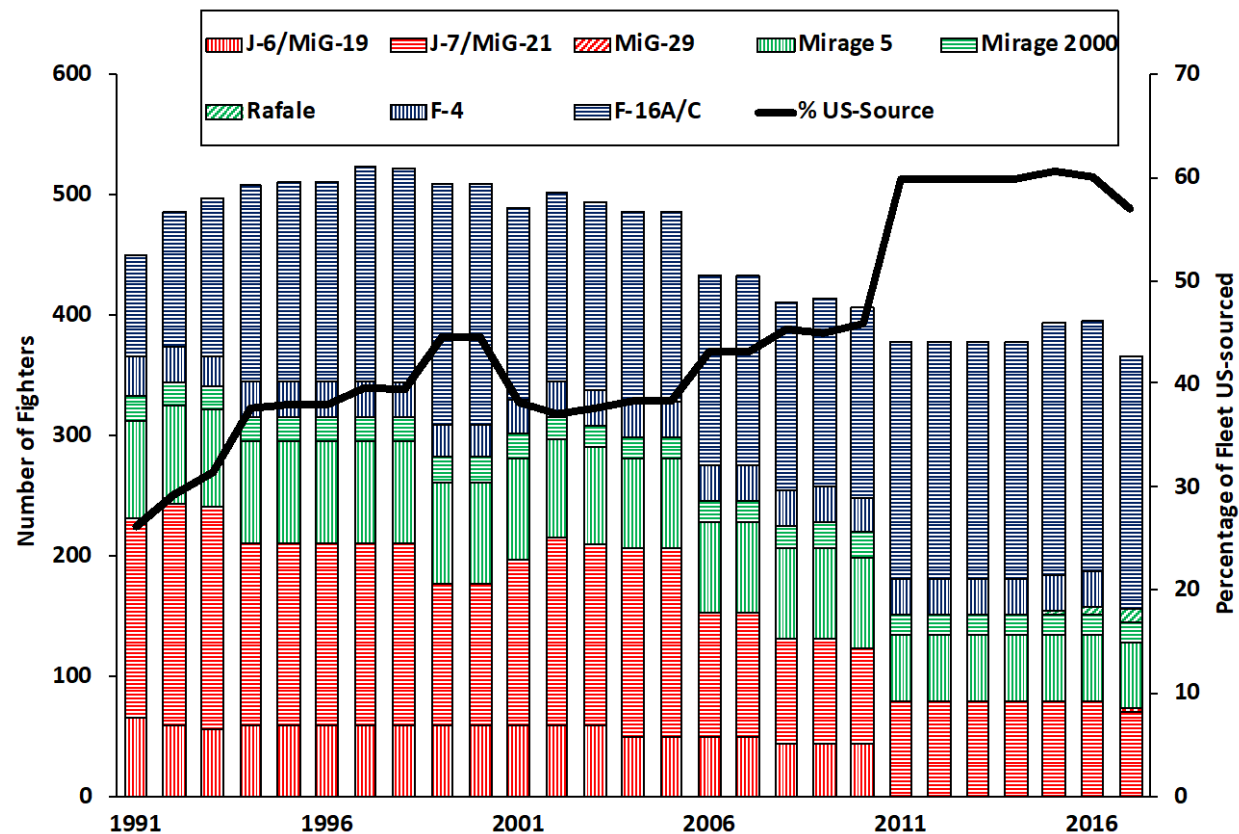
Poland – Bloc-Fleet Alignment; Free and Future Fighters

Year - Case	Supply-Side	Bloc-Fleet Alignment	High Threat Environment	Security Reliance	Supply Security	Domestic Production & Tech Transfer	State –Prediction /Actual	Bloc Change – Prediction / Actual
2003 – F-16	No	No	No	Not High	Yes	Yes	C / C	C / C
2002 – MiG-29	No	No	No	Not High	Yes	Yes	C / NC*	C / NC*
2024 – ?	No	Yes	Yes	High	Yes	No	NC / ?	NC / ?



