



Designing and Managing Successful International Joint Development Programs

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Research Questions

1. What are the characteristics of international joint development programs that result in positive or negative cost, scheduling, and end-product outcomes, such as final product, interoperability, technical relevance, and development of existing defense industrial bases?
2. How are best practices of international joint development programs in defense acquisition different from best practices of single-nation acquisition programs?

Methodology

- Identify the best practices defined in acquisition literature.
- Select and research the six cases to determine how they were structured and implemented.
- Identify characteristics research shows as specifically crucial to the outcomes of international joint development programs.
- Investigate case studies by interviewing stakeholders from industry and government, as well as outside experts.
 - Ask interviews to categorize their project for each of the characteristics using a Likert-type scale.
 - Record other key characteristics and other incidents key to each individual case suggested by interviewees.

Hypotheses (1 of 2)

1. **The structure of cooperation in international joint development programs matters** – the international joint development programs whose stakeholders cooperate only during the development or production phases will have less successful cost, scheduling, and end-product outcomes.
2. International joint development programs that **are more grounded in security policies** rather than economic efficiency interests are more likely to result in negative cost, scheduling, or end-product outcomes.

Hypotheses (2 of 2)

3. **Countries that have cooperated in defense acquisition before** have a higher chance of achieving positive cost, scheduling, and end-product outcomes.
4. Countries that are uniquely capable of producing complex acquisition programs **benefit from working with smaller countries or industries who may have comparative advantages in certain technologies**, but do not have the capacity to produce complex acquisition programs on their own.

Cases: the NATO Aerial Ground Surveillance (NATO AGS) Program

	Program Goals
Overall Capability	NATO-owned and operated airborne ground surveillance platform with the capability to provide continuous, wide area surveillance to all levels of command
Core Capability	A radar with similar capabilities to JSTARS' radar with synthetic aperture radar (SAR) and ground moving target indicator (GMTI) modes was preferred but not required
Program Development	Platform was to be developed cooperatively by industries of partner nations, radar to be adapted from JSTARS radar
Type of Platform	Aerial ISR
Level of Interoperability	Interoperability between NATO and national airborne, ground, and support platforms was a critical goal of the program
Spectrum of Operations	Surveillance, situational awareness, target acquisition, and damage assessment



Cost Goals	
Total FY 2009 United States Cost Estimate, as of 2003	\$195,228,000
Actual FY 2009 United States Cost, Reported 2010	\$22,471,000
Total FY 2015 United States Cost Estimate, as of 2009	\$252,668,000
Schedule Goals	
Planned Initial Operational Capability	Initial Operational Capability (IOC) planned for 2010 according to 2002 AGS Master Schedule
Planned Full Operational Capability	Full Operational Capability (FOC) planned for 2013 according to 2002 AGS Master Schedule

Image of [NATO AGS craft arriving at Edwards Air Force Base](#) by Chris Okula.

Cases: the Joint Strike Fighter (JSF/F-35) Program

	Program Goals
Overall Capability	“Develop and deploy a family of strike aircraft by capitalizing on commonality and modularity to maximize affordability”
Core Capability	“Single-seat, single-engine aircraft capable of performing and surviving lethal strike warfare using an affordable blend of key technologies”
Program Development	Utilize platform commonality (70%-80%) to reduce costs by integrating test plan, achieving economies of testing (2000 DOTE)
Level of Interoperability	Interoperability is a central feature of JSF.
Spectrum of Operations	Next generation platform designed to meet advanced threats in 2010 and beyond – USN wanted “first-day-of-the-war, survivable aircraft to complement the F/A-18E/F, USAF wanted a “replacement for the F-16 and A-10 and complement [for the] F-22,” USMC wanted a “single-STOVL platform to replace the AV-8B and F/A-18C/D,” UK RN and RAF wanted a “supersonic STOVL fighter/attack aircraft to replace the Sea Harrier and GR-7, respectively”
International Development/Sales	Platform designed to address the needs of US Armed Forces, UK Royal Navy and Royal Air Force – high foreign interest in the program has translated to numerous cooperative agreements to participate in program – joint development and foreign military sales viewed as opportunity to reduce cost of program



	Cost Goals
Total Program Cost Estimated 2000	\$200 billion over 3000 aircraft
F-35A Unit Cost Estimated 2000	\$28 million (according to USAF)
F-35B Unit Cost Estimated 2000	\$30 million - \$35 million (according to USMC)
F-35C Unit Cost Estimated 2000	\$31 million - \$38 million (according to USN)

Image of [F-35 A-Variant Testing](#).