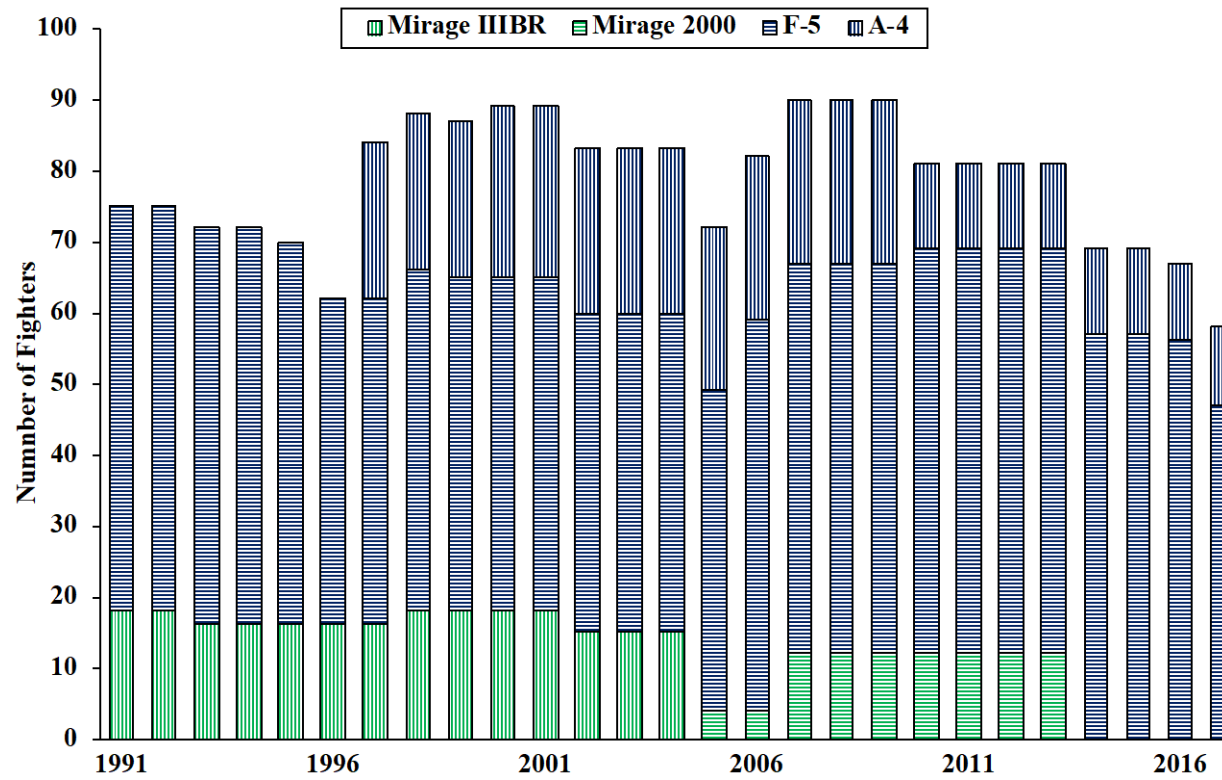
Egypt– Threat Environment and Supply Insecurity

Year – Case	Supply-Side	Bloc-Fleet Alignment	High Threat Environment	Security Reliance	Supply Security	Domestic Production & Tech Transfer	State –Prediction /Actual	Bloc Change – Prediction / Actual
2010 – F-16	No	Yes	No	Not High	Yes	No	NC / NC	NC / NC
2015 – MiG-29	No	Yes	Yes	Not High	No	No	C / C	C / C
2015 – Rafale	Yes*	Yes	Yes	Not High	No	No	C / C*	C / NC*



Brazil – Domestic Production and Technology Transfer

Year – Case	Supply-Side	Bloc-Fleet Alignment	High Threat Environment	Security Reliance	Supply Security	Domestic Production & Tech Transfer	State –Prediction /Actual	Bloc Change – Prediction / Actual
2005 – Mirage	No	Yes	No	Not High	Yes	No	NC / NC	NC / NC
2013 – Gripen	No	Yes	No	Not High	Yes	Yes	C / C	NC / NC



Adding the 19 “other” Change Cases

Of the 22 total cases of change:

- 8 (7) supply-side capability driven change (H2)
- 8 (7) bloc-fleet misalignment (H3)
- 8 (7) combination high threat and low supply security (H4b)
 - Taiwan (H4a, split-buy), Kuwait (H4a, split-buy)
 - Thailand (part-dev)
- 4 (1) involve increased domestic production (H5)
 - Only Brazil where it was primary factor
 - Reflects producer compliance, not low demand
- Austria (deviant), and corruption

Results

FSC theory and associated hypotheses hold up extremely well

- Change mechanisms present in all cases of change (except Austria)
 - Cannot check universe of status quo, but matches for those included
- Politico-Security factors dominate
- Coding decisions supported in case studies

Areas for Improvement:

- Where do “free” arms fit in?
- Attrition and addition Vs. generational change and recapitalization
- How to anticipate ultimate selection, not just change
- Thailand, Austria, and corruption

Takeaways

Arms as Influence or Coercion?