Cases: The Lightweight 155m (LW155) or M777 Program

	Program Goals
Overall Capability	Provide Army and USMC with lightweight, general support artillery with strategic deployability, tactical mobility, survivability, and digitization
Core Capability	155mm Lightweight Howitzer, weighing approx. 5,500lbs less the platform it was developed to replace, equipped with towed artillery digitization (TAD), a self-locating electronic aiming system
Program Development	Original contract planned for 70% of program development to occur in U.S., other 30% in U.K.
International Sales	None originally planned



	Cost Goals
Program Baseline Cost as of 2000	\$1,087 million
	Schedule Goals
First Test Howitzer Delivery	June 1998
Production approval (Milestone III)	December 1999
Production Contract Award	December 1999
First Production Howitzer	March 2001
Marine Corps Initial Operational Capability	March 2002
Army Initial Operational Capability	March 2005

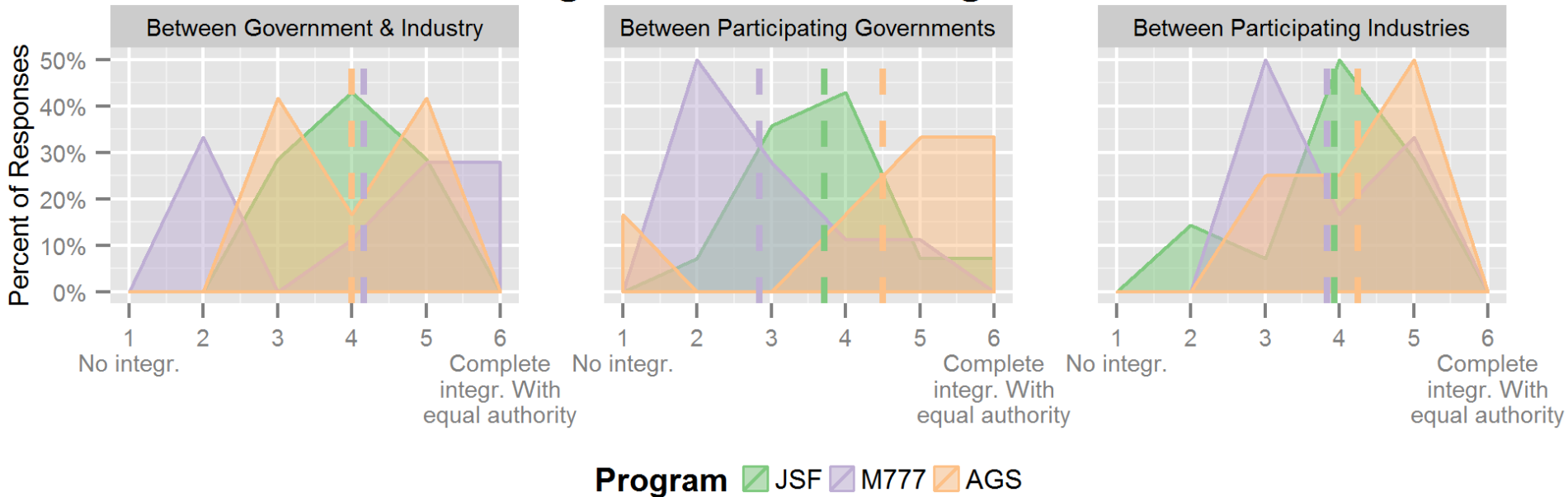
Image of [U.S. Marines firing an M777 155 mm howitzer at Fire Base Fiddlers Green, Afghanistan](#), by Cpl. Jeff Drew.

Survey Results: Characteristic 1

1. Integration

The transnational partnerships that must be made for governments and industries to work together cause exceedingly complex organizational structures and how governments and industries are integrated matters.

Figure 1. Extent of Integration

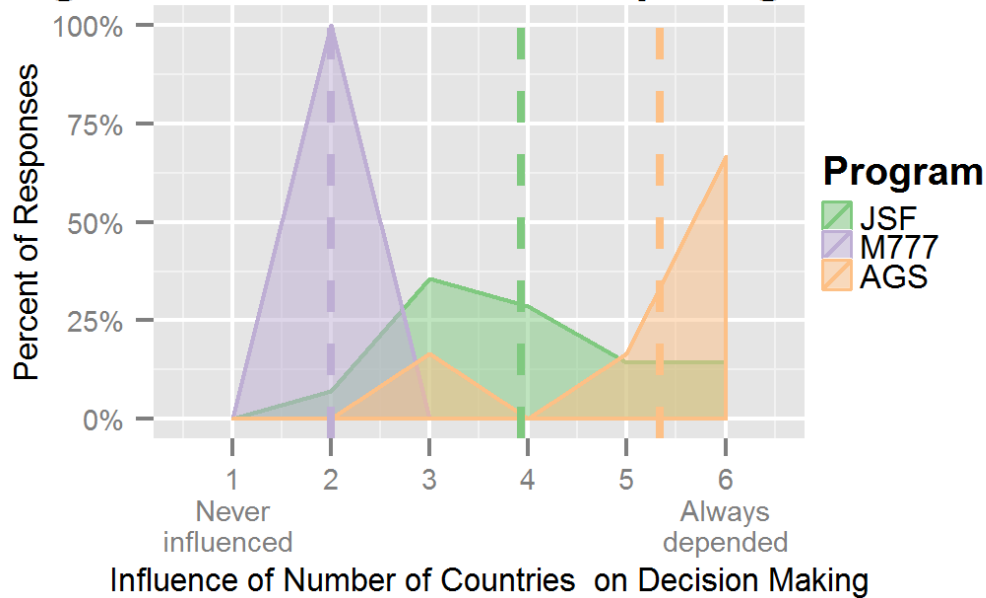


Survey Results: Characteristic 2

2. Number of Participating Countries

The number of partner nations in acquisition programs is associated with collaboration inefficiencies based on evidence Keith Hartley (defense economist) has found. Furthermore, the higher the number of partner nations, the higher the level of complexity.