- Bargaining failures; i.e. Indonesia, Egypt, Kuwait
 - Why do these happen? Selection Effects?
- Provides Access - Limited leverage
- Embargo to hurt tactical readiness, not political influence (Iran, Vene)

Return of Great Power Competition

- China rapidly filling global role (i.e. FC-1/JF-17)

Future Research

Sole versus Multi-Source

Other weapons systems, different “networks”

Arms sourcing change and conflict (Fearon and Hansen)

- Dyad change; 25% increase (contig) / doubling (non-contig) in MID

Drones, China, and the Future of the Fighter Network

Questions

Country – Year, Case	Supply-Side	Bloc-Fleet Alignment	High Threat Environment	Security Reliance	Supply Security	Domestic Production & Tech Transfer	DV Prediction / Actual	State – DV Prediction / Actual	Bloc –
Oman 2002, F-16	Yes	Yes	Yes	Not High	Yes	No	C / C	NC / NC	
Sri Lanka 1995, Kfir	Yes	Yes	Yes	Not High	Yes	No	C / C	NC / NC	
Myanmar 2001, MiG-29	Yes	Yes	Yes	High	Yes	No	C / C	NC / NC	
UK 2006, F-35	Yes	Yes	No	Not High	Yes	No	C / C	NC / NC	
UAE 2000, F-16	Yes	Yes	No	Not High	Yes	No	C / C	NC / NC	
Malaysia 1994, MiG-29	Yes	Yes	Yes	Not-High	No	No	C / C	C / C	
Austria 2003, Eurofighter	No	Yes	No	Not-High	Yes	No	NC / C*	NC / NC	
Brazil 2005, Mirage 2000	No	Yes	No	Not High	Yes	No	NC / NC	NC / NC	
Egypt 2010, F-16	No	Yes	No	Not-High	Yes	No	NC / NC	NC / NC	
Indonesia 2003, Su-27	No	Yes	Yes	Not-High	No	No	C / C	C / C	
Thailand 2008, Gripen	No	Yes	Yes	Not-High	No	No	C / C	C / NC*	
Egypt 2015, MiG-29	No	Yes	Yes	Not-High	No	No	C / C	C / C	
Taiwan 1992, Mirage 2000	Yes	Yes	Yes	High	No	No	C / C	NC / NC	
Kuwait 2016, Eurofighter	No	Yes	Yes	High	No	No	C / C	NC / NC	
Finland 1992, F/A-18	No	No	No	Not-High	Yes	Yes	C / C	C / C	
Poland 2003, F-16	No	No	No	Not-High	Yes	Yes	C / C	C / C	
Hungary 2001, Gripen	No	No	No	Not-High	Yes	No	C / C	C / C	
Czech Republic 2004 Gripen	No	No	No	Not-High	Yes	No	C / C	C / C	
Poland 2002, MiG-29	No	No	No	Not-High	Yes	No	C / NC+	C / NC+	
Venezuela 2006, Su-30	No	No	No	Not-High	No	No	C / C	C / C	
Romania 2013, F-16	No	No	Yes	Not-High	No	No	C / C	C / C	
Ecuador 2010, Cheetah-C	No	No	Yes	Not-High	No	No	C / C	C / C	
S. Africa 1999, Gripen	Yes	Yes	No	Not High	Yes	Yes	C / C	NC / NC	
Brazil 2013, Gripen	No	Yes	No	Not High	Yes	Yes	C / C	NC / NC	
Qatar 2016 Eurofighter/F-15	No	Yes	Yes	Not-High	Yes	No	C# / C	NC / NC	
Poland 2024 Competition	No	Yes	Yes	High	Yes	No	NC / ?	NC / ?	