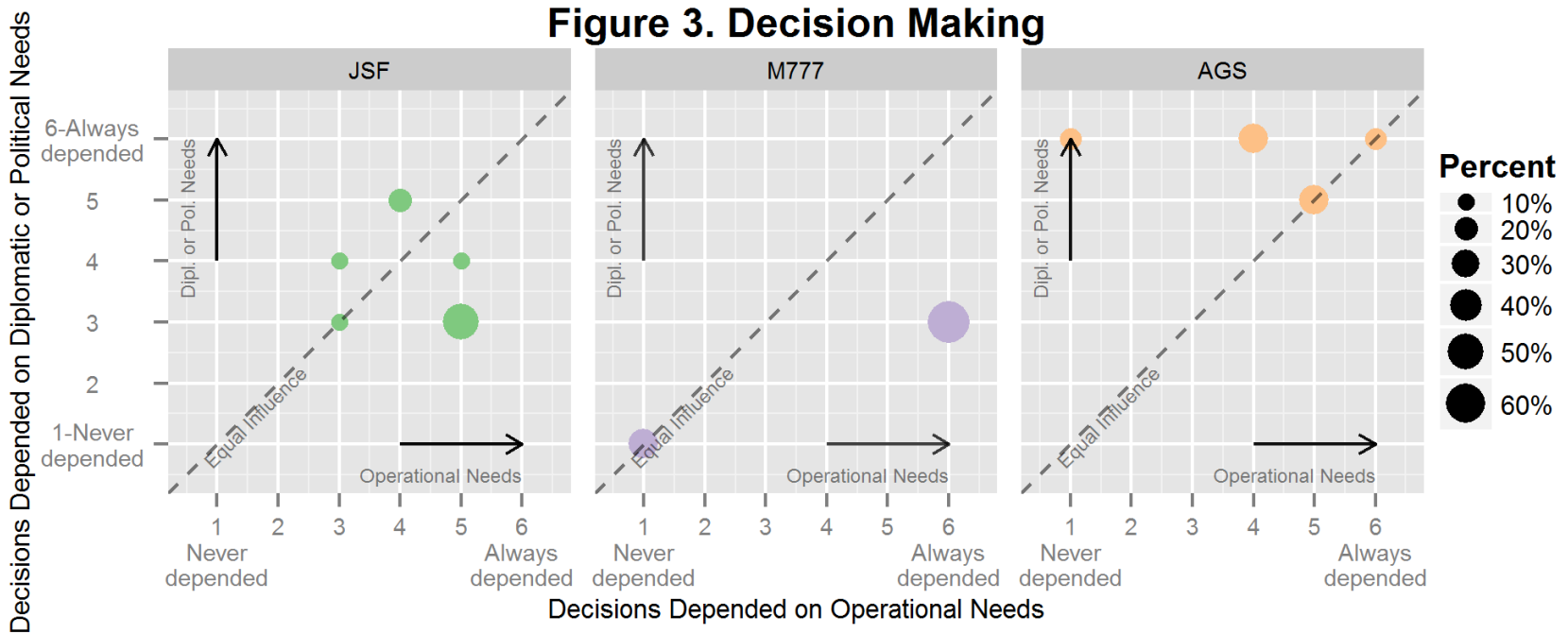
Figure 2. Number of Participating Countries



Survey Results: Characteristic 3

3. Decision Making

Programs' ability to reach certain outcomes is affected by whether or not decisions were made more often on operational needs that could not be met by competing systems versus on diplomatic or political needs.

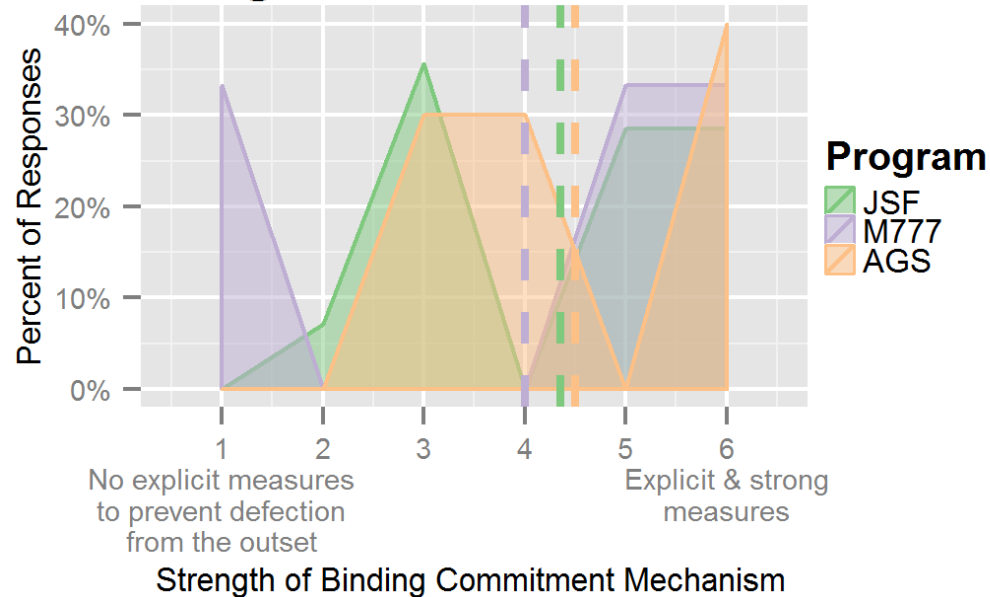


Survey Results: Characteristic 4

4. Commitment

The degree to which programs enforced commitment impacts the program’s ability to achieve cost goals and end-product goals. When a country defects, costs rise for the remaining participants, program could be killed, and schedule delays are likely.

Figure 4. Commitment



Survey Results: Characteristic 5

5. Flexibility

The volatile technological and security environment facing the international security theater today requires programs that can quickly respond to the changing internal and external environments. Therefore, the management of programs must have the capacity to respond to changing environments without killing the program.

Figure 5. Flexibility

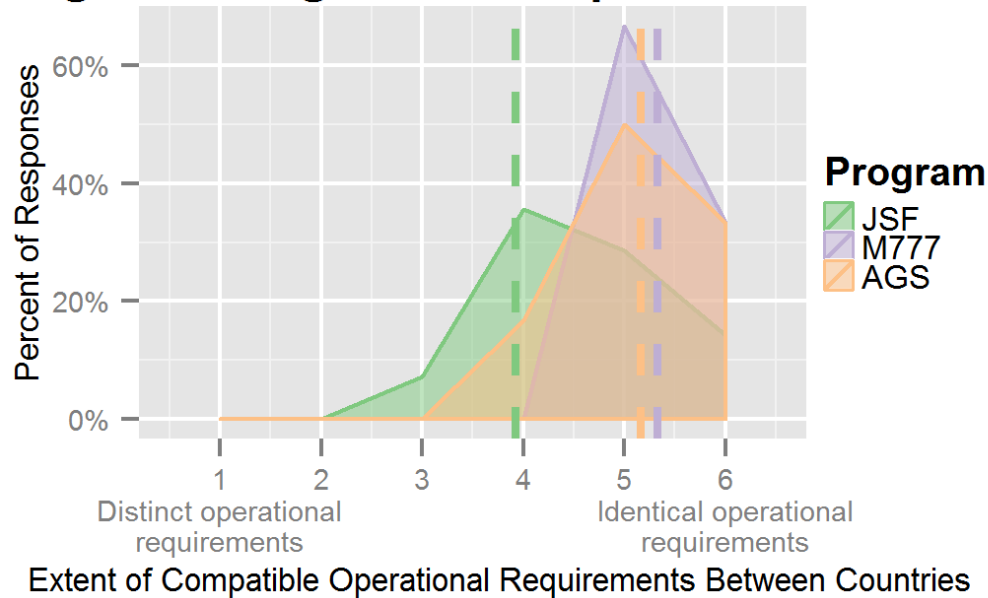


Survey results: Characteristic 6

6. Alignment of Operational Needs

Having multiple militaries working together could introduce a variety of different operational goals. In order to produce a successful end-product, partner nations need to have reciprocal goals so that the program stays focused and partner nations are equally investing in acquiring the capability.

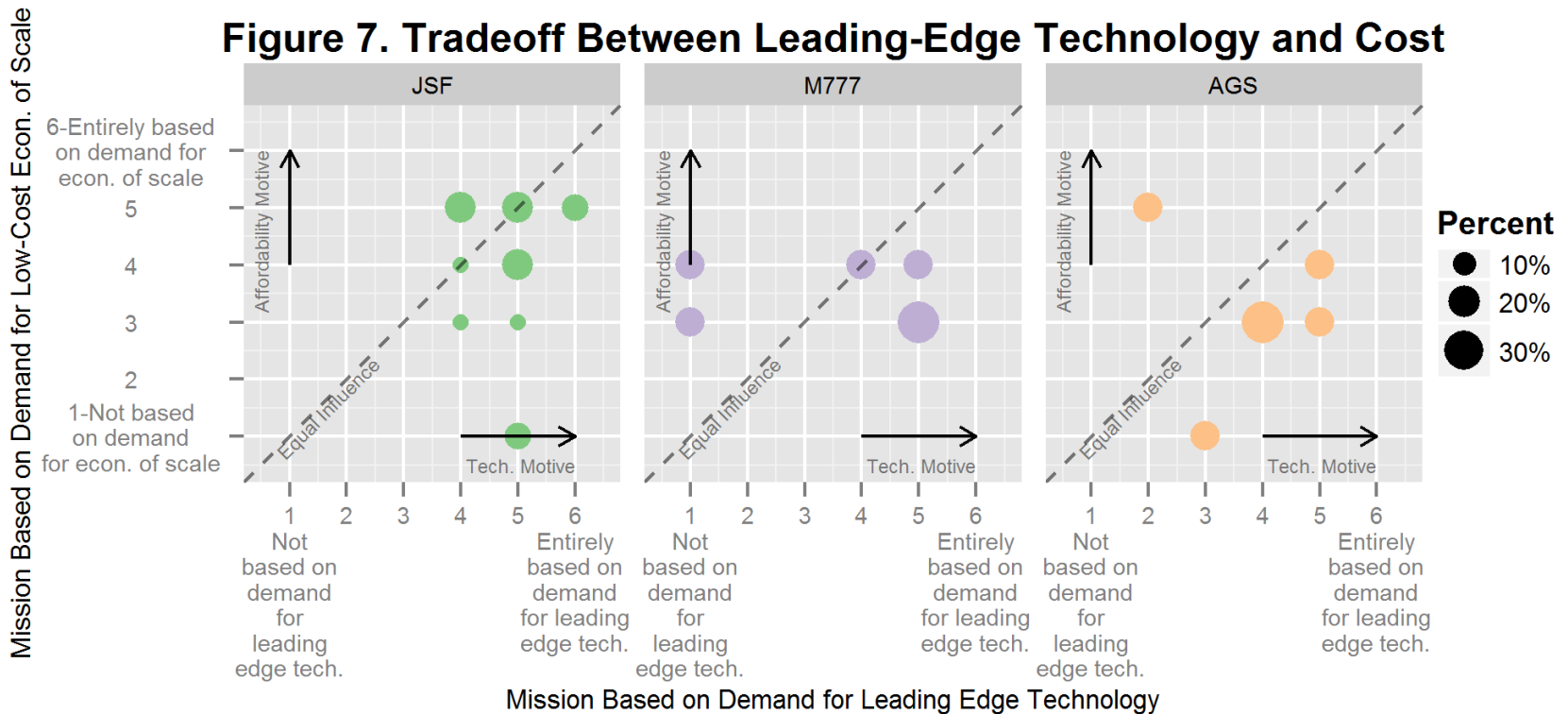
Figure 6. Alignment of Operational Needs



Survey results: Characteristic 7

7. Leading-edge Technology versus Affordability

There is a trade-off between achieving leading-edge technology and affordability structures such as economies of scale. The exceptionally high cost of R&D in modern defense acquisition is crucial to procuring technologically advanced capabilities. Economies of scale should be focused on after a successful and advanced capability has been developed and in high demand.

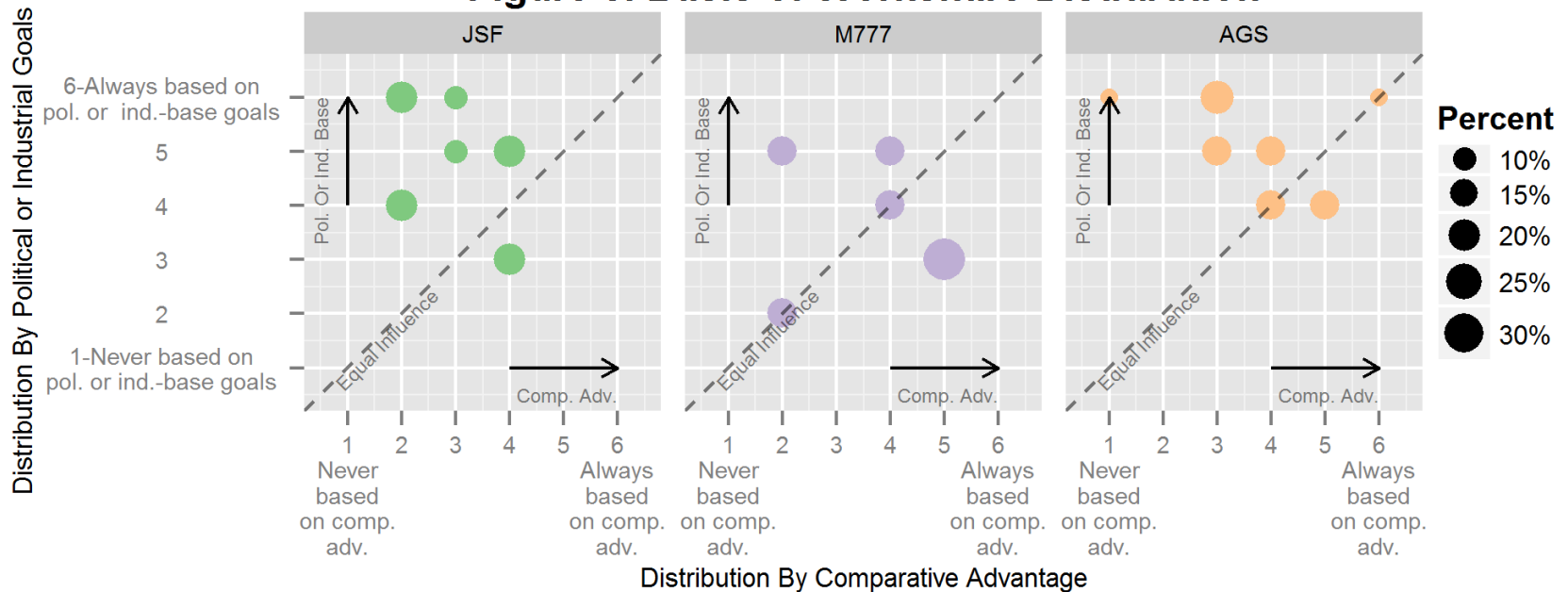


Survey Results: Characteristic 8

8. Workshare Distribution

To achieve cost-efficient outcomes, international programs present greater opportunity for competition based on comparative advantage. However, international collaboration also presents a higher level of political and industrial-base variables into procurement and acquisition. Strategic posture, trade policy, industrial gain, and technology transfer are spillover benefits to international cooperation and may be more desirable than cost-efficiency for some nations.

Figure 8. Basis of Workshare Distribution



Notable Conclusions (1 of 2)

Hypothesis 1 – Structure Matters

- Organizational complexity is the key difference and challenge international programs face compared to single-nation programs.
- The incentives for participating in development are not necessarily derived from the demand to achieve an individual end product outcome. Instead, the demand is for spill over benefits (e.g. industrial development or operations and maintenance savings).

Hypothesis 2 – Security Policies vs. Economic Case

- The two cases with a larger number of participants based decisions on political or industrial-based goals more than the case with fewer participants.
- While programs that are more grounded in security policies rather than economic efficiency interests experience more negative cost and scheduling outcomes, for some programs political and security policies are crucial to achieving program goals.

Notable Conclusions (2 of 2)

Hypothesis 3 – Prior Cooperation between Countries

- While some of the cases suggest that prior cooperation can improve outcomes, the program with the highest institutional memory had experienced the greatest challenges throughout the first 15 years of the program.
- In two cases, development laid the groundwork for future cooperation by working through tech. transfer or building industry to foreign government relationships.

Hypothesis 4 – Platform Producing and Specialists Countries Cooperating

- All three cases support the hypothesis that countries who are uniquely capable of producing complex acquisition programs can achieve cost sharing or interoperability benefits from working with smaller countries or industries.

EmergEd from Interviews

- In most cases programs overestimate their ability to simultaneously pursue leading-edge technology and cost efficiency, with the later often not achievable.
- Interviewees regularly mentioned that setting key parameters and anticipating technology transfer hurdles is crucial to avoiding cooperation problems.